ABSTRACT

Title of Dissertation: STEM TEACHERS AS INTERNATIONAL STRATEGIC LEADERS: CHANGE AGENTS AT THE SYSTEMS SCALE

Rebecca Elizabeth Vieyra, Doctor of Philosophy, 2022

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This dissertation research attempts to answer the questions "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?" This study aims to move beyond the mostly descriptive studies of teacher leadership, to understand *why* a particular group of teachers chose to lead. It attends to visionary leadership outside the school building or district that contributes beyond administrative or political boundaries, at the wider level of the STEM teaching profession. It explores literature across multiple disciplines to aid the adoption and contextualization of a theoretical framework for data collection and analysis of seven case studies of teacher leaders. The resulting theoretical framework is anchored in Bandura's Social Cognitive Theory for its emphasis on self-efficacy and is informed by prior work in leadership and STEM teacher leader development. This theoretical lens is aligned with themes that previously emerged from the results of preliminary interviews with teachers who attributed their leadership to significant increases in leadership self-efficacy.

Findings from this study suggest that the teachers acted upon their tendency toward impulsivity to accept new opportunities for strategic leadership in STEM education even when

self-efficacy for STEM and teacher leadership was reported to be low, or non-existent due to the lack of familiarity with leadership or STEM (Finding #1). After accepting leadership opportunities, growing self-efficacy for leadership activities primarily derived from improvements in their STEM identity (Finding #2). Among Bandura's sources of self-efficacy, these teachers frequently reported the importance of emotional and physiological states to engage opportunistically in strategic teacher leadership in STEM education, as well as the role of persuasion from friends and colleagues (Finding #3).

Implications from this research include recognizing the importance of supporting early childhood teachers' STEM identity through the recognition of work they already do that falls within the domain of STEM content and processes. It also suggests the need for educational leaders to help early childhood teachers move toward and overcome a commonly expressed fear of STEM. Further, it calls for those who support teachers to identify and foster risk-taking mentalities concerning leadership, offering opportunities and support even (or perhaps especially) to those teachers who do not yet feel ready to lead others. This work aims to increase the awareness of early childhood teachers' potential as reform agents in STEM education, as well as bring attention to more human, individualized elements of teacher personal wellness and professional growth that can be realized through leadership.

STEM TEACHERS AS INTERNATIONAL STRATEGIC LEADERS: CHANGE AGENTS AT THE SYSTEMS SCALE

by

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Foreword

Portions of this dissertation have been prepared for publication. Chapter 2 includes substantial ideological components of a paper co-authored with dissertation committee member Dr. Rebecca Hite which has been submitted for publication. As lead author, Rebecca Vieyra's contributions include the original crafting and execution of the literature review. Chapters 3 and 4 include contributions from Rebecca Vieyra's prior direct report, Dr. Carmen del Pilar Suárez Rodríguez, of the University of San Luis Potosí, Mexico. Dr. Suárez served as Coordinator of the ITEN Teacher Fellowship, from which the research participants for this study were selected. Dr. Suárez contributed to this research by helping to design the interview protocol for the 2020 interviews, collecting data as part of the Teacher Fellowship requirements, and providing critical feedback to the 2021 interview protocol designed and implemented by Rebecca Vieyra.

Other important collaborations that have contributed to Rebecca Vieyra's thinking about STEM teacher leadership include the following.

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- Hite, R., Vieyra, R., Milbourne, J., Dou, R., Spuck, T., Smith, J. (2020, 05). STEM teacher leadership in policy. In C. Johnson, M. Mohr-Schroeder, T. Moore & L. English (Eds.), *Handbook of Research on STEM Education* (pp. 470-480). London, UK: Routledge/Taylor & Francis.

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I am also indebted to those who saw more in me than I saw in myself. Individuals who have significantly influenced my career pathway after becoming a teacher include a plethora of

people who have mentored me in some capacity or another. Among my friends and colleagues, Mr. Tom Holbrook and Mr. Rodger Baldwin supported me in my first years of teaching and inspired me to be a teacher leader from the outset. Mr. Jay Sargeant, past principal of Cary-Grove High School, modeled an enthusiasm and respect for teachers to which I still aspire. Mr. Tony Springer and Mr. John Montgomery of the NASA Aeronautics Research Mission Directorate were among the first who helped me to realize that my skills as a teacher need not be restricted to the classroom alone, figuratively opening the skies to me. Dr. Beth Cunningham, Dr. Robert Hilborn, and Dr. Jack Hehn hold a particularly special place in my heart for entrusting me with the responsibility to think–and lead–strategically on behalf of the K-12 physics teaching profession during my time at the American Association of Physics Teachers. I am thankful to Mrs. Kim Osborne and Mr. Schucry Giacoman of the Organization of American States and Mrs. Julianna Aynes-Neville of the U.S. Department of State for the confidence they expressed in me to design and lead initiatives in STEM teacher education far beyond my own comfort zone, across the political borders of the many countries of the Americas. I am also grateful to Dr. Kathy Perkins of the PhET Interactive Simulations project, who has given me the confidence to finish this major dissertation project while at the same time entrusting me with her vision to improve STEM education by creating new teacher leadership opportunities across the world.

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Chapter 1: Introduction

Researcher Narrative

An important element of laying down the theoretical foundation for my proposed research project is *reflexivity* (Gergen & Gergen, 1991)—examining my relationship to the research process and the people and phenomena I intend to study. My own lived experience can influence both my development and interpretation of my research (Berger, 2013).

I am approaching my research on STEM teachers' professional strategic leadership as an insider concerning my engagement as a prior STEM teacher leader. After earning my bachelor's degree in physics education, I taught physics, engineering, and integrated science for seven years in Illinois public high schools. During that time, I was exposed to a plethora of opportunities to engage with local, state, national, and international science teaching societies, and to take part in summer institutes and research projects. I felt welcomed by many teacher communities, including the Illinois and Chicago sections of the American Association of Physics Teachers, Physics Northwest, and the Illinois Science Teaching Association. I felt validated in my instructional capacities by earning National Board Teacher Certification and being selected as a Presidential Award for Excellence in Math and Science Teaching. Soon thereafter, I gained a new vision for science education while serving as an educational advisor at NASA as an Albert Einstein Distinguished Educator Fellowship.

Through these experiences, I came to understand that I was part of the physics teaching profession, a community whose tendrils extended beyond my school and district. I felt committed to supporting the teaching profession by taking part in and offering professional development to my colleagues and engaging with state and national grant-funded projects. I

realized that I was able to be a bigger—and more strategic—part of a change for science education than my job description alone suggested.

I also became acutely aware of the tension inherent to being a classroom teacher while engaging in strategic kinds of professional activities. I had intended to go back to my classroom after the completion of my Albert Einstein Fellowship in Washington, DC, but I had hoped to return to a position that would allow me to keep a foot in the classroom while also taking on novel leadership roles within the district. As this dual role was not available to me, I left my district to take on science education project management roles, first at the American Association of Physics Teachers, then at the Organization of American States, and now at the PhET Interactive Simulations project at the University of Colorado Boulder. Collectively, these experiences have given me a vantage point to see the possibilities for teacher leadership and to recognize how many teachers contribute formally and informally to a large set of interconnected educational systems within and beyond the U.S.

In contrast to my insider experience as a STEM teacher leader, I am a bit more of an outsider concerning the specific context of the individuals I study for my dissertation. I studied early childhood teachers who lead STEM teacher education initiatives across the Americas, including English-speaking North America and the Caribbean, and Spanish-speaking Central America and South America. While I am a fluent Spanish speaker, I did not grow up in a Spanish-speaking home, nor was I immersed in Latin American and Caribbean society until my very late adolescent years. My professional preparation was squarely set on secondary science, while most of my research participant teachers have been prepared to be early childhood generalists, or, in some cases, were not formally prepared to be early childhood teachers at all.

My own insider-outsider experiences with teacher leadership have helped me to understand what is possible for teacher leadership. My identity, vision, and practice of strategic leadership might provide valuable insight into how STEM teacher leaders develop. At the same time, I acknowledge that my experience as a STEM teacher and the opportunities I received as a STEM teacher leader were atypical and might not be accessible to those who receive far less personal or professional support. As I planned and executed my research work, I kept my positionality in mind and attempted to be aware of how my experiences and perspectives color what I see and how I interpret it.

Rationale

Teacher leadership has received growing attention around the world. The U.S. has led numerous initiatives to identify and develop STEM teacher leaders. Policymakers and educational agencies have called for the nation to provide active support to STEM teachers for the work they do both within their classrooms, schools, and districts as well as *outside of* the boundaries of their traditional roles as school or district staff (100Kin10, n.d., National Research Council, 2014 & 2017; National Science Foundation, 2015; President's Council of Advisors on Science and Technology, 2010; U.S. Department of Education, 2016; White House 2012 & 2018). Beyond improving the instructional practices and learning outcomes in their classrooms and those of their proximal colleagues generally (Leithwood & Louis, 2011; Louis, 2015), STEM teacher leadership has been recognized as one part of the solution to pervasive challenges in education. Some of these widespread challenges that STEM teachers can help to solve include advising STEM education standards and policies at the state and national level (Hite et al., 2020; National Research Council, 2017), serving in elected positions that influence STEM education

(Howe & Stubbs, 2001), addressing matters of underrepresentation, diversity, and equity in STEM education and careers (Doraiswamy, 2015; Hazari et al., 2017), contributing to STEM and education research (Hite et al., 2020), and mentoring future and novice STEM teachers (Criswell, et al., 2017; Hanuscin et al., 2012; Hite & Milbourne, 2018; Sinha & Hanuscin, 2017), among other activities.

More broadly, the promise of promoting STEM teacher leadership for integral and sustainable development has not escaped policymakers and influencers around the world. Global leaders have identified major gender discrepancies in student interest, performance, and career aspirations in some STEM-related fields (UNESCO, 2017), as well as the overall need for more STEM-enabled professionals (National Science Board, 2018), including STEM teachers (IDB, 2016; UNESCO, 2015). The recognition that teachers need to be invited to the forefront to help address these challenges has led to initiatives such as the International Task Force on Teacher Education (n.d.), which aims to advocate for teachers and include them in their governance. Additionally, some education researchers, including Chowdhury et al. (2020), believe that STEM education must be inherently oriented toward advocacy work directed by STEM teacher leaders.

Various initiatives have been created to specifically advance STEM teacher leadership over the past few years. Within the U.S., these initiatives include the Albert Einstein Distinguished Educator Fellowship (U.S. Department of Energy, n.d.), the Presidential Awards for Excellence in Math and Science Teaching (PAEMST, n.d.) alumni network, the STEM Teacher Leadership Network (STEMTLNet, n.d.), and the Knowles Fellows and Senior Fellows Programs (Knowles Teacher Initiative, n.d.). Other more general teacher leadership initiatives have also placed targeted emphasis on STEM teachers, including the Kenan Fellowship (Kenan Fellows, 2019) and the School Ambassador Fellowship (U.S. Department of Education, n.d.).

STEM teacher leadership is being recognized internationally as well across Latin America, the Caribbean, and Africa (Movimiento STEAM, n.d.; OAS, n.d.; PhET Interactive Simulations, 2022; Siemens Stiftung, n.d.), and is present in more general teacher leadership career pathways that are available across Europe, Asia, and Australia (Darling-Hammond, 2017). Globally, the United Nations has recognized the importance of including STEM teachers in conversations about educational policy development (UNESCO, 2009).

Notably, only a limited number of STEM teacher leadership initiatives account for generalists who also teach STEM throughout the school day (i.e. preschool and primary) teachers, and most exclude preschool teachers. For example, the Albert Einstein Distinguished Educator Fellowship and the Presidential Awards for Excellence in Math and Science Teaching restrict eligibility to K-12 teachers, despite the overall importance of high-quality early childhood experiences to lifelong achievement (Burger, 2010; Camilli et al., 2010), which includes having positive STEM experiences. Research points to the importance of STEM experiences from very early ages even before kindergarten (Aldemir, Jale, & Hengameh Kermani, 2016; Chaillé and Britain, 2007; Early Childhood STEM Working Group, 2017), yet acknowledge the low instructional self-efficacy of early grades teachers for teaching STEM (Trygstad, 2012; Hong Wan et al., 2020). The literature demonstrates that early childhood teachers can effectively foster early childhood STEM identity (Hachey, 2020), leading to more equitable engagement by young girls (Stephenson et al., 2021). It therefore follows that any effort to improve STEM education in early grades, including the actions of STEM teachers who impact other STEM teachers and STEM education systems (i.e., STEM teacher leaders), should be of great interest and importance to the STEM education community.

As recent arrivals to the world of government-mandated formal education, early childhood educators, and the subpopulation of these teachers with an affinity for or specialization in STEM, are a novel population of the study. Globally, only about 41% of preschool-aged children were enrolled in preschools in 2019, although this percentage represents a dramatic increase, up from about 32% in 2016 (Global Partnership for Education, 2020). In comparison, preschool participation in the U.S. hovers around 60% (U.S. Department of Education, 2021).

Even when funded by governments, preschool education has not always been viewed as a full part of the teaching profession—for example, nearly 70% of government preschool teachers in rural Mexico do not have a teaching degree, which is a much higher percentage than their primary or secondary counterparts (UNESCO, 2020). The struggle to develop *educational professionals*—or retrain *educational workers* as professionals—is a significant challenge for developing countries that have pushed to increase early childhood education access in the past years. The limited number of qualified teachers is an obstacle in places like Latin America and the Caribbean, including Trinidad and Tobago, where preschool education has become mandatory (UNESCO, 2016). Because of this lack of formalized education or recognition for early childhood teachers, they have often been excluded from even general studies on teachers and teaching (ibid).

The burgeoning number of international initiatives to advance STEM education in tandem with an emphasis on teacher leadership to support the teaching profession suggests that these intersectional topics merit additional attention by the research community—particularly for understudied generalist teacher groups. While there is a robust history of research on leadership in general (Antonakis & Day, 2018), and multiple decades' worth of research on discipline-agnostic teacher leadership (York-Barr & Duke, 2004; Wenner & Campbell, 2017), research on

the experiences of teachers with disciplinary identities (especially in generalist teaching roles such as preschool and primary school) is more limited. Wenner and Campbell desired to "aggregate research on teacher leadership by discipline such that the unique idiosyncrasies of each discipline could be illuminated" (2017, p. 160), but felt they were unable to do so because of the small literature base and lack of descriptive disciplinary context for most studies. Further, they urged education researchers to pursue deeper studies on teacher leadership by discipline, using science education as an example, to understand "how disciplinary idiosyncrasies contribute to the selection of disciplinary teacher leaders, how they help shape and organize the work of teacher leaders, and how teacher leaders influence student learning within these disciplines" (ibid, p. 160).

The growing social and political emphasis on STEM has opened new opportunities for teachers to lead beyond the building level, to include more systems-based strategic leadership actions to support the STEM teaching profession as a whole (National Research Council, 2014). The systemic nature of the challenges inherent to STEM education might result in teachers who feel called to lead within a wider sphere beyond the building or district in which they work. Teachers who lead at the systems level might involve institutions of higher education, governmental education agencies, professional societies, or other networks that serve as a "space between" (Bauman, 2018) the traditional workspaces of teachers. This kind of leadership might not be captured in studies that are limited to school leadership.

This dissertation broadly aims to address important and intersectional gaps in the literature: the origins of STEM teacher leadership self-efficacy of early childhood teachers. My proposed research is oriented toward understanding the personal experience of teachers who step boldly forward on behalf of their profession to improve STEM education through their strategic

leadership. An exploration of STEM teachers' beliefs about their ability to lead strategically has the potential to advance the research field that goes beyond the description of teacher leadership alone. Additionally, it might provide some insights as to how to better identify potential leaders, predict their leadership effectiveness, and more effectively partner practitioners with policymakers as advocates for positive educational change.

Organization of the Dissertation

This dissertation includes a blend of traditional chapters and full papers. Chapter 1 (this chapter) describes the landscape of the research, as well as important definitions, problem statement and rationale, purpose statement, context, and the research questions. This overview chapter aims to clarify how this proposed research is situated within the intersection of extant work on leadership generally, teacher leadership, strategic leadership, and STEM education. Chapter 2 is a full paper composed of a systematic literature review on science teachers' strategic leadership; although this chapter is focused on secondary science education, the later pilot study demonstrates the relevant similarities between early childhood STEM and secondary science teacher leadership, allowing me to apply these findings to my chosen study population, early childhood teachers. Chapter 3 presents a broader, more traditional literature review for the various intersecting domains of this study (including the findings of Chapter 2), which lays a foundation for my dissertation's theoretical framework, which I then used to develop a methodology for a pilot study. The results of the pilot study are also described in this chapter. Chapter 4 is a full paper describing the final methods I used to answer this dissertation's research questions, including the study results. Chapter 5 presents a brief conclusion.

Background and Definitions

A study on teachers' strategic leadership in early childhood STEM education necessitates a firm definition of what is meant by teacher leadership, strategic leadership, teachers' strategic leadership in STEM education, and STEM in early childhood education. The following sections define each of these terms, grounded in literature, and culminate with the critical working definition for this study: teachers' strategic leadership in early childhood STEM education.

Teacher Leadership

Literature from the field of education has struggled to come to a consensus about the definition of teacher leadership. York-Barr & Duke (2004) noted that there is no official shared definition of teacher leadership. However, the general vision for teacher leadership has expanded from being primarily small-scale (small learning communities, such as departments), to whole-school and accountability-focused, to later aiming more widely to address matters of social justice. In a review a decade and a half later, Wenner & Campbell (2017) defined teacher leaders as "teachers who maintain K-12 classroom-based teaching responsibilities, while also taking on leadership responsibilities outside of the classroom" (p. 140). Notably, this definition excludes the leadership of pre-K teachers, many of whom might be formally recognized by their governments as fully certified teachers in educational systems that mandate preschool participation.

Recent initiatives have attempted to operationally define teacher leadership by creating highly descriptive frameworks of specific teacher leadership actions or competencies. Some of these leadership frameworks include the Teacher Leadership Exploratory Consortium's *Teacher*

Leader Model Standards (Cosenza, 2015) and the National Education Association Teacher Leadership Institute's *Competencies* (Teacher Leadership Institute, n.d.). Nachtigall's (2019) review of 19 teacher leadership frameworks revealed only three were designed for STEM-specific contexts, including *Aspiring to Lead: Engaging K-12 Teachers as Agents of Change in Physics Education* (AAPT Master Teacher Leader Task Force, 2017), the *Prime Leadership Framework* (National Council of Supervisors of Mathematics, 2018), and *STEM-I*^{3} (Sublette, 2013). Nachtigall (2019) found that these frameworks did not necessarily lead to consensus about a definition of teacher leadership, but that they did support the idea that teacher leadership is a process, rather than a formal position of authority.

Strategic Leadership

Strategic leadership is one dimension of leadership (including teacher leadership) that suggests a systems-level understanding of complex environments, long-term vision, and the development and execution of a strategy to aim to achieve that vision. Hite and Milbourne (2018) authored one of the few publications on STEM teacher leadership that explicitly identified strategic leadership by name. They identified this form of leadership as a potential pinnacle of the leadership trajectory embodied in their STEM Master Teacher (STEMMaTe) model for the levels of participation in the STEM master teacher community of practice. Their definition of strategic leadership is a process by which teachers lead "through distribution of their leadership and expertise in national advocacy and reform arenas" (p. 7). Although it could be argued that strategic leadership can occur at other levels (such as at school, provincial, or state levels), the emphasis on wide-scale, systems-level engagement is clear.

Similarly, literature from the field of business defines strategic leadership as the intentional actions (or inaction) that one takes to lead an institution or organization (Finkelstein, et al., 2009). Authors such as Anderson et al. (2008) defined strategic leaders in their taxonomy as individuals who they "regarded as 'big picture' thinkers who saw the organization holistically and understood it as an open system within a larger business context. A strategic leader thought about, forecasted, and prepared for future business developments; understood the evolving nature of business markets; and acted to change cultural norms and values for the purpose of organizational realignment" (p. 602). A more complex framework for strategic leadership has been developed by Samimi et al. (2020), but while they acknowledge a more distributed leadership style in their meta-analysis of prior reviews on strategic leaders, their framework only includes those in high formal leadership positions, including CEOs, management teams, and boards of directors.

One example of how strategic leadership has been explored in education is the work of Davies and Davis (2005). The authors defined an initial framework for strategic leadership that included (1) core moral purpose and values, (2) future perspectives and vision, (3) operational planning, and (4) current actions and reactions. By undertaking a qualitative interview study of leaders in 23 schools, they found that interviewees described strategic leaders who set the direction of the school, translate strategy into actions, align the people, the organization, and the strategy, determine effective strategic intervention points, and develop strategic capabilities within the school. They also teased out characteristics that underlie these actions and found that individuals described strategic leaders as those who challenge and question and "have a dissatisfaction or restlessness with the present" (p. 248), prioritize and learn, demonstrate wisdom founded on their core belief system, are well-connected, and relate to others well. This

analysis primarily explored actions and externally perceived characteristics and did not explore the mindset of internal workings of teachers.

In the context of education, strategic leadership formally falls to building or district-level administration, despite the reality that leadership is often more widely distributed among numerous actors, artifacts, and situations (Spillane, et al., 2001b). York-Barr and Duke (2004) noted in their review that while most leadership was conceptualized as school-based, this trend was shifting. Wenner and Campbell (2017) noted that common conceptions of teacher leadership had expanded since York-Barr and Duke's review, and that the research community had come to focus on "roles beyond the classroom, supporting the professional learning of peers, influencing policy/decision making, and ultimately targeting student learning" (p. 134), activities which might be deemed *strategic leadership.* They also specifically called for the further exploration of the nuances of disciplinary leadership, including that of STEM teachers.

Teachers' Strategic Leadership in STEM Education

For this dissertation, I look not at a single institution or organization bounded by physical walls or employee status, but at strategic leadership that impacts the professional community of educators. In the context of STEM education, strategic leadership can take on a decidedly different meaning than what is usually inferred in building or district-level systems with little attention to the disciplinary identities of teachers. A strategic leader in STEM education might build a professional community of practice of STEM teachers across a country or region (hosting webinars, face-to-face gatherings, etc.), collaborate with a university to improve its STEM teacher education program or engage in research, and might author articles about their practice or opinion pieces that aim to shift others' practices or policies. Broadly, STEM teacher strategic

leaders might engage with a disciplinary professional society, by becoming a "teacherpreneur" (Berry et al., 2013) who provides novel services or resources to peers, or by serving as an advisor to state-led initiatives, including STEM education standards or assessments.

Considering the contributions from researchers in the fields of education and management and the nuanced contexts in which STEM teachers work, for my research, my definition of teachers' strategic leadership in STEM education is found in Table 1.1. This definition includes generalist teachers (typically early childhood and primary teachers) who teach STEM in their instructional areas. Necessarily, this definition emphasizes teachers who aim to impact STEM education on a broad scale.

Table 1.1
Definition of teachers' strategic leadership in STEM education

Teachers' strategic leadership in STEM Education: The actions of STEM teachers to influence policy and/or underlying norms to improve STEM education systems at scale

While strategic leadership could technically occur within any definition of *system*, this definition is oriented toward change of the STEM teaching profession, specifically, and therefore emphasizes leadership that is more likely to occur at scale, be it through provincial, national, or international levels. Strategic leadership within the domain of STEM education has the potential to occur outside of the typical school day, unnoticed by direct peers or administrators. While STEM-specific strategic leadership can happen in principle at the school or district level where there are large groups of STEM teachers, teachers are much more likely to receive STEM-specific preparation and support from actors that extend beyond their building (including university partners, professional societies, state science or math coordinator, etc.).

Because STEM teachers might have shared identities that expand regionally or even globally based upon their professed discipline or domain (i.e., STEM or its disciplines), strategic leadership for STEM teachers might occur in domains beyond their traditional scope of work. While strategic teacher leadership might be observed among any kind of teacher, STEM teachers and their leadership exist in a nuanced context. Some of these nuances include the emphasis on science education as a national and international priority for national security and economic stability (National Science Board, 2018; IDB, 2016; Medina-Jerez, 2016), addressing teacher shortages (UNESCO, 2015; Villegas-Reimer, 2003), closing the gender gap for math and science achievement (UNESCO, 2017), and increasing awareness of the importance of general scientific literacy (UNESCO, 1995). Within the United States, STEM teachers have also been exposed to the most recent national reforms in education standards (NGSS Lead States, 2013). Further, many STEM teachers (including pre-K and elementary teachers who are required to teach science) feel underprepared to teach the content and skills of STEM disciplines (Trygstad, 2013), and schools rarely have the capacity to provide the kinds of content-specific support they need when there are so few teachers per specific discipline. In upper secondary schools, this difficulty is compounded by the isolation experienced by many STEM teachers (White & Tyler, 2014), as they struggle to relate to their peers from other disciplines.

Teachers' Strategic Leadership in Early Childhood STEM Education.

The population I have chosen to study for research on teachers' strategic leadership in STEM education is early childhood educators. In many countries, this period of formal education is referred to as *preschool*, but I have adopted the more widely used term across the Americas, *early childhood education*, as a growing number of countries are encouraging—or mandating—

early childhood education to be a component of public schooling, and therefore no longer officially *pre*-school. Although early childhood education may be defined as education from birth through ages five to eight, I have selected to study individuals who teach children ages three, four, or five years old in formal, government-run schools.

Problem Statement and Rationale

Increasing social and technological complexity and connectedness is impacting the way people lead and effect change both generally and in terms of the response to the push for STEM education as a solution to global challenges. According to complexity leadership researchers Uhl-Bien and Arena (2017), "For some, these are exciting times and the opportunities to lead change have never been greater. For others, the lack of clarity and speed at which complexity is increasing feels overwhelming and chaotic. For the latter, there is a growing sense of dismay about what the future holds and the inability to control it." (p. 9). The authors use these words to primarily refer to organizational management rather than what might be perceived as larger, loosely connected actors and elements of educational systems. However, I hypothesize that teachers also operate under the awareness of the world that is changing around them, compounded by how STEM education initiatives are linked to changing social and economic needs.

Despite a growing research base on STEM teacher leadership, including the development of leadership frameworks, the literature primarily provides a *description* of teacher leadership actions or competencies. The actual process of *development* of STEM teacher leaders is relatively unexplored (Sinha & Hanuscin, 2017; Nachtigall, 2019). STEM teachers' enactment of wide-scale strategic leadership, in particular, has not been widely documented beyond program

evaluations (see Gareis et al. (2011) and Galosy et al. (2017)). Further, the kind of systems level leadership described above often occurs informally, particularly in the case of STEM teachers. Wenner & Campbell (2017) noted that math and language arts initiatives often embraced a more distributed leadership style in which teachers and administrators collaborate closely with official roles, while "science was typically led by a few informal teacher leaders" (p. 139). The work of informal teacher leaders has not been explored to the same depth as teachers' formal, job-embedded roles (NASEM, 2015).

While frameworks may describe the expanding roles of STEM teacher leaders and the contexts that promote them, questions remain as to *why* some teachers lead strategically to impact the profession on a wide scale. Of particular interest to me are the reasons behind why some teachers move beyond the bounds of their classroom and school responsibilities to spheres of influence where their work is focused more toward the STEM teaching profession than directly toward classroom learning, and more toward engaging in large-scale initiatives than local change. However, it is critical to note that these different modes of leadership are not at odds with one another—evidence suggests that most teachers expand their leadership capacities only after achieving significant mastery of classroom instruction (Mentzer et al., 2014; Hite & Milbourne, 2018). I am intrigued by what drives some STEM teachers, especially generalist educators, to desire to engage as leaders with increasingly complex systems that affect education, including the political and social forces that shape it.

An exploration using Social Cognitive Theory (Bandura, 1986) may shine some light on why some STEM teachers choose to lead beyond their schools and districts, including what motivated them to take their first steps toward and persist in their systems level leadership in STEM. Social Cognitive Theory might help uncover the reasons behind why some STEM

teachers become strategic leaders, as, per this theory, behavior (i.e., teacher leadership) is mediated by personal and contextual elements, which are, in turn, both mediated predominantly by self-efficacy beliefs. According to Anderson (2008) who was able to empirically link leaders' perceptions of self-efficacy to peers' perceptions of the leaders' effectiveness, "leadership development efforts might benefit by focusing on self-efficacy as a starting point" (p. 606). An exploration of STEM teachers' self-efficacy beliefs about their ability to lead strategically has the potential to advance the research field that goes beyond the description of teacher leadership alone. Additionally, it might provide some insights as to how to better identify potential leaders, support their leadership development, and predict their leadership effectiveness.

Early psychology research is rooted in the idea that behavior is mediated by perceived self-efficacy, a term that Bandura (1994) defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 71). Therefore, exploring STEM teachers' self-efficacy for strategic leadership—including their sources of initial increases in self-efficacy—can be important for understanding *why* some STEM teachers become strategic teacher leaders.

To better understand the hypothetical role of self-efficacy in STEM teachers' strategic leadership and to create a foundation for the analysis of data in this dissertation study, I performed two literature reviews (detailed in Chapters 2 and 3). The nature of these literature reviews reflects my own evolution of research, moving from the conceptualizations and contexts of science-specific teacher leadership at the secondary level (Chapter 2) toward exploring self-efficacy for more generalized STEM teacher leadership at the early childhood level (Chapter 3).

1. **Conceptualizations:** In what way does the literature on science teacher leadership conceptualize secondary science teachers' engagement in *strategic leadership in science education*? [See Chapter 2.]
2. **Contexts:** How does the literature describe secondary science teachers' specific *strategic leadership* actions and contexts that encourage or discourage those actions? [See Chapter 2.]
3. **Self-Efficacy (SE):** How is self-efficacy classically defined? (Is its definition and its impact context-specific?) How does self-efficacy mediate individuals' actions, in general? [See Chapter 3.]
4. **Leadership Self-Efficacy (LSE):** How is self-efficacy situated within frameworks for leadership, in general, and for strategic leadership, specifically? [See Chapter 3.]
5. **Teacher Leadership Self-Efficacy (TLSE):** How is self-efficacy situated within frameworks for teacher leadership and teacher leader development? [See Chapter 3.]
6. **STEM teacher Strategic Leadership Self-Efficacy (STSLSE):** How is self-efficacy situated within frameworks for STEM teacher leadership and teacher leader development? [See Chapter 3.]

The answers to the above questions provided implications for how I ultimately conceptualized STEM teacher self-efficacy for leadership and its role in transitioning toward strategic leadership. Given the similarities I saw in early childhood and secondary STEM teachers, I was able to take findings from both literature reviews to contribute to the development of an analysis tool for exploring early childhood STEM teachers' self-efficacy and its role in their strategic leadership.

Purpose Statement

My research aimed to move beyond the mostly descriptive studies of teacher leadership, to understand *why* individual teachers choose to lead, with attention to visionary leadership beyond the school building or district that contributes at the level of the STEM teaching profession. It aims to analyze the role of self-efficacy in teachers' initial growth toward and actions related to *strategic leadership* in STEM teachers. My focus is on the individual experience of leadership, attending to the concern from Spillane et al. (2001b) that while the nature of most educational leadership is distributed among multiple actors, that "a focus on the distributed nature of the context of action may lead us to overlook the traditional importance of individual agency" (p. 24).

My qualitative, interpretive study examined how self-efficacy for strategic leadership mediates the development of strategic leadership of seven early childhood STEM teachers from six countries—three Caribbean countries (including a teacher who migrated to North America), one Central American country, and two South American countries. These teachers participated in the Teacher Fellowship of the Inter-American Teacher Education Network (ITEN) (OAS, n.d.) from 2019 to 2021, and grew as STEM teacher strategic leaders as evidenced through their identity, vision, and practices as leaders in STEM education. As such, the research questions first guided exploration of teachers' sources of self-efficacy for leadership, followed by investigation into how self-efficacy mediates teachers' responses to factors (internal and external) then affected leadership engagement.

Context: Inter-American Teacher Education Network Phase 4

Phase 4 of the Inter-American Teacher Education Network (ITEN) was a STEM teacher education-focused initiative of the Organization of American States that aimed to partner teachers as change agents alongside teacher education institutions to improve educational quality across the Americas. As the project manager, I designed and executed the project between November 2018 and November 2021. The teachers I studied for this research engaged in a multi-year fellowship focused on improving gender-equitable STEM education pedagogy and leadership capacity. During this fellowship, the teacher participants engaged in strategic leadership to influence STEM education policies or underlying cultural norms within their countries or even across the Latin American and Caribbean region.

ITEN program context is important for understanding how it provided opportunities to reveal teachers' lifelong experiences, as well as the lens through which teachers interpret their feelings about leadership, including how they define their leadership and the language they use to describe it. Further, understanding how I designed ITEN's Teacher Fellowship as the context for this study gives clear insight into my researcher orientation, as "qualitative studies are intentionally value-laden" as part of the interpretive act (Stake, 2006, p. 85). Additional details about program design can be found in Appendix A: ITEN Program Description.

It is worth mentioning that this research did not intend to serve as a program evaluation of ITEN or the Teacher Fellowship. My research did not attempt to establish any causal link between program activities and direct outcomes with respect to the origins of STEM teachers' strategic leadership. Rather, my research aimed to explore teachers' deeper experiences, personal factors, and their internal responses to leadership opportunities that they create for themselves or

that are presented to them across their professional careers. The origin of strategic leadership in STEM education might have occurred either before or during the ITEN program.

ITEN Teacher Fellowship.

A primary mechanism within this project for supporting strategic change in STEM teacher education across the Americas was the ITEN Teacher Fellowship, a two-year program composed of 36 classroom STEM teachers (Teacher Fellows) who were nominated by their ministries of education or teacher education institutions from among OAS' member states. Teacher Fellows hailed from 11 countries, including Argentina, The Bahamas, Colombia, Costa Rica, the Dominican Republic, Grenada, Jamaica, Mexico, Peru, St. Kitts and Nevis, Trinidad and Tobago, and the United States. The kinds of strategic leadership that ITEN aimed to support included developing STEM-specific teacher education pathways for pre-service and in-service teachers, designing and disseminating model instructional frameworks and curricular resources for adoption by educational agencies, building up communities of practice, and influencing STEM education policy, among others.

During this process, 36 individuals (15 early childhood teachers and 21 secondary physics teachers) from across Latin America, the Caribbean, and the U.S. took part in extensive professional development and community-building activities. From June to July 2019, participants completed a 20-hour online course that asked them to reflect on their identities as STEM teachers, learn about evidence-based pedagogical approaches unique to STEM (or applied in a STEM context), and reflect on their practice.

From 15-23 August 2019, these teachers came together in Peru for 8 days of professional development, including 5 days of grade-level STEM instructional and leadership workshops. For

early childhood fellows, this included an immersive experience in Reggio Emilia-inspired student-centered STEM learning approaches in three different schools across Lima, 1 day of STEM teacher leadership development (focused on developing advocacy plans and communication skills), and 2 days of whole-network policy dialogue alongside representatives of teacher education institutions that had nominated them for the fellowship. From October to December 2019, the teachers participated in a 20-hour online course about critical thinking, followed by coaching activities from January to April 2020 that resulted in the development of a modified learning sequence to incorporate what they had learned across the previous year. From May 2020 to May 2021, the fellowship provided everyone with personalized coaching to create and execute a STEM teacher leadership plan to impact no fewer than 20 STEM teacher peers or STEM teacher education policies. Teachers maintained community through facilitated monthly gatherings and special virtual events such as teacher-led webinars, poster presentations, and virtual seminars.

To measure changes in teachers across both years, we collected multiple forms of data that helped us to develop strong relationships with each participating teacher. In addition to the administration of surveys on network analysis, STEM teacher leadership engagement, and active and equitable teaching practices, we monitored shifts in lesson planning with detailed rubrics. Lastly, we followed changes in teachers' STEM teacher leadership through written reflections, one-on-one interviews, small group discussions, leadership plan development, and documentation of leadership activities through multimedia portfolios.

Early Childhood Teachers' Strategic Leadership in STEM within ITEN.

Despite the varied social and educational contexts of teacher participants in ITEN, numerous early childhood teachers demonstrated strategic leadership. The vignettes in Table 1.2 illustrate just a few examples of STEM teacher leadership that resulted from ITEN broadly, with the first two emanating from the ITEN Teacher Fellowship directly.

Table 1.2
Examples of early childhood teachers' strategic leadership in STEM education

Context	Vignette
Trinidad and Tobago, USA, & Jamaica *ITEN Teacher Fellows*	Two early childhood teachers from Trinidad decided that they wanted to ensure that early childhood teachers understood that STEM was not something to be feared. After collaborating with partners in Arizona and Jamaica, they worked with their Ministry to create a 1-day hands-on workshop to help their peers recognize similarities between their existing pedagogical practice and many of the foundations of STEM fields (inquiry, modeling) while partnering with students as they explored topics, such as science, with which the teachers were less familiar. Ultimately, they worked with their ministry of education to allocate professional development time across the island to offer this workshop multiple times across four days. As a result, all 576 public and private early childhood teachers in Trinidad, as well as 41 administrators, participated in the workshop, where many of them were exposed to the idea of STEM for the first time.
Colombia, Costa Rica, Dominican Republic, Guatemala, Peru *ITEN Teacher Fellows*	Five early childhood teachers from Colombia, Costa Rica, the Dominican Republic, and Peru made a pact during their time in Lima, Peru to become change agents for the region and to advocate for STEM for all. As part of their Teacher Fellowship leadership plans, they crafted a 6-week course that included 12 hours of synchronous virtual workshops about student-centered instruction, active learning, gender equity, and STEM. To ensure approval and wide recognition of their work, they engaged their administrators in the recruitment of other teachers and/or sought support from their local or national ministries of education. Each teacher leader recruited approximately 15 teachers from their networks to take part in the course and collaborated with a colleague from Guatemala to recruit an additional 9 participants, for a total of 95 teachers. At the conclusion of the course, participants provided evidence of instructional changes that included STEM through a presentation at a synchronous virtual poster session. Upon an invitation of a colleague, these teachers again replicated this experience, this time working with the national ministry of education of Ecuador.
Colombia & Chile *ITEN Teacher Leaders (not part of the Fellowship, but who interacted with*	Early childhood educators from Colombia and Chile worked together in coordination with the National Ministry of Education of Colombia and the Siemens Stiftung Foundation to create a guide on closing the gender gap by incorporating STEM into early childhood education. To do so, they performed a review of academic and gray literature on STEM and gender equity in early childhood, early childhood education national policies in both countries, developed an interview and survey protocol that they administered to teachers in 5 countries (Chile, Colombia, Dominican Republic, Costa Rica, and Peru), and incorporated resources from the Experimento STEM 3+ resources developed by the Siemens Stiftung Foundation and its partners in Mexico. This document was co-published between the two

ITEN Teacher Fellows)	institutions and the OAS and is meant to serve as a tool to introduce teachers to the aspirations of STEM to prepare students for global challenges. Separately, each teacher acquired funds for additional partnering institutions to carry out wide-scale activities, including the development of a STEM for Girls massive open online course (MOOC) with the National Academy of Natural, Physical, and Exact Sciences of Colombia, and an early childhood STEM community of practice with the University of Santiago in Chile.

The above-described activities are strategic because they aim to influence a long-term vision for STEM education, and they demonstrate an understanding of complex system management. They occur at national and international levels, which provide evidence of the strategic nature of the work that supersedes localized issues. They illustrate decidedly different kinds of actions (workshops, online courses, policy documents), but they share several strategic elements, including the following:

- **Long-Term Vision:** Teacher Fellows developed their leadership plans based on a vision for science education and specific goals to achieve.
- **Complex Systems (examples):**
    - Science advocacy through teacher education → Teacher Fellows focused on advancing science and STEM education in classrooms by supporting pre-service and in-service teacher education.
    - Multilateral (multiple institutions) → Teacher Fellows worked with two or more institutions, sometimes including partners from other countries.
    - Multiple stakeholders (government officials, teachers, etc.) → Teacher Fellows solicited support from both their peers as well as from administrative authorities.

Research Purpose

Across the more than two years of the ITEN Teacher Fellowship, I believe that STEM teachers' leadership has emerged as one of the most successful, sustainable, and measurable

elements of the program. Indeed, even when ministries of education were unable to maintain their commitments to ITEN-related projects (often the result of government changeovers), teachers typically sustained contact with ITEN through the Teacher Fellowship. While the Covid-19 pandemic made it nearly impossible to fairly and equitably measure changes in teachers' instructional practices, we had ample examples (and documentation) of STEM teachers' strategic leadership. Of ITEN's virtual and face-to-face STEM teacher activities (courses, workshops, webinars, resource creation, etc.) that served more than 237,000 teachers between 2019 and 2021, the majority were spearheaded or led by practicing teachers, many of whom were a part of the ITEN Teacher Fellowship.

Importantly, the kind of leadership displayed by ITEN's teacher leaders was centered around STEM not as a content focus alone, but as an innovative pedagogical approach with its emphasis on problem-based and project-based learning guided by student inquiry. Further, the leadership that Teacher Fellows displayed was directed toward their fellow teachers (not toward students alone) and was typically of a national or regional (Latin American or Caribbean) scope carried out with the support (or the permission) of their Ministry of Education.

Understanding *why* teachers chose to engage in this kind of leadership, not only as part of ITEN, but throughout their careers, can help researchers to not only understand the root cause of this program component, but also reveals teachers' motivations for becoming agents of change. To understand why teachers decided to lead, I must unearth the source of teachers' beliefs about themselves as capable leaders that can (and do) effect change in science education at the system scale. I need to understand teachers' unique stories as they make sense of the initial experience(s) that led them to feel capable of impacting others and how their understanding of themselves and the educational system interrelated in such a way as to motivate them to engage in leadership.

Understanding the source and progression of teachers' self-efficacy across an international context may serve to illustrate what motivates teachers at the core to be change agents in ways that are not necessarily encouraged by traditional school systems, including motivations that might be shared (or not) across diverse cultures. The findings could be used to create new opportunities for STEM teachers' strategic leadership, to serve as a model for promoting, developing, and rewarding STEM teachers' strategic leadership, and to help us understand more holistically the experiences of being a STEM teacher across the Americas—including what *teachers* perceive as the challenges and opportunities for improving working conditions for STEM teachers and their students.

Research Questions

Pulling from this international population in the context of the ITEN project, I made use of available data sources (written reflections, interviews, and artifacts of leadership activities) from 2019 through 2021 to explore the strategic leadership of its Teacher Fellows. Using a qualitative multi-site case study approach, I analyzed the work of these teachers to answer the questions found in Table 1.3.

Table 1.3
Research questions

What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?
How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education?

To avoid program evaluation, this research explores teachers' career-long experiences with leadership, not just those that might have resulted from being in the fellowship. It makes use

of the participants within the program to more holistically understand the roots of their strategic leadership (which might or might not be related to program components). These findings help determine what mechanisms can support teachers as they gain leadership and elevate the profession of science teaching globally. Findings from this research can be used to help shift cultural perceptions of teachers as professionals who are involved in their own governance and can support both teacher leadership program designers and those that want to invest in programs that strengthen the teaching profession.

Chapter 2: Conceptualizing Science Teachers as Large-Scale Policy Agents

A review of Literature on Teachers' Strategic Leadership

Introduction

Multiple researchers have generated renewed attention toward the conceptualization of *teacher leadership* in the United States (e.g., Berg & Zoellick, 2019; Hite & Milbourne, 2018; Hunzicker, 2017; Wenner & Campbell, 2017). Researchers' heightened awareness may be occurring, in part, from the expansion of K-12 teachers' roles in leadership beyond *instructional leadership* alone, which is largely centered on sharing expertise with proximal colleagues, participating in shared decision making with administrators, or advocating on the behalf of teachers in their school or district (Angelle & Teague, 2014; Cheung et al., 2018; Gigante & Firestone, 2008). Emergent notions of teacher leadership have broadened to include "leaders of informing, developing, and implementing *education policy* [emphasis added] and practice to steer *systematic improvements* [emphasis added] to benefit student learning" (U.S. Department of Education, n.d., b, para 2). The shift in defining and bounding teacher leadership solely within instruction is also reflected in scholarship; the findings of a recent meta-analysis of teacher leadership studies from the past twenty years have suggested *influence* (on policy) as a common and powerful aspect of teacher leadership, although there is little research on the outcomes of such influence on education policy (Nguyen et al., 2019). Science, technology, engineering, and mathematics (STEM) subjects have had the lion's share of this emergent national interest as agents of reform in STEM education policy, in part to enhance national competitiveness in the U.S. (National Research Council, 2014). In turn, we now see K-12 teachers of STEM engaging in *strategic leadership*—that is, taking specific and salient actions toward advocacy to systematically and systemically improve the rules that govern and courses of social action to

meet achievement goals (i.e., policies and norms, respectively) within their content areas. These actions describe teachers' direct advocacy towards a single policy or group of policies that are valued by the community of practice (adapted from Gordon et al., 1993).

An example of renewed attention toward science teachers' strategic leadership has come from one of the largest-scale STEM teaching reforms in the United States—the development and release of the *Next Generation Science Standards* (*NGSS*) (NGSS Lead States, 2013). Any successful change in policy, including the adoption of the *NGSS* and the resulting shifts in teachers' instructional practices, requires that science teachers vocally affirm the importance of this approach to teaching and learning in K-12 science by actively championing the *NGSS* within their communities and networks, locally as well as statewide and nationally. The success of the *NGSS*, which relies on first awareness and then implementation, is one example of how teachers' leadership can be viewed beyond the purview of instruction, entering into *strategic leadership* as a means to readdress wide-scale challenges in U.S. K-12 science education.

Defining Strategic Leadership in Science Education

Leading for systemic impact requires an expanded understanding of teacher leadership, moving beyond notions of instructional leadership at the school level (see Neumerski, 2013), to the larger realms of policy, which includes developing a knowledge of the purpose of policy and an understanding of the underlying norms that influence policy decisions and implementation at scale. To engage in this research, we secured the term *strategic leadership,* in part from managerial literature as a person having a strategic vision with tangible actions for the larger system (Finkelstein, et al., 2009; Samimi et al., 2020). Teachers may engage in strategic

leadership without retiring from their roles as full-time classroom teachers, particularly in the study of both administrative leadership and distributed leadership (Spillane, et al., 2001b).

We define strategic leadership in science education as the actions of science teachers to influence policy and/or underlying norms to improve science education systems at scale. We conceptualize strategic leadership in science education as encompassing more than their shifts in instructional practice or that of colleagues within their school building. As strategic leaders, science teachers can influence or advocate for policy and social norms through non-instructional avenues that extend beyond their proximal sphere of influence to impact matters in science education. Examples of these kinds of actions include collaborating with universities to recruit students into science teaching careers, crafting teaching and learning standards, leading professional development for large groups of science teachers, and creating sustainable and replicable avenues for K-12 students to have more equitable access to science education.

Because policy guides systemic decision-making, strategic leadership must occur at scale. We operationalize policy as the ideas and plans that establish goal posts for outcomes and norms for decision making, which are subject to "socio-cultural dynamism" in which actors influence policy formulation, dissemination, and interpretation (Nudzor, 2009, p. 85). Therefore, strategic leadership in science education expands teacher leadership beyond the purview of classroom or isolated building-level instruction, and scales to guide systematic improvements in science education (USDoEd, n.d.), particularly through sustainable influences on science discipline-specific education policy and norms that have a staying power for the system.

An example of utilizing systemic pathways to strategic leadership can be found in the way a group of high school teachers initiated a state-wide effort to pass an Arizona state senate bill (AZ SB 1038) to support teacher recertification for teachers in high-needs STEM fields to

address teacher shortages. To do so, they grew their leadership skills through a science education policy fellowship (Bundy et al., 2019). The experience led these teachers to establish a relationship with lawmakers and advocate for the passage of the bill, which resulted in the appropriation of more than $300,000 in scholarships for STEM teachers. This example illustrates how strategic leadership can impact science teaching at scale through enduring policy structures. Some strategic leadership activities are policy-adjacent, influencing underlying norms more than explicit guidelines or laws. Other examples may include teachers who serve on science education boards, lead science education workshops, or who partner with grant-funded initiatives to co-lead science education-related projects, such as one teacher who became a national ambassador to help teachers make their science classrooms more inclusive for women (Bundy et al., 2019). These types of activities have longevity well beyond the time of the leadership activity.

Discipline-Specific Strategic Leadership in Science Education

Discipline-specific leadership in science education can happen at the school or district level, however, much of that leadership among secondary teachers relates to school-centric policies on instruction and assessment (McNeil, 2014), and lacks the broader scale of science-specific education systems that define the scope of strategic leadership in science education we have chosen to study. For example, the work of a science department chairperson within a single school is likely to have more limited, short-term impacts that do not scale to the level of concretized policy or augmenting norms. Although occurrences of strategic leadership in science education at the local level might be infrequent, some teacher actions within school districts are large enough to have a systemic impact on science education. For example, Spillane et al. (2001a) studied teachers who strategically redesigned the elementary science curriculum for 13

area elementary schools within Chicago Public Schools. Because these teachers collaborated to allocate resources to improve science education *at scale*, this study is one example of strategic leadership in science education. Likewise, strategic leadership in science education may occur in spaces outside of educational administration. For example, closely-knit professional communities of science teachers (such as *STEMTeachersNYC* in New York City) span multiple school systems and are potential contexts for science teachers to engage in strategic leadership.

Focus of Study: Teachers' Strategic Leadership in Science Education

Our study specifically aimed to explore science teacher leadership that influences systems or systemic factors for science teaching at scale. We explored the strategic leadership of secondary-level science teachers—teachers who specialize in a science discipline, as is typically the case for teachers of children ages approximately 12-18 years. Our intent for this study was to distinguish strategic leadership in science education research from the scholarship that focuses on domain-agnostic distributed leadership (see Spillane et al., 2001b). Within the last decade, policymakers and educational agencies alike have called for support for science teachers to explore opportunities to lead *outside of* the boundaries of their traditional (instructional) classroom spheres (National Research Council, 2014; 2017; National Science Foundation, 2015; President's Council of Advisors on Science and Technology, 2010; Sunderman et al., 2004; U.S. Department of Education, 2016). The political attention that has been afforded to science teachers in the past decade necessitates an exploration into conceptualizations of what we term strategic leadership within the science education community. This heightened attention is likely due to the need to understand how strategic leadership in science education is manifested and its possible outcomes.

Because of strategic leadership's relationship to policy and scale, which goes beyond small scale impact or ephemeral changes in local norms, we further assert that there are leadership spaces for teachers of a variety of experience levels, rather than those relegated to teachers with the most years of experience at their school or district alone (McNeil, 2014; Weiner, 2011). We affirm that strategic teacher leaders are afforded avenues for larger-scale leadership within science-specific preparation and support programs from actors (herein external programs) that extend beyond their building (such as through university partnerships, fellowship programs, science teacher professional societies, state science coordinators, etc.). These avenues provide science teachers pathways not restricted to classroom instruction-focused leadership, to serve the science teaching profession at scale.

We acknowledge that those who study science teacher leadership programs are likely influenced by content-agnostic research on teacher leadership, and some researchers might contest the uniqueness of science teacher leadership. However, we anticipate that science teachers' leadership and conceptualizations about it might be influenced by several factors. These factors include the adoption of the *NGSS* across many U.S. states, the disciplinary isolation of many science teachers, as exemplified by secondary physics teachers, (see Krakehl et al., 2020), and the exceptionally large deficit of science teachers (U.S. Department of Education, 2020).

Because of the reasons listed above, we focus on secondary science teachers, as they are more visible in the literature and have a more robust science identity than primary teachers (Helms, 1998). As early childhood or primary school science teachers typically do not receive science designations, it is difficult to disentangle their strategic efforts among only the science disciplines for a salient analysis. Notably, research tends to focus on secondary science teachers

as curriculum innovators who take up educational reforms much more readily than their primary counterparts (Wallace & Priestley, 2016), and who bring to bear greater responsibility for secondary-tertiary transitions within the American science pipeline (Young, 2005).

To garner an understanding of the conceptualization of teacher leadership outside the classroom and school, expanding to scaled policy-based or policy-adjacent leadership and situated within a specific domain (secondary science education), we performed a systematic literature review. Because the bulk of prior research focuses solely on teachers' instructional leadership (Tsai, 2015), we do not know the extent to which strategic leadership is not only quantified generally in the literature, but also qualified through specific U.S. examples of advocacy activities that have systemic or enduring impacts for secondary science teachers. For this paper, we have excluded from our definition of science teachers' strategic leadership those activities that are organized by discipline-agnostic groups, such as union-based advocacy for legislative or social action on matters such as teacher salary or working conditions. This restriction mitigates threats to validity in examining discipline-specific strategic leadership, limiting the scope of this review to the domain of science teaching.

Overview of Science Teacher Leadership

This study of strategic leadership among science teachers is situated within a larger literature base, described by two cogent meta-analyses, that affirms the importance of conceptualizing how teachers become leaders and the tangible outcomes of teachers exercising their leadership. To ascertain the state-of-the-field regarding teacher leadership scholarship, York-Barr and Duke (2004) synthesized extant literature and developed a conceptual framework that identified the nature of teacher leaders, their activities, and potential outcomes, with the

improvement of student learning at the heart of the framework. The authors identified models of leadership that included instructional, participative, distributed, and parallel leadership, as well as "leadership as an organizational quality" (p. 261), all mostly at the school building or organizational level. They also found that "professional norms of isolation, individualism, and egalitarianism challenge the emergency of teacher leadership" (p. 288), a common sentiment within articles on teacher leadership (Donaldson et al., 2008; Tschannen-Moran, 2009; Weiner & Woulfin, 2018). They found evidence of the impact of overall school leadership (shared with teachers) on students' enhanced student learning, however, they urged teacher leaders to better align their individual leadership activities with goals for school and student achievement.

Thirteen years later, in contrast to York-Barr and Duke (2004), who did not discuss discipline-specific teacher leadership, Wenner and Campbell (2017) desired to "aggregate research on teacher leadership by discipline such that the unique idiosyncrasies of each discipline could be illuminated" (2017, p. 160), but felt they were unable to do so because of the limited literature and lack of descriptive disciplinary context for most studies. Further, they urged education researchers to pursue studies on teacher leadership by discipline, using science education as an example, to understand "how disciplinary idiosyncrasies…help shape and organize the work of teacher leaders" (ibid, p. 160).

The above two major reviews did not capture the kind of leadership that we define as strategic leadership in science education. We posit that science teachers' disciplinary identities often result in transversal relationships within communities and networks that cross the traditional boundaries of schools, districts, and states, such as regional or national professional societies and interest groups. Because strategic leadership in science education is often highly specialized, beyond the scope of teachers' official duties, and not bounded within traditional

realms of research (such as in the school building), we anticipate that strategic leadership may be found on the fringes of previously published teacher leadership studies and/or within the unexpected findings and discussion sections. Understanding teachers' disciplinary engagement helps frame a more modern vision of nuanced teacher leadership that encompasses the new opportunities for strategic leadership that have been presented in recent decades.

By exploring content-specific leadership, Wenner and Campbell (2017) have brought attention to the historical shift we have observed in teachers' actions towards self-regulation of the science teaching profession. A review of history presented by DeBoer (2001) suggests that science teachers from the late 1800s to the late 1900s were rarely invited to lead initiatives that defined their profession, until the development of the National Science Education Standards in the early 1990s. The notion of disciplinary teacher leadership did not emerge until the 1980s, and, even then, was small-scale, relegated to the classroom or disciplinary department (Little, 2003). However, given the pace and scale of educational reform, focusing strongly on teachers of STEM (National Research Council, 2014), researchers recognize the importance of teachers' voices in policy.

The increasingly complex nature of education, with demands for reforms in domain content and practices, inclusivity, social justice, etc., requires that change agents have a systemic understanding of their context, including a sense of purpose, nuance, collaboration, knowledge building and sharing, and coherence (Fullan, 2020). Effective educational reform necessitates reaching beyond the building- and district-level to support the teaching profession (Fullan & Hargreaves, 1998)—in a word, teachers could engage in *strategic* leadership activities for reform. This typology of strategic leadership among science teachers is critical to the health of the U.S. K-12 science education system and the science teaching profession itself to reduce

science teachers' perceived isolation and to advocate for disciplinary-specific support (National Academies of Sciences, Engineering, and Medicine, 2015; National Research Council, 2014).

The Need for Conceptualizations of Strategic Leadership in Science Education

Now that we have established the importance of science teachers' strategic leadership despite not being a part of most instructional-based conceptualizations of teacher leadership, we illuminate how attributes of strategic leadership are found in the periphery of teacher leadership scholarship. We also describe why we believe our definition, which attends to strategic leadership as its own subdomain of teacher leadership, is ideal for exploration as it may appear transversely across the teacher leadership literature, providing an important and salient contribution to the emerging field of diversifying teacher leadership.

The first reason lies in teacher preparation; comparable countries to the U.S. in terms of development, like Singapore and Finland, heavily invest in pre-service teacher preparation and in-service professional development for building strategic leadership skills (Darling-Hammond, 2017). Unlike those countries, in the U.S. professional development pathways for potential science teacher leaders are fragmented among a mix of initiatives managed by university systems, state governments, professional societies, foundations, and educational companies, among other actors (National Research Council, 2014). Additionally, many science positions are filled by secondary science teachers who were prepared out-of-field (Nixon et al., 2017) and who experience isolation and lack of disciplinary support (White & Tyler, 2014, 2015).

Science teachers' professional experiences may also be unique from other teaching fields, as there are significant shortages of secondary science teachers across the U.S., a problem that is especially acute for teachers of physics and chemistry (U.S. Department of Education, 2020). In

many cases, a secondary science teacher's recourse for disciplinary support is to push outside of their classroom and school to interact with other science teachers beyond the borders of their schools and districts (Rasberry & Mahajan, 2008), or to partner with larger organizations that can support their disciplinary needs (National Academies of Sciences, Engineering, and Medicine, 2015). We contend that this may cause secondary science teachers to lead (more than just participate as a member) in their state- or national-level professional societies (e.g., National Science Teaching Association), advise their State Board of Education, or serve within other influential bodies to craft legislation related to science education to mitigate issues of isolation and advocate for more or better resources (Bundy et al., 2019).

The value that science teachers' strategic leadership can bring to the table is reflected in global goals for education as well. Teachers are necessary advocates for science and science education as a national and international priority for national security and economic stability (Bos et al., 2016; National Science Board, 2018; Medina-Jerez, 2016), addressing teacher shortages (UNESCO, 2015; Villegas-Reimer, 2003); closing the gender gaps in math and science achievement (UNESCO, 2017), and increasing general scientific literacy (UNESCO, 1995).

While strategic leadership has not been recognized explicitly as a central theme in literature, we believe that it often can appear on the periphery of research studies, particularly if those studies are not intentionally bounded by instructional leadership and endemic improvements within science education. As such, our research aims to sift through existing research that may implicitly capture evidence of teachers' strategic leadership. Prior literature has described why teacher participation and leadership in guiding and implementing policy is vital for systematic reform of U.S. education (e.g., National Research Council, 2014; Sunderman

et al., 2004; Van Driel et al., 2001); this present research provides insight to how science teachers' experiences and leadership matter in influencing and implementing policy.

A Brief History of Strategic Leadership for U.S. Science Teachers

A major rationale for exploring science teachers' strategic leadership is in response to the past 11 years of conversations on the underutilized potential science teachers as reform levers in science education. Fensham (2009) identified the gap between policy and practice in science education—a gap that could be filled by the expertise and wisdom of in-service science teachers. National exposure renewed the public's attention to science teacher leadership occurred with the release of the report, *Prepare and Inspire* (President's Council of Advisors on Science and Technology, 2010). In this report, advisors for then-President Obama called for the recognition of a *STEM Master Teacher Corps* of experienced STEM teachers who, among other roles, could "provide a voice for their profession in educational policy" (p. 76). In a 2014 National Research Council (NRC) convening titled, *Opportunities for STEM Teacher Leadership*, participating science teachers called for specific leadership opportunities beyond the scope of instruction, identifying the need for teacher input to policies of licensure, credentialing, and certification, mirroring international avenues for large-scale strategic leadership and career ladders for teachers, like that of other nations (see Darling-Hammond, 2017). Specifically, teachers advocated for professional development that included strategic leadership support, to develop the assets they bring as experts in curriculum, to best advise state boards of education in standards development. Independent from the NRC convening, a related National Academies of Sciences, Engineering, and Medicine report in 2015 on evidence-based practices for science teacher

professional development echoed the need for teacher leadership in shaping education policy at state and national scales.

Movement in this area came to a head when Congress, led by then-Senator Al Franken (D-MN), introduced the *STEM Master Teacher Corps Act* (S. 402, 2015). To continue the momentum, the U.S. Department of Education (2016) brought together a group of stakeholders to discuss STEM teacher leadership in spheres beyond their instructional roles (i.e. strategic leadership) and to develop and publish whitepapers on the topic. Other efforts that have engaged American science teachers in policy or strategic leadership (Johnson & Brady, 2018) include: 1) the Albert Einstein Distinguished Educator Fellowship (U.S. Department of Energy, 2020), which places K-12 STEM teachers in federal agencies and in political offices on Capitol Hill to advise national STEM strategy; 2) the STEM Ambassador Program (NCTM, 2018; NSTA, 2018) and 3) the AAPT/AIP Physics Master Teacher Policy Fellowship (AAPT, 2019). While not exclusively focused on matters of policy or strategic leadership, an online community STEM Teacher Leadership Network (stemtlnet.org), founded in 2019, explicitly includes and encourages policy engagement among its monthly thematic discussion topics.

The confluence of national-level stakeholders and science teachers themselves giving emphatic voice to the notion of strategic leadership in the past decade suggests that science teachers' strategic leadership merits exploration. Given that teacher leadership, related to a typology akin to strategic leadership, has been nominally recognized and indirectly studied by educational researchers (Wenner & Campbell, 2017; York-Barr & Duke, 2004), there remains a dearth of understanding about what constitutes science teachers' engagement in strategic leadership (conceptualization through actions and activities).

This paper aims to review and analyze the extant research surrounding science teachers' involvement in discipline-specific (secondary science), professional reform activities (leadership) that extends beyond instructional influences or limited impacts at the district, school, or classroom levels (strategic). The goal of the literature review was intended to provide insights into how the literature has begun to conceptualize secondary science teachers' strategic leadership, and to consider how those conceptualizations promote or discourage the engagement of science teachers in policy and/or reforms that influence their professional practice at large.

Methods

To understand the state of the field in strategic leadership among secondary science teachers, we conducted a systematic literature review (SLR). The specific SLR approach was selected per the recommendations of Pejić-Bach and Cerpa (2019) and uses a four-step process of 1) defining the scope of the literature review within the purview of secondary science teacher strategic leadership; 2) conceptualizing that topic using defined key terms; 3) engaging in the literature search by documenting literature with inclusion and exclusion criteria; and 4) conducting the analysis and a thematic synthesis with a concept-centric approach. SLR has been a methodologically rigorous and highly useful tool to synthesize studies on a salient topic or research question, including engineering (Kitchenham et al., 2009) and medicine (Tremmel et al., 2017). An SLR approach was ideal as this methodology can provide a theoretical insight and establish foundations for current and future research (Fink, 2005). As scholarship was being published on science teacher leadership while national calls for strategic leadership were beginning to emerge, we have included the prerequisite decade-plus of teacher leadership scholarship to explore the nascence of strategic leadership (Petticrew & Robert, 2006).

Defining the scope and conceptualizing the topic

By situating the exploration in the unique political and experiential contexts of science teachers, we proposed the following two critical questions (per Alexander, 2020) that guided our research. Our first question is RQ1- In what way does the literature on science teacher leadership conceptualize secondary science teachers' engagement in *strategic leadership in science education*? By conceptualize, we mean that we wish to understand how authors make sense of science teachers' strategic leadership actions–that fall into our definition–within the wider scope of their models, frameworks, taxonomies, or narrative illustrations of teacher leadership. Our second question is RQ2 - How does the literature describe secondary science teachers' specific *strategic leadership* actions and contexts that encourage or discourage those actions? Specifically, we were curious to look for the kinds of actions and contexts reported by authors–that fall into our definition–, to create a panorama of the kinds of strategic leadership that are being reported in the literature.

The search methods in this SLR aimed to capture publications that conceptualized (theorized) or described (empirically) secondary science teachers' strategic leadership. Therefore, each database search included the keyword 'science' or 'STEM.' Notably, the latter search term of 'STEM' was used as an inclusive term to capture research on disciplinary science teachers that may not have appeared under the former search term of 'science.' Title keywords included the base term 'leader' (including its variations, such as 'leaders,' and 'leadership') or 'master teacher,' all terms that have been used in relation to STEM teacher leadership per the NRC 2014 report on STEM teacher leadership. We used these combinations of search terms to search WorldCat (2019) and MSPnet (2019). We selected WorldCat as it credits itself as the

world's largest network of university library content, pulling publications from reputable databases such as EBSCO and ERIC. As a secondary means of coverage on the topic of science teacher (strategic) leadership, we selected MSPnet (2020) as a repository for curated publications produced by math and science education programs and notable researchers funded by National Science Foundation grants within the time frame of the SLR. Given the minimal amount of literature directly related to our specific definition of strategic leadership within teacher leadership scholarship, we did not limit our review to any specific period, although we were restricted by the availability of digitized publications. All search terms are found in Table 2.1.

Table 2.1
Search terms, search results, and literature selections for the data set

Search Terms	Results	Reviewed	Selected
keyword:(science) OR keyword:(STEM) AND keyword:(teacher) AND title:(leader*) AND *Peer Reviewed*	1,567	100*	18
keyword:(science) OR keyword:(STEM) AND keyword:(teacher) AND title:(leader*)	16,136	100*	6
keyword:(science) OR keyword:(STEM) AND title:('master teacher')	66	66	1
Publications identified in conversation with science education researchers	5	5	5

*Search terms included all derivations of "leader," such as "leadership" and "leaders."
*The first 100 articles were reviewed from each search. The relevance of the publications to the search terms significantly declined after the first 100 entries.

One author performed a search of peer-reviewed journal articles first to ensure a solid academic foundation for our review, leading to 18 relevant selections. Due to the dearth of literature on strategic leadership, we broadened the search to include additional types of literature (using the same terms as before, as well as a combination with the term master teacher), to capture any relevant additional publications (i.e., published dissertations and book chapters) that might lead to further insights and unique perspectives on the topic. We further expanded the search to include potentially non-refereed albeit published and non-empirical researchers' reflections, opinion pieces, and consensus reports. To ensure capture of all relevant documents, we reviewed the first 100 publications from each database search, although relevance significantly declined within the first 50 entries. We reviewed titles and abstracts for language that referenced science or STEM teachers' leadership, and they skimmed those articles that seemed to have any relevance to leadership to see if they met the indicators described in the selection and exclusion criteria. The same search parameters were used in MSPnet, a National Science Foundation-sponsored database of math- and science-specific education research, which confirmed many of the findings in WorldCat and did not yield any additional publications. This search and review cycle of 271 articles produced 25 publications that adhered to the SLR parameters. Notably, one article (Hite & Milbourne, 2018) had extremely high relevance to the topic, in which strategic leadership was found as a named construct. During the process of skimming articles during the search and review cycle, five additional publications were included in this review, including four program-specific reports related to strategic leadership for science teachers. These four reports were individually noted in the articles included for the SRL and directly pertained to strategic leadership (i.e., AAPT/AIP Master Teacher Leader Task Force, 2017; U.S. Department of Energy, n.d.; Galosy et al. 2017a; 2017b).

Documentation of the selection and exclusion criteria

To secure publications that addressed science teachers' strategic leadership, the first author identified articles that met both of the following criteria: (a) having a disciplinary focus on secondary science (or STEM, when it was inclusive of science teachers), and (b) including explicit reference to teacher leadership through the presentation of a model, framework, taxonomy, or narrative illustrations that described teacher leadership. Articles were excluded that were intentionally bound to study a single dimension of science leadership, such as *instructional* or *administrative* science teacher leadership within a single school or district setting. Articles that only included teachers within a single school or district were included so long as the conceptualization of science teacher leadership and the data collection methodology permitted the capturing of teachers' optional or supplemental work beyond the confines of the school and/or district program. The second author reviewed the audit trail created by the first author and authenticated the process and articles within the data set. Upon their inspection, there were no inconsistencies with the SLR categorization due to the saliency of categorization and transparency of data (e.g., easily verifiable content of sampled articles to check categorization) in the SLR process.

It is important to note that we opted to cast a wide net with regard to the nature of publications to be included in the SLR. We decided to include personal narrative accounts as well as traditional academic work because our goal was to understand the fields' conceptualizations of leadership, which includes both practitioners and researchers. As many journal articles provided an external perspective on teachers' leadership, we included personal,

theoretical, and non-empirical pieces (e.g., book chapters), in our search to provide a broader and more equitable view of strategic leadership within the community of practice.

Characterization of literature in the data set

Using the search terms and criteria above, we identified 30 publications for SLR analysis that met the criteria of science teachers engaging in strategic leadership within science education. While this set of literature is small, it reflects the paucity of publications on discipline-specific teacher leadership and especially in science education. Even so, the review comprises a wide range of unique teacher leadership initiatives and associated research. Our SLR pulled from traditional academic peer-reviewed journal articles published by education researchers as well dissertations, book chapters, and some reports. This literature set provides an inclusive view of strategic leadership in science education as it is conceptualized by various researchers (including teacher leaders themselves) in science education within the U.S.

Appendix B contains the audit trail with complete entries of each publication including the author, structure of the article, perspective (e.g., researcher, teacher, policy maker), a researcher memo on how it related to SLR inquiry, and how the piece related to the conceptualization of science teacher (strategic) leadership. The data set was bifurcated by empirical (n = 17) or non-empirical (n = 13) nature of the contribution. Of the 17 empirical studies, they included: 13 journal articles (Alemdar et al., 2018; Criswell et al. 2017; Criswell et al. 2018; Doraiswamy et al., 2016; Galosy & Gillespie, 2013; Hanuscin et al., 2012; Author, 2018; Howe & Stubbs, 2001; Klein et al., 2018; Klentschy, 2018; Luft et al., 2016; Mentzer et al., 2016; Sinha & Hanuscin, 2017), three reports (Galosy et al., 2017a; 2017b; Gareis et al., 2011), and one published doctoral dissertation (Sublette, 2013). The 13 remaining non-empirical

contributions were: seven book chapters (Davis, 2009; Gess-Newsome & Austin, 2010; Greitz Miller, 2009; Lederman & Lederman, 2010; Pike, 2009; Sato et al., 2010; Yeotis et al., 2009), two reports (AAPT Master Teacher Leader Task Force, 2017; NRC, 2014), two journal articles (Cheung et al., 2018; Author, 2019), and two opinion pieces (to provide a historical perspective) (Peterson, 1962; Rice, 1961). All publications originated from 25 unique and unrelated sets of authors. Three sets of authors had multiple publications that were selected, including Brett Criswell of Alemdar et al. (2018), Criswell et al. (2017), and Criswell et al. (2018); Jodie Galosy of Galosy and Gillespie (2013) and Galosy et al. (2017a; 2017b); and Deborah Hanuscin of Hanuscin et al. (2012) and Sinha and Hanuscin (2017). Although these publications were included from the same sets of authors, each publication presented results that were either from different research studies or demonstrated unique dimensions of the same research study.

The Focus of Literature. Empirical methodologies relied heavily on case studies to explore frameworks for science teacher leadership, emphasizing teacher leader development. All the empirical literature made use of observation of teacher interactions, interviews with individuals and focus groups, teacher self-reflection reports, and/or document analyses. A handful of studies also included the use of surveys to quantify the type and nature of teachers' leadership self-efficacy, perceptions about what counts as leadership, and self-reports of leadership engagement (Hanuscin et al., 2012; Sihna & Hanuscin, 2017). Multiple publications included an explicit emphasis on program evaluations, including the Noyce science teacher leadership program for chemistry and physics teachers (Alemdar et al., 2018), the Knowles Science Teaching Fellowship (Galosy & Gillespie, 2013), the Albert Einstein Distinguished Educator Fellowship (Gareis et al., 2011), and a two-part meta-analysis of STEM teacher

leadership programs (Galosy et al., 2017a; 2017b). Non-empirical publications included personal reflections, opinion pieces, and reports.

The Scope and Scale of Literature.

Because this literature review focuses on strategic leadership in science education at scale, it was anticipated that findings might be influenced by the geographic scope of the leadership projects that the researchers studied. Of the empirical articles, only six of them had a national scope (i.e., Galosy & Gillespie, 2013; Galosy et al., 2017a & 2017b; Gareis et al., 2011; Author, 2018; Luft et al., 2016). The remainder of empirical publications focused on sub-state regional programs, including district-level programs that served their own teachers or university-based programs that served their immediate communities from multiple districts, such as Noyce and Math Science Partnerships funded by the National Science Foundation. However, even when programs intended to build teachers' leadership at the local level, authors reported that these programs often resulted in supporting teachers' engagement in wider strategic leadership. Publications with a local or regional geographic scope were usually associated with university-led research efforts, while those with a national scope often included collaborations with professional societies and private foundations.

Notions of Teacher Leadership in Literature.

The 17 empirical studies were mixed in their focus on teacher leader experience level: two focused on novice teachers (holding 1-5 years of classroom teaching experience) (Criswell et al., 2017; 2018), four solely on master teachers (>5 years of classroom teaching experience) (Gareis et al., 2011; Hite & Milbourne, 2018; Klentschy, 2008; Mentzer et al., 2014), and 11 on

mixed groups of teachers (Alemdar et al., 2018; Doraiswamy et al., 2016; Galosy & Gillespie, 2013; Galosy et al., 2017a; 2017b; Hanuscin et al., 2012; Howe & Stubbs, 2003; Klein et al., 2018; Luft et al., 2016; Sinha & Hanuscin, 2017; Sublette, 2013). Studies of mixed groups often placed a strong emphasis on mentoring programs and instructional leadership among peers (typically funded by the National Science Foundation).

While some studies captured information on teachers' leadership programs, activities, or attitudes as a single snapshot (Galosy et al., 2017a & 2017b; Gess-Newsome & Austin, 2010; Peterson, 1962; Rice, 1961), the remainder of empirical and non-empirical studies combined described a change in teacher leadership over an extended period as a matter of development or change in teachers. Among empirical studies, the majority (n = 11) looked at short-term teacher leadership development (across 1-5 years) (Criswell et al., 2017 & 2018; Doraiswamy et al., 2016; Galosy & Gillespie, 2013; Gareis et al., 2011; Hanuscin et al., 2012; Howe & Stubbs, 2001; Klein et al., 2018; Klentschy, 2008; Luft et al., 2016; Mentzer et al., 2014; Sinha & Hanuscin, 2017; Sublette, 2013), and six on transitional phases of leadership growth across 1-3 years. Two studies looked at teachers' growth longer-term, across seven years or more (Alemdar et al., 2018; Hite & Milbourne, 2018), although Hite & Milbourne (2018) did so by analyzing their professional lives over time (evidenced by their curriculum vitae), and not through direct observation. In contrast, four non-empirical publications looked at longer-term leadership changes (Davis, 2009; Greitz Miller, 2009; Pike, 2009; Yeotis, 2009), and included individuals' self-reflections on their leadership journeys across their entire careers.

SLR Analysis

Themes were sought to reflect the nature of the literature within the data set to qualify this type of science content-specific and large-scale, policy-focused teacher leadership. In all, 30 out of 271 reviewed publications (i.e., 17 articles, seven book chapters, five reports, and one unpublished thesis) from 25 unique sets of authors were included in the data set (Appendix B). Each of the 30 selected articles was read in full and manually categorized based upon similarities per step four of Pejić-Bach and Cerpa's (2019) paradigm to develop a thematic synthesis with the concept of secondary science teachers engaging in strategic leadership.

To address RQ1, to understand how literature conceptualized science teachers' engagement in strategic leadership in science education, the first author developed codes *a posteriori* the review of the literature. These codes categorized the conceptualization of science teacher leadership within the publications into the following categories of *structure* and *perspective*. Structure reflects the robustness of the publication's conceptualization of science teacher leadership, which was further divided by those publications with models or frameworks, clearly structured conceptualizations with explanatory or categorical power that included descriptive illustrations, and descriptive illustrations such as narratives and case studies. The category of perspectives, which reflected the point of view from which science teacher leadership was conceptualized, was divided by the placement of the locus of conceptualization on the researcher, classroom teacher, and school or district administrator.

Using those categories, the literature was coded to distinguish how strategic leadership was situated within those conceptualizations. In some pieces of literature, strategic leadership was an explicit component of the conceptualization of science teachers' leadership. In such

studies, the authors explicitly focused on teachers' contributions to their profession at a state or national level, or intentionally included strategic leadership in their framework for teacher leaders—these pieces were coded as strategic leadership as being an *essential* element of their conceptualizations. Other pieces of literature did not explicitly identify strategic leadership activities, skills, or dispositions within their conceptualizations or goals for their project, but instead referred to strategic leadership as an unintended consequence or a supplementary component—these pieces were coded as *peripheral*. Essential and peripheral designations refer to designations within the conceptualization, and do not necessarily suggest that strategic leadership was strongly or weakly present in the data the authors presented. (See Appendix B, which displays all 30 publications analyzed with their respective codes.)

It is important to note that, in most cases, the conceptualizations were adopted or adapted from discipline-agnostic extant theories on teacher leadership, such as Dempsey (1992), Lave and Wenger (1991), Palus and Drath (1995), Teacher Leadership Exploratory Consortium (n.d.), and York-Barr and Duke (2004). Some authors suggested that science teacher leadership might simply be a context for studying teacher leadership in general (Howe & Stubbs, 2001). However, numerous authors identified science teacher leadership as a unique phenomenon either because of challenges inherent to the discipline or the policy context and opportunities that are afforded specifically to science teachers (Criswell et al., 2018; Hite & Milbourne, 2018).

For RQ2, which sought specific strategic leadership actions and contexts that encourage or discourage those actions, publications were listed in which the authors explicitly observed or collected data on the following examples of strategic leadership actions (as seen in Table 2.2).

Table 2.2
Strategic leadership actions observed or reported in the literature

Action (influencing the profession beyond the district level)	**Articles**
Supporting Pre-Service Education	Criswell, et al (2017); Hanuscin et al. (2012); Hite & Milbourne (2018); Sinha & Hanuscin (2017)
Creating or Promoting Curriculum or Resources	Gareis et al. (2011); Hite & Milbourne (2018); Howe & Stubbs (2003); Klentschy (2008); Rice (1961)
Leading Science Professional Development (beyond the district)	Bundy et al., (2019); Galosy & Gillespie 2013); Author (2018)
Serving on Advisory Councils	Hite & Milbourne (2018); Howe & Stubbs (2001); National Research Council (2014)
Serving in Elected Office (related to science education)	Hite & Milbourne (2018); Howe & Stubbs (2001); Sinha & Hanuscin (2017)
Advocating for/against Broad Initiatives, Policies, or Legislation	Bundy et al., (2019); Gareis et al. (2011); Hite & Milbourne (2018)
Contributing to Research Efforts	Author (2018)
Authoring Presentations/Publications	Galosy & Gillespie (2013); Author (2018); Howe & Stubbs (2001); Pike (2009)
Fostering Gatherings of Other Teachers (conferences, panels)	Gareis et al. (2011)
Movement from Classroom Teacher to other Position that Influences Science Education	Davis (2009); Greitz Miller (2009); Hite & Milbourne (2018); Yeotis et al. (2009)

Other activities: 'Contributing to the Profession' or 'Influencing Science Education at the School Level and Beyond'	Cheung, et al., (2018); Galosy & Gillespie (2013); Hanuscin et al. (2012); Luft et al. (2016); Sinha & Hanuscin (2017)

Activities within the literature that occurred beyond the context of the district included elements as wide as supporting pre-service teachers through university partnerships, developing curriculum and delivering workshops, serving on advisory boards, presenting at state and national conferences, and participating in research. This list reflects actual observations—not theoretical constructs of what anyone believes science teacher leaders should do, but what they actually do. These lists are not all-inclusive of science teachers' strategic leadership but reflect those activities that were most strongly noted across the literature. Table 2.3 presents the contexts that supported or discouraged strategic leadership, which are further explored in the themes of this review.

Table 2.3
Contexts that promote or discourage strategic leadership actions observed or reported in the literature

Context	Articles
Contexts that Promote Strategic Leadership	
Understanding of how the System Works/Vision for Leadership	Criswell, et al (2017); Criswell, et al (2018); Galosy & Gillespie (2013); Luft et al. (2016);
Dissatisfaction with the Status Quo / Desire to Change the System	Alemdar, M. et al. (2018); Author, (2019); Criswell, et al (2018); Galosy & Gillespie (2013); Howe & Stubbs (2001); Pike (2009); Sublette (2013)
Policy or Administrative Alignment with Desired Change	Klein et al. (2018); Sinha & Hanuscin (2017); Sublette (2013)

Increased Confidence/Self-Efficacy/Leadership Skills	Alemdar, M. et al. (2018); Author, (2019); Gareis et al. (2011); Howe & Stubbs (2001); Klentschy (2008); Mentzer et al. (2014); Sinha & Hanuscin (2017); Pike (2009)
Isolation (disciplinary, gender, racial)	Alemdar, M. et al. (2018); Criswell, et al (2018); Davis (2009); Galosy & Gillespie (2013); Howe & Stubbs (2001); Klentschy (2008); Yeotis et al. (2009)
Social Injustice	Author, (2019); Criswell, et al (2018)
Encouragement from Colleagues or Coaches	Galosy & Gillespie (2013); Gareis et al. (2011); Klein et al. (2018); Luft et al. (2016); Sublette (2013)
New Opportunities for Leadership	Luft et al. (2016)
Contexts that Discourage Strategic Leadership	
Limited Perception of Leadership	Hanuscin et al. (2012); Klein et al. (2018); Sinha & Hanuscin (2017);
Tensions with Colleagues/Administrators	Cheung, et al., (2018); Criswell, et al (2018); Gareis et al. (2011); Klein et al. (2018); National Research Council (2014); Sublette (2013)

Trustworthiness.

To achieve credibility, dependability, conformability, and transferability of qualitative research set by Guba and Lincoln (1994), the following efforts were made to meet these standards. Concerning both credibility and dependability, using a published, extant SLR methodology (Pejić-Bach & Cerpa, 2019) with clear and justified search parameters lends to the transparency and reproducibility of this research. For confirmability and transferability, the first author audited data collection and analysis processes internally (via the audit trail found in

Appendix B) and externally (by the second author) to justify the selection of the data set and affirm the thematic findings.

Results

The following sections present four themes that emerged from the SLR analysis. Themes one and two address RQ1, whereas themes three and four address RQ2. Theme one describes how publications were split evenly about the *essentiality* of science teachers' strategic leadership within the sampled authors' conceptualizations of leadership (inferred through the researchers' interpretations of reading the publication). The literature analysis also revealed contrasts between the conceptualizations of strategic leadership from the perspectives of researchers, teachers, and administrators (in theme two). The literature described the uniqueness of teacher leadership pathways, and leadership beyond district boundaries is difficult to encapsulate within a single construct (theme three). Finally, the literature analysis provided evidence that science teachers' dissatisfaction with a local or national educational system, coupled with self-realization and confidence as a leader, drove their actions as strategic leaders (theme four).

Theme one: Divisions in strategic leadership

Authors are divided about how essential strategic leadership is to their conceptualization of science teacher leadership. Sixty percent of publications (18 of 30) included some element of strategic leadership as an essential component of their conceptualization of science teacher leadership, meaning that the idea of teachers as strategic leaders was built into the foundation of their model, framework, taxonomy, or narrative illustration of teacher leadership (AAPT Master Teacher Leader Task Force, 2017; Criswell et al., 2017, 2018; Galosy & Gillespie, 2013; Galosy

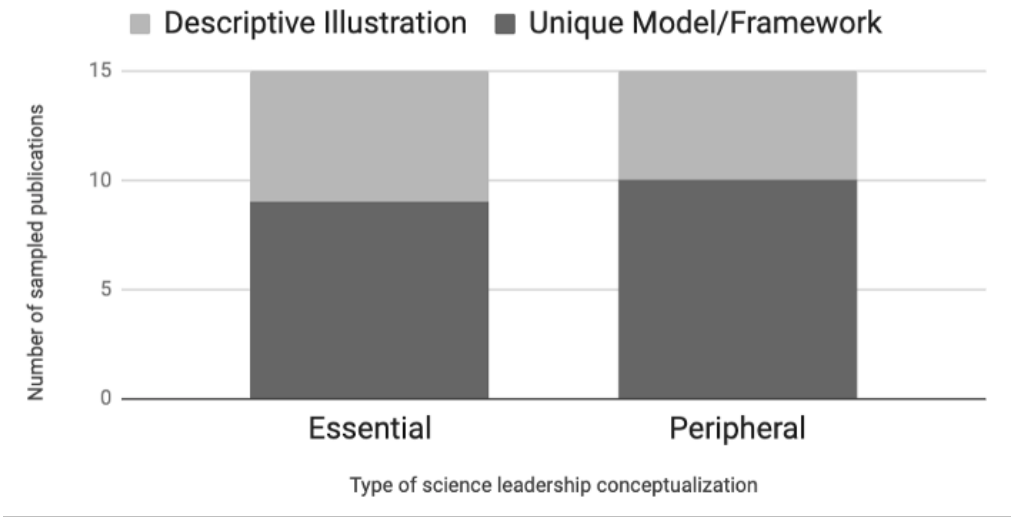
et al., 2017a, 2017b; Gareis et al., 2011; Hanuscin et al., 2012; Hite & Milbourne, 2018, 2019; Klein et al., 2018; Klentschy, 2008; Lederman & Lederman, 2010; NRC, 2014; Peterson, 1962; Rice, 1961; Sato et al., 2010; Sinha & Hanuscin, 2017). For example, Hite & Milbourne (2018) studied the trajectories of ten nationally recognized master teachers, developing a model based on situative theory for teacher leadership in policy; they found strategic leadership was the highest rung of leadership engagement, which STEM teacher leaders reported as the pinnacle of their teacher leadership careers.

The articles that placed strategic leadership on the periphery of their conceptualizations suggested the possibility of strategic leadership–often as an unexpected or tangential outcome–, but the focus of the articles was primarily on teachers as instructional leaders within their own districts as the end goal. For example, the framework by Cheung et al. (2018) includes "collaborating with others to improve science instruction…providing resources for effective science instruction…advocating in service of effective science instruction…[and]… modeling effective science instruction" (p. 40-1). While all activities pointed toward the classroom, the authors suggested some of the activities decidedly can or must occur beyond the scope of the district, such as contributions to the science teacher leader community and forging advocacy-based alliances for improved science education.

Regardless of strategic leadership being essential or peripheral within the publications, some authors were explicit about their conceptualizations, while others were more implicit. Of the 15 articles that included structured models or frameworks, six described unique models or frameworks. Nine publications explicitly included in their conceptualizations of science teacher leadership the idea that teachers could be actors beyond their districts, and that science teachers might have a shared identity with other science teachers because of shared discipline (AAPT

Master Teacher Leader Task Force, 2017; Criswell et al., 2017; Criswell et al., 2018; Galosy & Gillespie, 2013; Galosy et al., 2017a, 2017b; Hanuscin et al., 2012; Hite & Milbourne, 2018; Sinha & Hanuscin, 2017), which is seen in Figure 2.1.

Figure 2.1
Types of sample publications that incorporated professional strategic leadership as essential or peripheral to their science leadership conceptualizations



Notably, Hanuscin et al. (2012) and Sinha and Hanuscin (2017) used explicit indicators of strategic leadership from York-Barr and Duke's (2004) dimensions of practice, including phrasing like 'Contributions to the profession' and supporting 'Preservice teacher education,' which reached beyond the district into professional societies, universities, and colleges. Three publications categorized teachers' leadership activity, not on the nature of the activity alone, but expressly defined it by the geographic scope: school, district, state, national, and/or international (AAPT Master Teacher Leader Task Force, 2017; Hite & Milbourne, 2018). Other authors might not have defined activities with geographic boundaries per se, but expressed that their projects or programs aspired to help science teacher leaders become state or national leaders (Criswell, et al.

2017, 2018; Bundy et al., 2019), suggesting that the authors' visions for teacher leadership are expansive enough to embrace strategic leadership.

With a few exceptions, descriptive illustrations did not have much structure in their conceptualizations; rather, they included personal reflections or program descriptions ordered chronologically or developmentally. However, descriptive illustrations were more likely to present examples of strategic leadership as an essential part of leadership than conceptualizations presented as a model or framework. Descriptive illustrations included case studies and personal narratives of science teacher leadership (Davis, 2009; Greitz Miller, 2009; Luft et al., 2016; Yeotis et al., 2009), summaries of science teacher leadership programs (Gareis et al., 2011; Lederman & Lederman, 2010; Sublette, 2013), or summaries of opportunities for teacher leadership roles (NRC 2014; Peterson, 1962; Rice, 1961).

While no article explicitly defined strategic professional leadership, articles were often replete with references to activities that would fall into strategic professional leadership as defined for this literature review (as seen in Table 2.2). Of special note, in an evaluation of the Albert Einstein Distinguished Educator Fellowship program, Gareis et al. (2011) asked program alumni and finalists about their change in their leadership involvement in activities at the school, district, state, and national levels, but interestingly, there was no exploration of what the study authors or research subjects considered were types of external leadership (actions or activities).

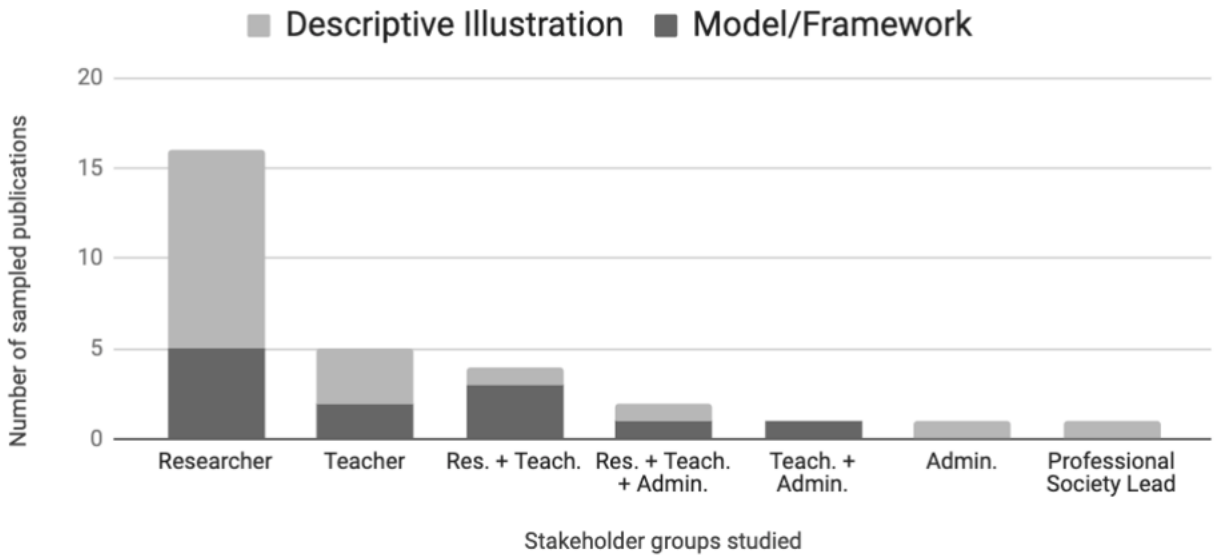
Theme two: Conflicting conceptualizations of strategic leadership

Another important theme was the apparent conflict in how strategic leadership is conceptualized among researchers, science teachers, administrators, and other professionals. Five publications were written from the perspective of classroom teachers alone, although some of

these individuals had become researchers at the time of writing, and their reflections are possibly a mix of that of K-12 teacher and researcher (Davis, 2009; Greitz Miller, 2009; Bundy et al., 2019; Pike, 2009; Yeotis et al., 2009). A limited number of publications included multiple stakeholder perspectives as seen in Figure 2.2, including researchers and teachers combined (AAPT Master Teacher Leader Task Force, 2017; Gess-Newsome & Austin, 2010; Hanuscin et al., 2012; Sinha & Hanuscin, 2017), researchers, teachers, and administrators combined (NRC, 2014; Klein et al., 2018), teachers and administrators combined (Cheung et al., 2018), as well as a state administrator (Peterson, 1962) and a professional society leader (Rice, 1961).

Figure 2.2

Types of sample publications and the stakeholder groups that were studied



The researchers that studied these differences noted significant contrasts in conceptualizations of science teacher leadership among teachers, their administrators, and the researchers themselves. The remainder of the publications (16 out of 30) described conceptualizations that were presented from the lens of the researchers alone, although it is

unclear if practicing classroom teachers were included in the development of the extant theories about teacher leadership that were adopted by the researchers.

The differences in the conceptualization of leadership activities were greatest for those activities that fall into strategic leadership. In general, teachers had more limited views of leadership—including their own leadership—than researchers (Alemdar et al., 2018; Criswell et al., 2017, 2018; Galosy & Gillespie, 2013; Hanuscin et al., 2012; Howe & Stubbs, 2003; Sinha & Hanuscin, 2017; Author, 2018; Klein et al., 2018). For example, Hanuscin et al. (2012, p. 15) demonstrated from surveys that while the majority (80%) of physics teachers in their three-year leadership program reported that they offered professional development opportunities to their colleagues, reporting that only 60% of those individuals "view[ed] this activity as constituting 'leadership.'" Interestingly, about half of the physics teachers in the program reported involvement in supporting pre-service teacher education, which was viewed as science teacher leadership by over 95% of teachers. Further, case studies reported by Sinha and Hanuscin (2017) showed that teachers typically only associated leadership with formal, hierarchical roles within their school or district. Klein et al. (2018) verified these earlier findings by evidencing that administrator often have limited conceptualizations of leadership as well, as many administrators suggested examples of teacher leadership might include serving as bus monitor or taking on ad-hoc administrative duties. As an illustration, Klein et al. interviewed Abby, a teacher who engaged in activities to build relationships with the local university to connect her students to a network of practicing scientists. However, "neither her [science] coordinator nor Abby saw her activities as teacher leadership work; rather, they saw her activities as an extension of her individual passion" (p. 99). Some researchers have explored the reason for these differences; scholarship by Criswell et al. (2017, 2018) has described the discrepancy as teachers'

underdeveloped visions for leadership. Without an outside perspective, teachers (as well as their administrators) do not often see the leaders they are or that they can become.

The lack of conceptualization of strategic leadership by teachers themselves might have some impact on teachers' actions. In one study on the development of a science teacher leadership measurement instrument by Doraiswamy et al. (2016), no participating teacher in their sample displayed evidence of the strategic leadership construct as actions that advocate for the profession, which had been anticipated by the researchers. As a result, the domain was dropped entirely from the analysis. Their findings suggest that the teachers in their study did not acknowledge or did not engage in strategic leadership, which may be why researchers sometimes eschew this strategic-based conceptualization of teacher leadership.

However, despite these differences, multiple researchers documented the convergence of researchers' and teachers' views of leadership across time and noted that teachers began to actively reach toward strategic leadership as they progressed through leadership programs designed by the researchers (Alemdar et al., 2018; Criswell et al., 2017; Galosy & Gillespie, 2013; Howe & Stubbs, 2003; Luft et al., 2016; Sublette, 2013). In effect, the reviewed literature suggests that science teachers are unaware of what is available to them, outside of the locality, regarding leadership opportunities. But, once they realize how they can be engaged beyond the district, they desire to be involved. For example, Criswell et al. (2017) stated that while they did not see any of their subjects "move to the level of influencers of policy during the time frame of this study, [they] did see how supporting the [Master Teacher Fellows] in being disseminators of scholarship positively impacted [their] teacher leadership trajectories" (p. 831). The work by Howe and Stubbs (2001) stands out from more intentional leadership programs, however, because teacher leadership "was an unexpected outgrowth" (p. 282) attributed to a professional

development program that was only intended to improve teachers' content knowledge. The authors further report that as a result of their program, teachers engaged in strategic leadership such as serving on state science committees, running for and being elected to city council, and publishing on the national scale. In their study, both the researchers and teachers were surprised by how professional development influenced their professional trajectories, providing some understanding of the affordances for science teachers who engage in this type of leadership.

Additionally, researchers often noted that teachers who desired to engage in leadership encountered resistance from their administrators. Specifically, multiple pieces of literature acknowledged that differing opinions about teacher leadership roles caused tension between teachers and their administrators, especially when leadership activities fall outside of the school or district-level scope of the normal job description of a teacher (Cheung et al., 2018; Criswell et al., 2018; Gareis et al., 2011; Klein et al., 2018; Klentschy, 2008; NRC, 2014; Sublette, 2013). Klein et al. (2018) noted that even when science curriculum coordinators claimed to be permissive of teachers' leadership activities, that coordinators implied that teachers' leadership activities should be in service of a particular agenda, not necessarily of the teachers' own design: "[administrators had a] notion of teacher leaders as implementers of policy, teachers of influence who can help support the agenda of the district, state, or nation" (p. 101). Further, the authors found that administrators did not necessarily acknowledge teachers' personal desires if they did not align with the district's plans. During an NRC convocation on STEM teacher leadership (2014), one teacher leader went so far as to warn the audience that even with explicit avenues for leadership, "teacher leaders are not guaranteed acceptance or even understanding by their administration" (p. 7); suggesting school-centered barriers to leadership activity. This review found one article in which teachers and their district administrators co-developed a science

teacher leadership model (Cheung et al., 2018), but this model is by far the most restrictive concerning contributions to strategic leadership. The model limits teacher activities "access[ing] resources such as district-provided materials [and] keep[ing] abreast of science-related policies, expectations, and decisions" (p. 41), rather than actively creating their own materials to encourage participation in the decision-making process at any level higher than the school. This theme (based upon analyzed literature therein) suggests barriers that have been constructed to stymie leadership to local levels, which has been evinced into the research literature.

Theme three: Individualized experiences in strategic leadership

There is little uniformity in teachers' type of engagement at the strategic level, a finding supported by Hite & Milbourne (2018) as well as Luft et al. (2016), as previously seen in Table 2.2. However, the literature suggests that teacher leadership begins with instructional leadership. The focus on instruction dissipates as teachers begin to move toward activities beyond the classroom walls, such as policy and advocacy activities. Most teacher leadership models, frameworks, or programs in this literature review emphasized instructional ability as the foundation or a primary goal of leadership (Alemdar, et al., 2018; Cheung et al., 2018; Criswell et al., 2017, 2018; Doraiswamy et al., 2016; Hanuscin et al., 2012; Galosy & Gillespie, 2013; Hite & Milbourne, 2018; Howe & Stubbs, 2001; Klentschy, 2008; Luft et al., 2016; Mentzer et al., 2013; Sihna & Hanuscin, 2017; Sublette, 2013). This finding is additionally supported by a meta-review of STEM teacher leadership programs by Galosy et al. (2017b, p. 17-18) that found that the most frequent common aspect of leadership content was "learning facilitation skills," which included coaching and/or mentoring, facilitating professional learning communities, providing professional development, and developing curriculum. Only two programs, the

AAPT/AIP Master Teacher Policy Fellowship (Bundy et al., 2019) and the Albert Einstein Distinguished Educator Fellowship (Gareis et al., 2011), did not include improving specific forms of instructional practice in their programming, as they were focused on advocacy and leadership in science education policy.

Once teachers broke beyond district boundaries, leadership engagement diversified as teacher leaders' roles expanded into larger domains. Multiple authors explicitly commented on the individualized pathways that many teacher leaders took once they began to engage in strategic leadership (Hite & Milbourne, 2018; Luft et al., 2016); this was a noticeable trend implicit in many teachers' self-reflections on their career pathways (Davis, 2009; Greitz Miller, 2009; Yeotis et al., 2009). The very early piece by Peterson (1962) was included within this analysis as it described that while the state-level science education issues might include science curriculum and pre-service and in-service teacher education, it might also include making guidelines and decisions (policy) about science facilities, maintaining staff and public relations on the importance of science and science education, and serving as a liaison between K-12 schools and university-based researchers. Although written more than half a century ago, far beyond the more recent discussions of strategic leadership, this article illustrates the increasing complexity and diversity of issues of science education beyond the district that continue to modern-day, suggesting a legacy of discouraging teachers from strategic leadership.

Theme four: Strategic leadership precipitated by a transformative experience

Although publications often referenced a list of factors that contributed to teachers' willingness and success in leadership, three elements that had triggered science teachers' entry into strategic leadership were most prominent: (a) dissatisfaction with the status quo coupled

with a desire to change the system, (b) professional isolation, and (c) a pivotal or transformational experience that increased their self-confidence. Multiple researchers identified teachers' dissatisfaction with the status quo and a desire to change the system as a turning point in teacher leaders' careers toward strategic leadership (Alemdar et al., 2018; Bundy et al., 2019; Criswell et al., 2018; Galosy & Gillespie, 2013; Howe & Stubbs, 2001; Sublette, 2013; Pike, 2009). Galosy and Gillespie (2013) noted that the cohort model of teacher leaders encouraged the desire to effect change in science education beyond their local contexts. One of their fellows affirmed this point that "To some extent, KSTF [Knowles Science Teacher Fellowship] makes me feel obligated to contribute on a bigger scale than just in my classroom" (p. 213).

Teachers' reflections on their leadership trajectory often revolved around the moment when they knew they had to do more to share what they know about effective science education with others: "If I remain silent, knowing that just my students are getting it, then I am just as guilty as those who are ignorant and afraid of change" (Pike, 2009, p. 183-4). Howe and Stubbs (2001) referred to this process of realization as part of the *disequilibrium*, a phase of leadership growth, which they adopted from the model developed by Palus and Drath (1995). During this phase, Howe and Stubbs (2001) stated that teachers' responses to these critical moments might be met by "confusion, initial lack of acceptance, or surprise at seeing one's world in a new light," while others might "recognize a need to make a change" (p. 286).

Dissatisfaction and the desire to change the system are frequently accompanied by two other indicators of teachers' strategic leadership in particular: professional isolation and increased self-confidence. The literature described professional isolation on multiple levels as a factor that motivated leadership (Alemdar et al., 2018; Criswell et al., 2018; Davis, 2009; Galosy & Gillespie, 2013; Howe & Stubbs, 2001; Klentschy, 2008; Yeotis et al., 2009), because teachers

often desire to commune with others who share their experience as the lone disciplinary science teacher. Teachers' self-confidence was also cited as critical to expanding teachers' perceptions about and engagement in leadership (Alemdar et al., 2018; Author, 2019; Gareis et al. 2011; Howe & Stubbs, 2001; Klentschy, 2008; Mentzer et al., 2014; Sinha & Hanuscin, 2017; Pike, 2009). This self-confidence often appears to be transferable—teachers who grew in confidence as instructors or researchers also become more confident as leaders overall—as evidenced by Howe and Stubbs' (2001) observation of national teacher leaders who attributed their confidence in leadership in education to having worked with practicing scientists on scientific research.

Discussion

Through this SRL analysis, we explored how the extant research literature on science teacher leadership conceptualized secondary science teachers' engagement in strategic leadership in science (RQ1) and how secondary science teachers' actions in or towards strategic leadership were met with either encouragement or discouragement (RQ2). While the 30 sampled studies were divided to the extent to which essential strategic leadership was embedded within their conceptualization of teachers' leadership, there is a migration toward a grander vision of how science teachers can lead strategically. An example of this progression is epitomized in Alemdar et al. (2017), Criswell et al. (2017), and Criswell et al. (2018). The conceptualization of strategic leadership was also tempered by social tensions that exist within teachers' perceptions of and participation in leadership. Teachers' and researchers' visions for what teachers may evolve as these tensions (conceptualizations of and barriers to strategic leadership) are lessened, then we may begin to see teachers' perceptions and expectations of themselves change as well as expectations of others (e.g. administrators) of teachers as leaders.

Numerous authors in the science education community are acknowledging strategic leadership, with researchers doing so even to a greater extent than teachers themselves. Further, we found specific examples in descriptive narratives of pathways toward and through strategic leadership that were unique to the individual, and that emanated from deeply transformative experiences. No single program claimed to consistently produce strategic leaders, nor were any teacher leaders claiming to have shared the same transformative experience. Rather, the literature analysis indicated that engagement in strategic leadership seemed to have resulted from a combination of dissatisfaction with present circumstances and personal desires to change a systemic issue. These findings among U.S. teachers echo prior work outside the U.S., including a study of science teachers in England that found that professional dissatisfaction is not only a necessary element to growth, but has the potential to be fruitful in supporting systemic change within science departments (Dillon, 2002).

Importantly, science teachers' experiences of isolation even within science departments provided an impetus to lead beyond their respective contexts, facilitating increases in confidence and activity within larger teacher leadership spaces. While York-Barr and Duke (2004) found that isolation was an obstacle to distributed leadership within building-level contexts, literature on science teacher leadership demonstrates teachers seeking opportunities and resources beyond their locality. Given that isolation mediates teachers' sense of job satisfaction (Steel & Craig, 2006) and job satisfaction significantly impacts perceptions of teacher leadership in schools (Sun & Xia, 2018), this may too apply to wider contexts. However, since schools are composed of a conglomerate of actors that the teacher has little choice in selecting, leadership experiences there could be markedly different from contexts in which the teachers can independently choose the external communities with which they engage (e.g., summer institutes, professional societies).

While some of the education research community appears to hold broad conceptualizations of what constitutes science teacher leadership, a critical finding of this analysis is that no sampled study focused exclusively on science teachers' strategic leadership. One reason for the lack of focused study on science teachers' strategic leadership may relate to programmatic limitations. Most of the empirical studies included novice teachers or mixed experience groups, were located within small geographic ranges and were studied for a relatively brief period. The nature of these studies does not permit a researcher to accumulate and study a critical mass of strategic leaders, provided the lack of strategic leadership opportunities (National Research Council, 2014) and the time needed for science teachers to develop skills in strategic leadership (Hite & Milbourne, 2018). Further, the emphasis of many nationally funded research programs focuses on teacher leadership centered on classroom or district-level instructional leadership as an attempt to increase science teacher retention in the short term (Brill & McCartney, 2008) or improve student achievement (Leithwood & Riehl, 2005). As a result, most education research on teacher leadership occurs during a narrow window of science teachers' professional practice.

It is also important to note that we found dissatisfaction to be a primary motivator for teachers to become strategic leaders; efforts by researchers to study and promote (or actively discourage) this form of leadership may pose some ethical concerns. While teachers might value their contributions to the wider profession, their district and school administrators might not, leaving teachers with the uncomfortable task of justifying their strategic leadership engagement to their supervisors (e.g., Donaldson et al., 2008; National Research Council, 2014; Tschannen-Moran, 2009; Weiner & Woulfin, 2018). A teacher's engagement in strategic leadership might lead the teacher down a pathway that removes the teacher from classroom instruction and from

providing direct benefit to students—an effect that districts are likely to interpret as a total loss. This concern is acutely apparent when teacher leadership programs acknowledge that one unintended consequence might be that science teachers choose to leave the classroom to serve in a non-instructional capacity (Galosy & Gillespie, 2013). Researchers could be accused of poaching teacher leaders that are needed in the classroom, regardless of any long-term benefits to the science education system. (However, it is yet unclear whether those teacher participants who chose not to go back to the classroom after their leadership programs would have stayed in the classroom anyway. A study of Albert Einstein Distinguished Educator Fellowship alumni found that many desired to return to their classrooms post-fellowship, but district and school climate factors precluded their reentry (Gareis et al., 2011). Regardless, we assert that administrators and researchers should permit teachers to grow and engage as rightful professionals throughout their careers, and any choice to proactively discourage teachers from having a sense of professional agency could be likewise unethical. One solution to this dilemma might be the provision of explicit, yet optional, pathways for strategic teacher leadership, as has been documented in a handful of countries (Darling-Hammond, 2017).

The above context for research on science teachers' professional leadership can be used to guide future research. First, researchers, teachers, and other educational stakeholders continue to struggle with their conceptualizations of teacher leadership. Further research is needed to advance an understanding of science teachers' strategic leadership, especially considering the critical need for well-prepared STEM teachers in the U.S. as called for by the National Research Council (2014). It is important to note that current research that speaks to science teacher leadership at any level may be limited by how researchers design their leadership programs, how funding agencies incentivize research on teacher leadership, and how both administrators and

teachers respond to leadership opportunities. We recommend research to understand the conceptual relationships among these four themes, such as teachers' understandings of teacher leadership to their degree of engagement as teacher leaders, and how these actions coupled with their varied professional context, influence their teacher leadership development. Second, it is essential to understand the actual impact of science teachers' engagement in strategic leadership at the systemic level. There was no publication examined that attempted to qualify how science teachers effect change strategically. Meaning, there is a dearth of description of the salient benefits of strategic leadership to the science teaching profession, how their leadership affects other teachers—the results of which are likely to have some impact on how people perceive teacher leadership, and, in turn, how science teachers engage in it or support it for other teachers' involvement and participation. These effects, both positive and negative, should be studied with special attention to matters of science teachers' professional satisfaction, retention, and transition to non-teaching roles.

Limitations

It is important to note that this literature review only included those authors who conceptualized science teachers' leadership beyond the confines of their normal duties and loyalties to their school and district. Researchers who actively oppose the promotion of science teachers' leadership beyond the district and therefore might exclude any reference to this form of leadership in their conceptualizations would not have been included in this review. A cursory examination of the literature that was excluded from the search suggests that many authors did not consider teacher leadership beyond the scope of the well-defined dimensions of instruction. However, it is possible that some authors on science teacher leadership directly oppose or

implicitly discourage strategic leadership among classroom teachers for reasons similar to those found among some administrators in this review. As a result, the overarching conceptualizations of leadership in this analysis might present a limited vision of teacher leadership and fail to recognize possible negative impacts of strategic leadership, such as teachers' increased dissatisfaction with their careers and decreased long-term retention of exemplary teachers. Further, as described in the characterization of the literature, many of the authors in this review built their conceptualizations of science teacher leadership by applying extant discipline-agnostic frameworks to science contexts. If there are any aspects of science teacher leaders' identity or actions specifically related to strategic leadership that are unique to being a science teacher—and not a teacher leader in general—we may have missed these aspects due to this type (or lack) of discipline-specific modeling of strategic teacher leadership in the literature.

Conclusion

The findings of this literature analysis present some novel understandings concerning research on science teachers' strategic leadership. Researchers with broad conceptualizations of science teacher leadership are generally acknowledging teachers' potential for and actions associated with strategic leadership. However, teachers' engagement with strategic leadership might be stifled by their own limited conceptualization of leadership or tensions within administration. Research on this kind of leadership appears to be limited in part by researchers' access to those teachers (i.e., programmatic constraints, lack of longitudinal access, attrition). When teachers engage in strategic leadership, researchers have found that their pathways are very personalized and unique, typically precipitated by a transformative experience. Thus, this SLR analysis revealed significant gaps in terms of studying the development or actions of

existing strategic leaders, research on the possible local benefits of classroom teachers engaging in strategic leadership, and the ethical concerns that might arise when science teachers look beyond their locality for leadership opportunities and activities.

Collectively, these findings suggest that research into teachers' strategic leadership could be both a fruitful and necessary pathway for education research and could serve as a tool for supporting teachers as they work to improve the science teaching profession and the science education system as a whole. To do so, we encourage researchers and classroom practitioners to become more aware of the opportunities that exist for science teacher leadership, both by familiarizing themselves with and engaging with existing external programs that build science teachers' strategic leadership skills and provide avenues for exercising strategic leadership beyond the local level.

A salient contribution of this research is in providing possible solutions to support research on science teachers' strategic leadership is for funding agencies by explicitly acknowledging the difference between instructional (i.e., school- or district-level) and strategic (i.e. at the level of a professional system) needs in science education. With this distinction, funding agencies could solicit research ideas to study separate, but connected, dimensions of teacher leadership, and help reinforce the idea that science teachers' strategic leadership in the long-term might support the nation's immediate need for highly-qualified science (and mathematics) teachers in the classroom (NRC, 2014). To promote this wider vision for how teachers can contribute to the system, funding agencies might consider promoting the networking of institutions that conduct smaller teacher education and/or educational research to help coordinate research efforts with a wider scope and longer time frame, and especially encourage the involvement of state and national professional teaching societies in research efforts. Funders

and researchers alike should also consider collaborating with school administrators to quantify science teachers' strategic leadership to demonstrate direct benefits to schools. In some cases, administrators resist teachers' engagement in strategic leadership activities, because they are unable to envision how science teachers' activities outside of the classroom benefit (and not detract) from their instructional responsibilities (see Cheng and Szeto (2016) for principals' varying ideas and support for teacher leadership) or become a threat to their own work (Little, 1998; Mangin, 2007). Given the localized funding and policy structure of U.S. school districts, it is reasonable and logical for district administrators to encourage teachers to focus their attention and leadership efforts within their classrooms, schools, and districts. However, districts tend to be agnostic (other than the use of instructional coaches) to the discipline- or subject-specific leadership support that science teachers need to overcome professional isolation (York-Barr & Duke, 2004) and need for professional growth to remain satisfied in the classroom (Hite et al., 2020). Importantly, districts that actively discourage science teachers' strategic leadership fail to benefit from their teachers' engagement in leadership (Lumpkin et al., 2016) and signal to building administrators that teacher leadership is unimportant (Mangin, 2007, 2008). Thus, district teachers have the potential to positively impact matters of teacher recruitment or pre-service education and in-service professional development for science teachers that could have direct effects on districts, schools, and classrooms. There is a dearth of research measuring the benefits of teacher leaders' engagement, beyond the district, on the students or communities they serve. As a result, an important part of research efforts could also include networked school districts and the involvement of administrators to incentivize them and garner their support for their science teachers' strategic leadership.

Chapter 3: Designing a Theoretical Framework and Interview Protocol to Explore Sources of Self-Efficacy for Strategic Leadership in STEM Education

Introduction

Teachers' engagement as teacher leaders is one possible mechanism for systemic change in education. Considering STEM-based global challenges, many countries have turned their attention to the quality of STEM education as a foundation for sustainable development (IDB, 2016; UNESCO, 2015). Given the pressing need to support STEM-literate societies, identifying and understanding *why* some STEM teachers become advocates for improved STEM education beyond their own classrooms should be a question of importance to educational leaders, from researchers to policymakers.

While some teachers might support the improvement of STEM teacher education through peripheral influence on other educators by modeling their own good practices (eg., inspiring teachers across the school building to follow their instructional models, inviting family and community members to engage in STEM practices with their students), other teachers choose to intentionally and explicitly engage in STEM leadership to shift STEM education systems at scale, often through programs and policies.

In particular, I am curious to better understand those teachers who possess a vision to improve STEM education beyond their own traditional day-to-day spheres of influence to impact system-wide educator factors. For example, some teachers invest substantial time in sharing their own practices with groups of educators through workshops and conferences, by writing standards and curricula, or by engaging in policy dialogue (Hite et al., 2020; Howe & Stubbs, 2001; National Research Council, 2017). I identify these kinds of activities as strategic leadership, pulling from definitions in education (Spillane, et al., 2001b; Hite & Milbourne,

2018) and business (Finkelstein, et al., 2009; Anderson et al., 2008; Davies & Davis, 2005). In turn, I define teachers' strategic leadership in STEM education as *the actions of STEM teachers to influence policy and/or underlying norms to improve STEM education systems at scale.*

Building on Bandura's work on self-efficacy and agency (1977, 1986, 1994, 2000, & 2006), a foundational assumption for why some teachers choose to engage in strategic leadership is that teachers' activities are mediated by a sense of *self-efficacy* for strategic leadership actions. However, despite the literature linking self-efficacy for leadership to leadership actions in the context of corporate leadership (Anderson et al., 2008; Paglis & Green, 2002; Stajkovic & Luthans, 1998), no tools yet exist to understand the self-efficacy or the sources of that self-efficacy for teacher leaders, much less within the context of disciplinary leadership such as STEM.

Rationale, Research Questions, and Purpose

Although ample literature has explored the nature and potential of teacher leadership (York-Barr & Duke, 2004; Wenner & Campbell, 2017), only a handful of studies have explored disciplinary leadership, such as STEM teacher leadership (Wenner & Campbell, 2017), and limited studies have investigated disciplinary leadership beyond the scope of traditional education structures such the school building (National Research Council, 2014). By default, even fewer have explored these topics inclusive of early childhood teachers—teachers who historically have not had strong self-efficacy in STEM education itself.

This study intends to develop a theoretical framework and interview protocol to guide exploration into *why* a group of STEM teacher leaders chose to engage in wide-scale, disciplinary leadership, thereby becoming reform agents to improve STEM education at the

national and international levels. Specifically, I hope to develop a foundation on which to be able to address two research questions: "*What do teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?"

This chapter describes the development of a theoretical framework and protocol for revealing sources of self-efficacy in early childhood teachers' strategic leadership in STEM education and how that self-efficacy influenced their trajectory. Following a brief overview of the study context and analytical lens, the paper describes this development in four phases. Phase 1 includes the literature review on strategic teacher leadership in STEM education to lay the definitional and organizational foundation for the theoretical framework. Phase 2 illustrates the theoretical framework, as well as its evolution based on feedback from experts in the field. Phase 3 describes the development and piloting of an interview protocol—aligned to the framework—that intends to reveal STEM teacher leaders' sources of self-efficacy. Finally, Phase 4 elaborates on the application of the protocol and the initial analysis of data from the pilot group. This paper presents an analysis of the final framework and framework-aligned protocol based on the utility of findings from the pilot group.

Context

This study is situated within the context of a STEM-focused two-year teacher fellowship organized by the Inter-American Teacher Education Network (ITEN) (OAS, n.d.), an initiative of the Organization of American States (OAS). This research explores the leadership experiences of classroom STEM teachers (Teacher Fellows) who were nominated by their ministries of

education or teacher education institutions from among OAS' member states. Teacher Fellows hailed from 11 countries, including Argentina, The Bahamas, Colombia, Costa Rica, the Dominican Republic, Grenada, Jamaica, Mexico, Peru, St. Kitts and Nevis, Trinidad and Tobago, and the United States. Teacher Fellows were at one of two grade-band levels: early childhood education (teachers of children ages 3-8) or secondary education (teachers of children ages 14-18).

The kinds of strategic leadership that ITEN aimed to support included developing STEM-specific teacher education pathways for pre-service and in-service teachers, designing and disseminating model instructional frameworks and curricular resources for adoption by educational agencies, building up communities of practice, and influencing STEM education policy, among others. The fellowship experience included one year of professional growth in evidence-based instructional practice in STEM followed by one year of leadership engagement, in which each Teacher Fellow designed and implemented a leadership plan to influence STEM education at scale.

Analytical Lens

This study aimed to develop a tool to explore teachers' individual leadership experiences and focused on their personal sources of self-efficacy for STEM teacher strategic leadership (as opposed to collective self-efficacy (Bandura, 2000)). However, because these teachers demonstrated a shared understanding of teacher leadership and took part in shared professional development experiences, I approached this effort from a multiple interpretive case study perspective.

The case study methodology has been defined as a "study of an issue explored through one or more cases within a bounded system" (Creswell, 2008, p. 73). Distinguished scholars who specialize in case study methodology include Merriam (1998 & 2009), Stake (1995, 2006 & 2010), and Yin (2002). Merriam and Stake share similar worldviews based on a constructivist lens (Yazan, 2015). Merriam (2009) emphasizes the "in-depth description and analysis of a bounded system" (p. 40), echoing the importance of thick description (Geertz, 1973). Stake (1995) emphasizes the importance of "the particularity and complexity of a single case, coming to understand its activity within important circumstances" (p xi) and provides markedly more guidance for analysis. Yin tends toward a positivist perspective (Yazan, 2015), perhaps in an attempt to justify qualitative case studies as valid scientific approaches.

Because I use Social Cognitive Theory as a foundation for my analytical lens, I adopt the compatible methodological perspectives of Merriam (2009) and Stake (1995), who both believe that the researcher should serve as an interpreter for meaning making. Further, because my cases are in diverse contexts across Latin America and the Caribbean, I used the detailed guidelines for multisite case studies set forth by Stake (2006), which provides for a more structured, programmatic review of the contexts in which the case is situated.

Multisite case studies, which study cases across multiple locations or contexts, can help make sense of complex systems and increase the generalizability of interpretations and findings (Merriam, 2009). Stake (2006) provides a model for multisite case studies across an international context, using the example of the Step by Step early childhood program that has been implemented across Eastern Europe and Central Asia. Stake urges researchers to carefully understand the relationship of the multiple cases to each other as well as their individual historical, cultural, political, and social contexts (providing detailed worksheets to guide such an

analysis), and to be open to new developments in research directions as researchers attend to embracing the diversity in the different contexts.

Method

Phase 1: Literature Review

To create a theoretical foundation for an analysis rooted in self-efficacy and to address *why* some teachers become strategic leaders in STEM education, I completed a critical literature review (Grant & Booth, 2009) that selectively pulled from buckets of literature that collectively represent the intersectionality of STEM teacher's strategic leadership. A critical review "provides the opportunity to 'take stock' and evaluate what is of value from the previous body of work" (Ibid, p. 93). Such a review is more appropriate to the nature of the questions that drive this work, given how the topic is uniquely situated between multiple disciplines and is likely, on the whole, not "sufficiently mature to support an in-depth interrogation" of a more holistic systematic review (Alexander, 2020, p. 10).

Rather than attempt to present a panorama of academic thinking about each element of STEM teachers' strategic leadership (which could include a plethora of permutations of concepts related to self-efficacy, leadership, and STEM education), at a minimum I aimed to identify core authors whose work hinted at possible interconnections among these intersecting ideas. I reviewed four categories of literature as illustrated in Table 3.1, including theoretical research around the concept of self-efficacy (SE) in general, leadership self-efficacy (LSE), teacher-leadership self-efficacy (TLSE), and STEM teachers' strategic leadership self-efficacy (STSLSE), which was explored through a systematic literature review described in Chapter 2.

Table 3.1

Literature review for STEM teachers' strategic leadership in self-efficacy: Categories, core questions, search terms, and core publications

Category	Core Questions	Search Terms	Core Publications
Self-Efficacy (SE)	How is self-efficacy classically defined? (Is its definition and its impact context-specific?) How does self-efficacy mediate individuals' and groups' actions, in general?	self-efficacy	**Seminal or Comprehensive:** Bandura (1977, 1986, 1999, 2006) **Additional High Relevance:** Maddux and Gosselin (2012); McCormick (2002); Prussia et al. (1998); Schunk & Pajares (2009); Vancouver et al. (2002)
Leadership Self-Efficacy (LSE)	How is self-efficacy situated within frameworks for strategic leadership?	self-efficacy + leadership, self-efficacy + strategic leadership	**Seminal or Comprehensive:** Day et al. (2014) **Additional High Relevance:** Ali et al. (2018); Anderson et al. (2008); House & Aditya (1997); McCormick et al. (2001, 2002); Northouse (2008); Paglis & Green (2002); Prussia et al. (1998); Stajkovic & Luthans (1998)
Teacher Leadership Self-Efficacy (TLSE)	How is self-efficacy situated within frameworks for teacher leadership and teacher leader development?	self-efficacy + teacher leadership	**Seminal or Comprehensive:** York-Barr & Duke (2004); Wenner & Campbell (2017) **Additional High Relevance:** Caine & Caine (2000); Katzenmeyer & Moller (2001); Kurt (2016); Smylie & Eckert (2018); Zheng et al. (2019); Zinn (1997)
STEM Teacher's Strategic Leadership Self-Efficacy (STSLSE)	What implications does the literature have for how I should conceptualize STEM teacher self-efficacy for leadership and its role in transitioning toward strategic leadership? What is an appropriate analysis tool for exploring STEM teachers' self-efficacy and its role in their strategic leadership?	"(science OR STEM) & (teacher & leader)" + *peer reviewed* "(science OR STEM) & (teacher & leader)" "(science OR STEM) & master teacher"	**Systematic Literature Review** AAPT Master Teacher Leader Task Force (2017); Alemdar et al. (2018); Bundy et al. (2019); Cheung et al. (2018); Criswell et al. (2018); Davis (2009); Doraiswamy et al. (2016); Galosy et al. (2017a); Galosy et al. (2017b); Galosy & Gillespie (2013); Gareis et al. (2011); Gess-Newsom & Austin (2010); Greitz Miller (2009); Hanuscin et al. (2012); Hite & Milbourne (2018); Howe & Stubbs (2003); Klein et al. (2018); Klentschy (2008); Lederman & Lederman (2010); Luft et al. (2016); Mentzer et al. (2014); National Research Council (2014); Peterson (1962); Pike (2009); Rice (1961); Sato et al. (2010); Sinha & Hanuscin (2017); Sublette (2013); Yeotis et al. (2009)

I attempted to find seminal or comprehensive publications (such as extensive literature reviews) as well as additional highly relevant (highly-cited as well as very recent) publications by reviewing the literature cited in the reviews and by widely browsing the search engines. For the first three broad categories (SE, LSE, and TLSE), I performed the search by using basic search terms in WorldCat (2019), ProQuest (n.d.), and Google Scholar. These three reviews did not use fully reproducible methods, such as strict adherence to search terms, exclusion principles based on methodology, or in-depth attention to quality beyond selecting peer-reviewed publications. However, I did address procedural challenges by incorporating referential backtracking and researcher-checking. I intended to identify 'nuggets' of ideas that could help me to elucidate the STEM teachers' strategic leadership by contextualizing it in the broad literature base from other fields, including psychology, management sciences, and discipline-agnostic educational leadership.

The final category, STEM teachers' strategic leadership self-efficacy, includes a very narrow band of literature. As such, I undertook a systematic literature review (Alexander, 2020) for this category alone (see Chapter 2). This review explored how the literature conceptualizes STEM teachers' engagement in strategic leadership, while also describing strategic leadership actions and contexts that encourage or discourage those actions.

The goal of the review across the four categories was to draw down information from the concepts and frameworks presented in publications by the core authors, allowing for critical comparisons and looking for gaps and similarities, to create a more holistic framework that explicitly attends to how self-efficacy influences the transition to strategic leadership actions by STEM teachers. What is needed is a stronger connection between self-efficacy theory that explores self-efficacy and extant STEM teacher leadership frameworks, with an eye toward those

elements of frameworks that look at the transition into strategic leadership actions. I hoped that this framework would be composed of descriptive concepts that might be used to categorize strategic leadership elements, as well as hierarchies or relationships among those concepts, to be able to use the framework to analyze future data sets of STEM teacher strategic leaders. The core list of literature that is explored in this review is in Table 3.1.

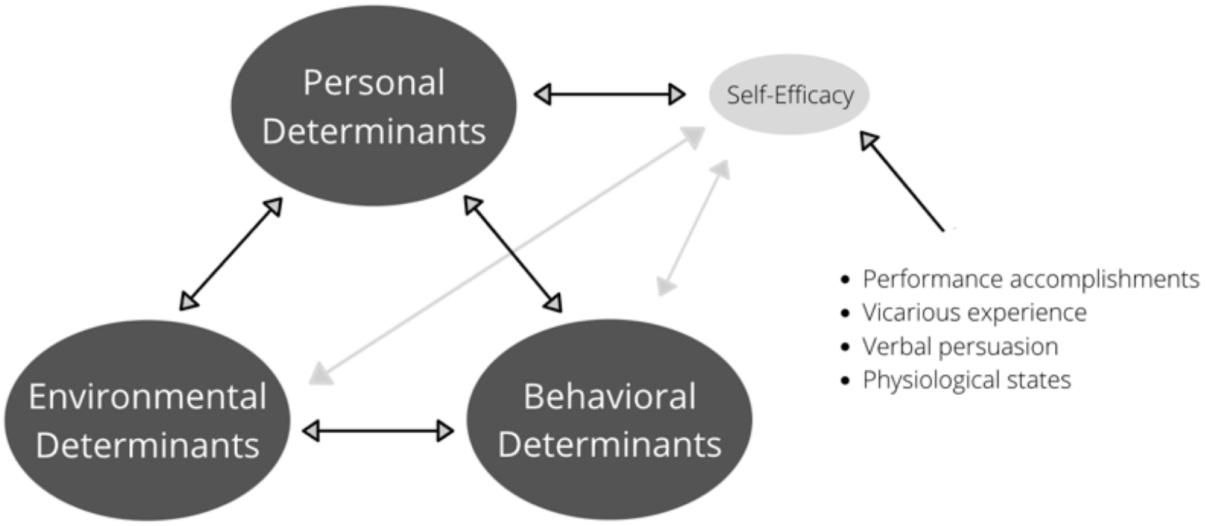
Self-Efficacy.

Self-efficacy is the belief that one has about their ability to accomplish a particular task, and self-efficacy theory rests on the idea that people are more likely to pursue behaviors they believe they can accomplish (Bandura, 1977). Self-efficacy is oriented toward specific actions and can change from situation to situation, as opposed to *self-confidence*, which is typically more viewed as a more static character trait (McCormick, 2002). Unlike *hope*, self-efficacy is an assessment of one's own abilities, not an aspiration alone.

Bandura (1977) believed that self-efficacy expectations mediate how a person's internal state is expressed through behavior, and that self-efficacy is the anchor for activity initiation, effort, and sustainment in the presence of difficulties. He asserted people's beliefs about their abilities are not innate—self-efficacy beliefs are developed over time from repeated experiences, including experiencing success on prior tasks (performance accomplishments), observing the behaviors of others (vicarious experiences), internalizing the messages others share about one's abilities (verbal persuasion), and experiencing emotional arousal (physiological states). The actual nature of inputs to self-efficacy can be quite context-specific, although primary factors likely come from family, society and culture, and formal education (Schunk & Pajares, 2009).

Bandura incorporated the concept of self-efficacy into his Social Cognitive Theory (1986), which describes how personal, environment, and behavioral factors influence one another (Figure 3.1). Self-efficacy is often perceived as one among multiple possible personal determinants, although the Social Cognitive Theory is based on reciprocity, suggesting that all determinants affect each other (they are reciprocal). The theory acknowledges that self-efficacy is not just about personal self-assessment, but about how individuals interpret feedback from others and their surroundings.

Figure 3.1
Bandura's (1986) triadic reciprocal model underlying Social Cognitive Theory with self-efficacy and its sources



For example, in the case of teacher leadership, one could apply the Social Cognitive Theory to hypothesize how a teacher's actions might be a result of the interplay among perceptions about the role and duties of a teacher as modeled by their peers (environmental), the skills the teacher has for understanding factors that influence education (behavioral), and the teachers' interest in leadership activities (personal). Any engagement in leadership activities might elicit positive or negative reactions from peers, which serve as a new determinant input.

The teacher might then use the interpretation of their peers' responses to learn additional leadership skills and to reassess their sense of self-efficacy for leadership.

More than just a theoretical concept, empirical studies have found that higher self-efficacy tends to be associated with better performance. Reviews across multiple disciplines have demonstrated the positive correlations between self-efficacy in the domains of psychological and physical health (Strecher et al., 1986), occupational choice and collective social movements (Maddux & Gosselin, 2012), and especially in academic performance (Honicke & Broadbent, 2016; Pajares, 1996). However, Maddux and Gosselin (2012) note that overly high self-efficacy can be an obstacle to success, particularly when it leads to people following an unachievable objective, invest less effort than is needed, or fail to seek necessary help—effects that have been documented in limited studies, such as those reviewed by Vancouver et al. (2002).

Leadership Self-Efficacy.

Self-efficacy for leadership, specifically, is a strong predictor of effective leadership (Anderson et al., 2008; Paglis & Green, 2002; Stajkovic & Luthans, 1998), and multiple literature reviews of leadership have emphasized the importance of self-efficacy (or self-confidence) as a foundation for leadership in general, including Ali et al. (2018), House & Aditya (1997), and Northouse (2008). Anderson et al. (2008) found that self-efficacy for leadership is linked to leadership effectiveness, as measured by acquiring managers' self-efficacy reports and comparing them to measures of leadership effectiveness provided by the managers' supervisors, peers, and subordinates. Higher self-efficacy is also linked to reported attempts to take on leadership roles (McCormick, 2002).

Building on his earlier work, Bandura (2000 & 2006) came to link self-efficacy to agency (the capacity to exert power), a concept associated with the enactment of leadership activities (Tourish, 2014; Raelin, 2016). Bandura (2006) believes that the mechanism for how self-efficacy impacts agency is that it feeds into four elements among many personal determinants in his triadic model: intentionality, forethought, self-reactiveness (responding to change), and self-reflectiveness (awareness of one's functions). In turn, these elements lead to individual, proxy (petitioning another person to do something), or collective (where there is a shared goal) agency and resulting behaviors to achieve the desired goal. Thus, Bandura's evolved vision for Social Cognitive Theory directly links self-efficacy to leadership-related actions.

As self-efficacy is oriented toward specific tasks, self-efficacy for leadership has distinct components depending upon the nature of the leadership, including relationship, impartial, technical, creative, directive, tenacious, empowering, influential, and strategic dimensions identified by Anderson et al. (2008). Anderson et al.'s (2008) quantitative study demonstrated that "LSE may be considered a multidimensional construct that exists at the level of its dimensions" (p. 605). As a result, leadership self-efficacy should not be analyzed as a conglomerate or a sum of its parts but should instead be analyzed separately. The strategic leadership dimension was strongly associated with three types of leadership self-efficacy (LSE), including (1) "Change LSE" (understanding the levers of change), (2) "Drive LSE" (getting things done), and (3) "Challenge LSE" (achieving difficult objectives).

Self-efficacy can also foster self-leadership (Prussia et al., 1998), which can increase capacities for desirable behaviors, including more leadership of others. Self-leadership has been described as the "influence people exert over themselves to achieve the self-motivation and self-direction needed to behave in desirable ways" (Prussia et al., 1998, p. 524), and is both an input

to and an output from self-efficacy. For example, a teacher leader who wants to increase the access of physics courses to students across the state might first engage in a fact-finding mission to learn about the factors that influence physics taking, such as the lack of highly qualified physics teachers, the common parental perceptions of physics, and system traits that encourage or discourage physics-taking (such as state policies on graduation requirements).

An important limitation of this literature base that relates to leadership self-efficacy is that most researchers explore it within work-related roles, typically in business. The assumptions made by many leadership researchers about the motives behind leadership in business (such as bonus pay or opportunities for career advancement) might not appropriately typify the kind of work of STEM teacher strategic leaders, particularly those who lead beyond the bounds of their formal job descriptions.

Teacher Leadership Self-Efficacy.

Despite the extensive use of self-efficacy theory in business management leadership, research on teacher leadership has tended to focus more on external contexts that promote or inhibit leadership than on the personal determinants of leadership. Some of the most comprehensive reviews of the literature on teacher leadership include York-Barr and Duke (2004) and Wenner and Campbell (2017). While Wenner and Campbell noted that the definition of teacher leadership had expanded in the prior decade, both reviews found that most teacher leadership studies were descriptive, focusing on leadership practice and context. Few studies explored leadership development or its impact. In answering “What conditions influence teacher leadership?”, York-Barr and Duke (2004) identified school culture and context, roles and relationships, and structures, all of which could be thought of as predominantly environmental

determinants in the Social Cognitive Theory. The review only explicitly pulled out two examples that attended to the role of teachers' personal orientations toward teacher leadership, including Caine and Caine's (2000) exploration of teachers' systemic understanding of education and the resulting increase in self-efficacy, and Katzenmeyer and Moller's (2001) tool for assessing one's readiness for leadership. While Wenner and Campbell (2017) did not explore leadership contexts, they did analyze the theoretical lenses used by the authors they reviewed. Among the plethora of theories, many used frameworks focused on group-level characteristics (such as Distributed Leadership, Lave and Wenger's Sociocultural Teacher Learning Models, Micropolitical Theory, Organizational Leadership Theory, Social Networks, etc.), and only a limited number explored the personal experience of leadership.

However, some studies have uncovered a link between teachers' instructional self-efficacy and their leadership self-efficacy. For example, a quantitative study by Kurt (2016) demonstrated that "teachers' self-efficacy acts as a significant mediator between distributed leadership and the three sub-dimensions of teacher leadership" in school-based organizational development, teachers' engagement in professional development, and teacher collaboration. This link between instructional self-efficacy and teachers' eventual foray into leadership has been noted by Katzenmeyer and Moller (2013) and Zinn (1997) as well. This relationship is potentially reciprocal, as teacher leadership in schools has also been shown to increase teachers' instructional self-efficacy (Zheng et al., 2019), which has the potential to initiate or sustain a positive feedback cycle to promote further teacher leadership.

In general, the core roots of teacher leadership, including personal determinants, are understudied. Despite growing enthusiasm for teacher leadership, Smylie and Eckert (2018) note that the literature base on how teachers develop as leaders is limited: "outside of research on the

effectiveness of specific leadership development programs and activities there is very little empirical work and very few research-based descriptive cases of development practice from which we can draw" (p. 558). The authors go on to present a model for teacher leadership development at the school building level, including a component relating to the initial capacity of prospective leaders, which includes self-efficacy. However, this model is anchored at the building ecosystem level and does not attend to the experiences of teachers or their ability to be actors in systems beyond their school.

STEM Teachers' Strategic Leadership.

To conceptualize strategic leadership within the context of STEM teachers, I undertook a systematic review of STEM teachers' professional leadership (see Chapter 2). Specifically, I aimed to understand how academic literature incorporated a view of strategic leadership within frameworks and illustrations of STEM teacher leadership. I also aimed to determine what kinds of strategic leadership actions were identified within leadership frameworks, as well as what kinds of contexts encouraged or discouraged those actions.

The review included 30 publications that did not self-limit to school-based STEM teacher leadership, which were split nearly evenly between empirical and theoretical pieces. Half of the publications included structured models or frameworks for STEM teacher leadership, while the remainder were narrative illustrations of STEM teachers' leadership, such as program descriptions, autoethnography, or consensus reports. The review resulted in four major themes.

The first of the themes from the review was that authors placed varying emphasis on the essentiality or necessity of professional strategic leadership in their visions for STEM teacher leadership. Nine publications explicitly included strategic types of leadership activities in their

descriptions (AAPT Master Teacher Leader Task Force, 2017; Criswell et al., 2017; Criswell et al., 2018; Galosy & Gillespie, 2013; Galosy et al., 2017a; Galosy et al., 2017b; Hanuscin et al., 2012; Hite & Milbourne, 2018; Sinha & Hanuscin, 2017). Some authors found that teachers' strategic leadership was an unanticipated outcome of a program that was meant to support teachers' content knowledge and instructional practice alone (Howe & Stubbs, 2003).

The second theme was that researchers, teachers, and administrators have different views about the nature and role of STEM teachers' strategic leadership. In nine papers, the researchers had broader views of leadership than did teachers themselves (Alemdar et al., 2018; Criswell et al., 2017 & 2018; Galosy & Gillespie, 2013; Hanuscin et al., 2012; Howe & Stubbs, 2003; Sinha & Hanuscin, 2017; Hite & Milbourne, 2018; Klein et al. 2018). Authors either explicitly noted that teachers' views of leadership were narrower than their own, or they implicitly demonstrated it by how authors' original frameworks for leadership were pared down as a result of more narrow perceptions of leadership by teachers during data collection. Notably, more than half of the STEM teachers in the study by Hanuscin et al. (2012) did not acknowledge their out-of-school leadership activities as leadership, even though many of the teachers engaged in what could be termed strategic leadership (such as supporting pre-service teacher education programs). A lack of administrator recognition (Klein et al., 2018) or administrators' disdain for teachers' extracurricular activities (National Research Council, 2014), as well as teachers' underdeveloped vision (Criswell et al., 2017 and 2018) can limit what teachers recognize as leadership activities, especially strategic leadership that falls outside of traditional teacher roles. While strategic leadership activities such as advocacy were anticipated in a leadership analysis framework by Doraiswamy et al. (2016), the lack of self-report by teachers led them to drop it

from their analysis, and, ultimately, from their framework—although questions remain as to if teachers do not engage in these activities, or simply do not recognize them.

The third theme was that strategic leadership trajectories are rooted in instructional excellence, but teachers' leadership paths branch off in diverse ways as they journey into the complexities of strategic leadership. Ultimately, strategic leadership occurs when teachers have found passion projects which lead to individualized pathways, a phenomenon documented both empirically (Hite & Milbourne, 2018; Luft et al., 2016) and through teachers' self-reflections (Davis, 2009; Greitz Miller, 2009; and Yeotis et al., 2009).

The first three themes speak to *what* strategic STEM teacher leaders do. A summary of the specific actions of STEM teacher strategic leaders, according to the publications in the review, include (1) supporting pre-service education, (2) creating or promoting curriculum or resources, (3) leading science professional development (beyond the district), (4) serving on advisory councils, (5) serving in elected office (related to science education), (6) advocating for.against broad initiatives, policies, or legislation, (7) contributing to research efforts, (8) authoring presentations/publications, (9) fostering gatherings or other teachers (conferences, panels), (10) movement from classroom teacher role to other position that influences science education, and (11) other activities that contribute to the profession or influence science education.

The final theme that emerged was that many teachers became strategic leaders only after experiencing a transformative experience. These experiences are usually accompanied by affective elements: a sense of dissatisfaction with the status quo and a desire to make a change to the system (Alemdar, M. et al., 2018; Bundy et al., 2019; Criswell, et al., 2018; Galosy & Gillespie, 2013; Howe & Stubbs, 2001; Sublette, 2013; Pike, 2009), a sense of isolation and a

desire to connect with others (Alemdar, M. et al., 2018; Criswell, et al., 2018; Davis, 2009; Galosy & Gillespie, 2013; Howe & Stubbs, 2001; Klentschy, 2008; Yeotis et al., 2009), and increased self-efficacy or self-confidence (Alemdar, M. et al., 2018; Bundy et al., 2019; Gareis et al.. 2011; Howe & Stubbs, 2001; Klentschy, 2008; Mentzer et al., 2014; Sinha & Hanuscin, 2017; Pike, 2009).

This final theme hints at the reasons *why* STEM teachers choose to engage in strategic leadership and the contexts that initiate or inhibit that kind of leadership. Specific contexts that promote leadership included (1) understanding how the system works or having a vision for leadership, (2) dissatisfaction with the status quote or a desire to change the system, (3) policy or administrative alignment with desired change, (4) increase confidence/self-efficacy/leadership skills, (5) isolation (disciplinary, gender, racial), (6) perceptions of social injustice, (7) encouragement from colleagues or coaches, and (8) new opportunities for leadership roles. In contrast, specific contexts that discouraged leadership included (1) possessing a limited perception of leadership and (2) tensions with colleagues/administrators.

Many empirical pieces were quantitative surveys or case studies that explored a relatively narrow band of teacher experience. In contrast, a small amount of literature included auto-ethnographies and personal reflections. However, these more personal, in-depth pieces by STEM teacher leaders uniformly reported that they had undergone a transformational experience that led them to believe that they could impact students and colleagues outside of their classrooms (Alemdar, M. et al., 2018; Bundy et al., 2019; Gareis et al., 2011; Mentzer et al., 2014). Even this self-efficacy for leadership, however, seems to be related to self-efficacy for specific skills that relate to leadership. For example, STEM teachers often attributed their growth in leadership self-efficacy to improving their public speaking (Bundy et al., 2019; Klentschy,

2008; Pike, 2009) and their growth in competence as disciplinary instructors (Howe & Stubbs 2001; Sinha & Hanuscin, 2017).

Within this review, two sets of researchers used detailed teacher accounts to explore the development of STEM teacher leaders over time in ways that typified specific dimensions of leadership vision (Sinha & Hanuscin, 2017; Criswell et al., 2018 and related papers, including Criswell et al., 2017 and Alemdar et al., 2018). Pulling primarily from teacher interviews and personal blogging activities that were a part of a professional development program, Sinha & Hanuscin (2017) identified three major themes that emerged from the data, including teachers' leadership identity, teachers' views of teacher leadership, and teacher leadership practices.

The authors noted through three case studies that novice teachers' identity, views, and practices often started as disjointed, but converged over time. For example, teachers might not have initially identified themselves as leaders, or might not have recognized their practices as leadership. However, over time, these teachers demonstrated a greater overlap among the dimensions of STEM teacher leadership, effectively causing their identity, views, and practices to coalesce. Criswell et al. (2018) likewise documented STEM teacher leadership development in teachers through observations of them in a professional development program. Supported by teacher narrative, they illustrated how teachers increased their *professional vision* (their perception of teaching as a profession) and their *vision for leadership* (their perception of the possibilities of teacher leadership). Their findings support the idea that identity and self-visualization—a form of vicarious learning, and an input for self-efficacy—are critical to leadership: "one cannot see *differently* (*vision for leadership*) unless one can see *as* (*professional vision*)" (p. 832).

Literature Review Summary and its Relationship to Self-Efficacy.

This literature review served three purposes: to more concretely describe strategic leadership in STEM education as it is situated within the literature and to identify themes across STEM teacher leadership literature as it relates to strategic actions. The final theme I identified in the literature—that teachers became strategic leaders only after experiencing a transformative experience—is pivotal for my study. It is within this theme that I see the need to explore teachers' self-efficacy. The final theme revealed that teachers' engagement in strategic leadership emerged from a desire to change the system and connect with others, as well as an experience that increased self-efficacy or self-confidence that allowed them to act on that desire. In my research, I aimed to explore the nature of the experiences that led to teachers' awareness of their need for systems change in STEM education and their abilities to be those change agents. Recognizing that leadership begins with a combination of internal and external factors, and not behavior alone, I explored teachers' self-efficacy for leadership in STEM education from the perspectives of Sinha and Hanuscin (2017), with attention to teachers' leadership identity, practices, and vision.

Phase 2: Theoretical Framework

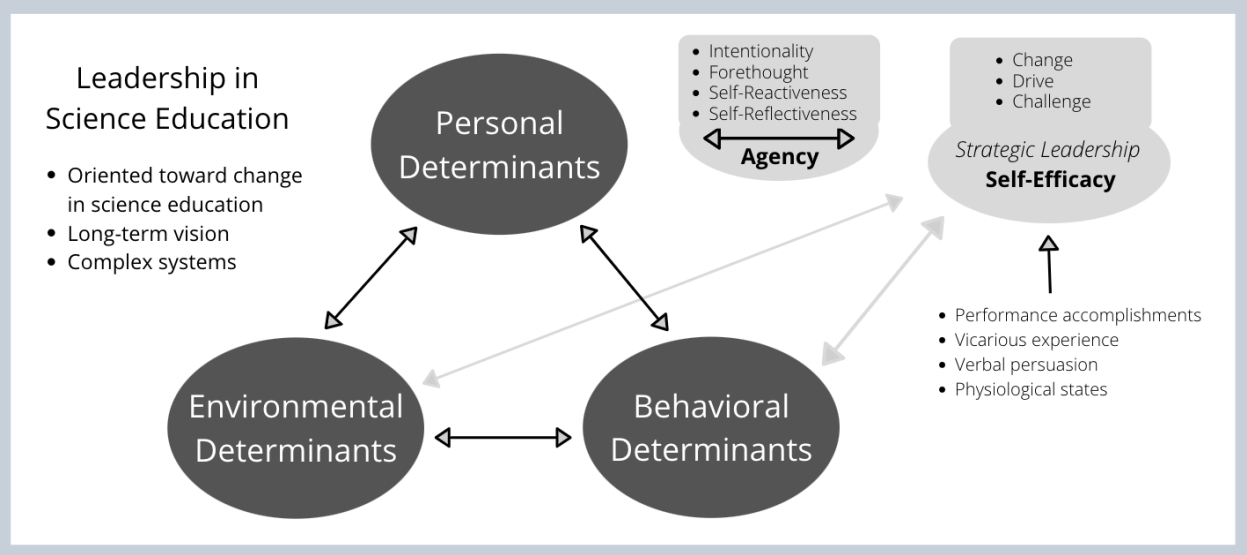
I have chosen to adopt a lens that explicitly emphasizes self-efficacy in the context of Social Cognitive Theory (Bandura, 1986). Undergirding Bandura's trifecta of personal, environmental, and behavioral determinants that influence actions, I specifically focus my research on self-efficacy for STEM teachers' strategic leadership, to understand teachers' *sources* of self-efficacy. However, I am attentive to those elements of self-efficacy for strategic

thinking and action defined by Anderson et al. (2008) and was also on the lookout for teachers' expressions about agency (Bandura, 1977), which can be used as natural points for encouraging the research subjects to dig deeper to get to its root.

Evolution of the Theoretical Framework.

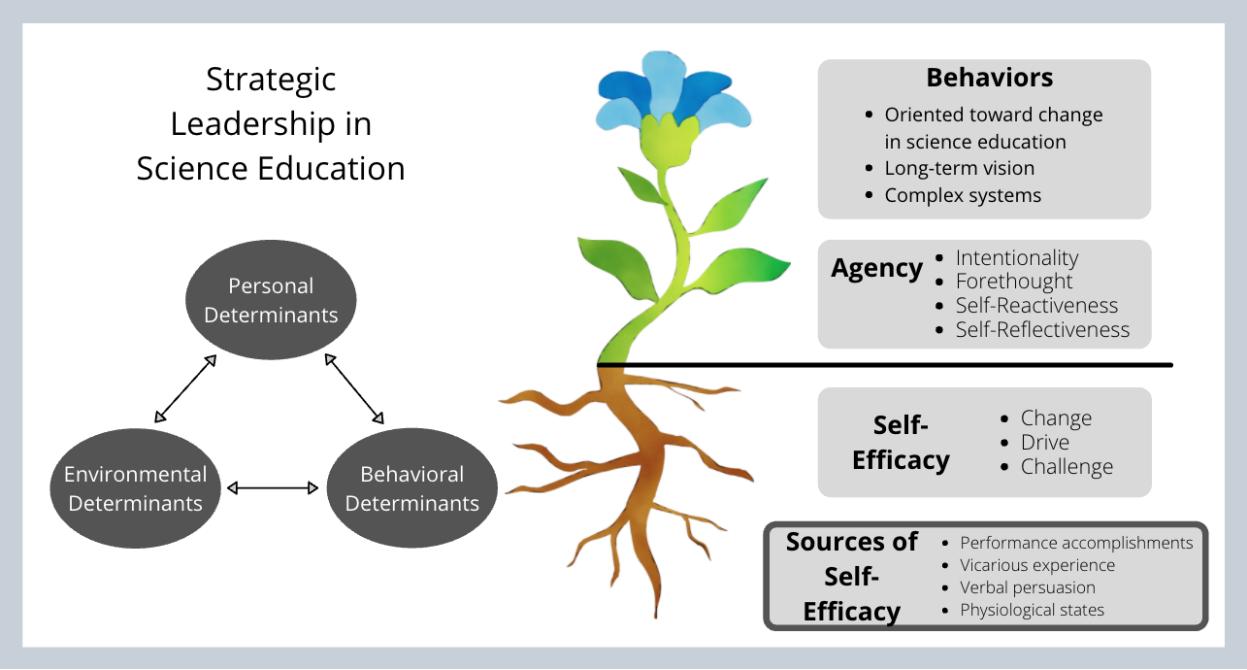
My initial theoretical framework (Figure 3.2) combined, in a non-hierarchical way, the connections among Bandura's personal, environmental, and behavior determinants with Bandura's constructs for agency and sources of self-efficacy, along with my definitions of strategic leadership for science educators that I consolidated from my literature review. Important to understanding my theoretical framework is that my goal was not to simply place into buckets the various sources of self-efficacy that teachers reveal in my study of them, but to probe for the origins of self-efficacy to understand holistically how the events, moments, or experiences that teachers describe came about and influenced their strategic leadership trajectories. Recognizing that teachers' development might be very unique to personal and professional circumstances, I attempted to determine if any themes undergird teachers' inclinations toward strategic leadership in STEM despite differences of language, culture, and politics across the Americas.

Figure 3.2
Initial theoretical framework for STEM teachers' strategic leadership that does not clearly display hierarchical relationships between constructs.



I presented the initial theoretical framework, supported by my literature review, to three experts in the fields of STEM education—STEM education faculty from two top-tier research (R1) universities in the United States. Feedback from this panel led me to re-visualize this theoretical framework (Figure 3.3) by explicitly creating a hierarchy of concepts that would help me to drill down to teachers' sources of self-efficacy for leadership in STEM. Bandura himself did not illustrate behaviors, agency, self-efficacy, and sources of self-efficacy hierarchically in his works, as he seemed to write about these separately, but the new visualization ultimately supported the crafting of a protocol to use with research participants to look for evidence of sources of self-efficacy for their leadership activities.

Figure 3.3
Revised theoretical framework for STEM teachers' strategic leadership displaying hierarchical relationships between constructs.



Phase 3: Developing the Framework-aligned Protocol

Building on my initial theoretical framework (Figure 3.3), I created an initial interview protocol for strategic teacher leaders in STEM education (see Table 3.2). This initial interview protocol also included some core questions (listed in *italics*) that I asked the research participants in late 2019 and early 2020 as part of their regular involvement in the ITEN Teacher Fellowship. The intent of reusing these questions was to illustrate any potential changes in teachers' self-perceptions over time.

The interview protocol included questions categorized into the dimensions of leadership expression identified by Sinha & Hanuscin (2017), namely, identity, vision, and practice, which loosely correspond to the personal, environmental, and behavioral determinants identified by Bandura (2006). While these initial questions were generally aligned with the theoretical framework, I failed to make this alignment explicit.

Table 3.2
Initial semi-structured interview protocol

Research Questions	Interview Protocol	Data Analysis
How does self-efficacy for strategic leadership mediate the strategic leadership of pK-12 STEM teachers as demonstrated through their identity, vision, and practices as leaders in science education?	Questions in *italics* were used to acquire initial interview data (at the mid-term interview) and again at the final interview.	For each category of questions, look for the following: **Evidence of agency** that infers strategic leadership self-efficacy: ● Intentionality ● Forethought ● Self-reactiveness ● Self-reflectiveness **Explicit statements** of strategic leadership self-efficacy: ● Change LSE: Describes managing levers of change ● Drive LSE: Describes getting things done ● Challenge LSE: Describes achieving difficult objectives **Sources** of self-efficacy: Per Bandura (1977) ● Performance ● Vicarious experience ● Verbal persuasion ● Physiological states Per Vieyra & Hite (under review): ● Professional dissatisfaction with the status quo
Personal Determinants -- Identity 1. How do STSLs perceive themselves as leaders? 2. How do STSLs perceive themselves as strategic leaders? 3. How have these perceptions changed over their careers? 4. Where did these perceptions come from? 5. Why did STSLs choose to lead?	● *Do you think of yourself as a teacher leader? (Why/why not? If so, when did you realize you were a teacher leader? Describe what occurred to cause you to realize it.)* ● Do you think of yourself as a STEM teacher leader? Why/why not? ● Do you think of yourself as a leader beyond your classroom/district? Why/why not? ● Think about the moment or period in your life when you had the opportunity to lead beyond your classroom/district. ● What was the opportunity? If applicable, describe the opportunity and the outcome of your leadership engagement. ● Why did you take the opportunity (or not)?	
Environmental Determinants -- Vision 1. How do STSLs envision an improved science education system? 2. What do STLs believe needs to be done to improve science education? 3. What do STSLs believe they can do to improve science education? 4. How has this vision changed over their careers? 5. Where did this vision come from?	● Please describe what STEM teacher leadership beyond the classroom/district looks like to you. If possible, give an example of someone you have observed engaging in STEM teacher leadership of this kind. ● *What challenges do you believe that the science teaching profession faces in your country and region?* ● *If there is anything you would want to change about support for STEM teachers in your country and region, what would that change look like?* ● *Do you want to play a role in making that change happen? If*	

	so, what role, and why? If not, why not? ● What do you believe you would be able to successfully contribute as a STEM teacher leader to make that change? ● *What kinds of experiences have you had across your career that have helped you to become a leader?*	● Professional isolation ● Transformational experience
Behavioral Determinants -- Practice 1. How do STSLs perceive the work that they actually do? 2. How has this vision changed over their careers? 3. Where does this vision come from?	● *Describe how you currently support the science teaching profession in your country and the region. What difficulties have you encountered? If so, have you overcome them? If so, how?* ● What kinds of leadership activities do you feel that you do well? What kinds of leadership skills do you possess? What do you need/desire to learn about leadership?	

I presented the initial protocol to the same three experts in the fields of STEM education who reviewed my initial theoretical framework. Based on their feedback, I revised the protocol to explicitly include a column that showed the line-by-line correspondence to my theoretical framework and its components (see Table 3.7 in the section titled ***Final Protocol*** to see the final version with this alignment). I intended this more explicit alignment to more clearly "mak[e] the research process public" (Anfara et al., 2002, p. 31). Additionally, I chose to maintain the alignment to the dimensions of leadership expression identified by Sinha & Hanuscin (2017), because I felt it was helpful for me to group questions into useful categories that targeted various expressions of leadership, but I was no longer concerned whether or not they directly aligned with Bandura's three dimensions of self-efficacy—Bandura was not used as an organizational tool for the interview, but the alignment was achieved through the clear correspondence to the theoretical framework.

Phase 4: Applying the protocol

I selected three pilot research participants from the ITEN Teacher Fellowship to take part in interviews using the protocol. This section describes the process of participant selection, participant demographics, and preparation before the interviews.

Participant Selection.

Although a good multi-case study will often include four to ten cases (Stake, 2006), I initially selected three cases as a pilot effort to determine the utility of the theoretical framework, the interview protocol, and the data collection methods. The focal phenomenon of my research—which Stake (2006) referred to as a *quintain* for its target-like focus with soft conceptual edges—is early childhood STEM teachers' strategic leadership. The cases—the bounded systems of study—are individual ITEN Teacher Fellows as units of observation, including their lived strategic leadership experiences in STEM education and how they interpreted those experiences.

I used Stake's (2006) principles of case selection by identifying those individuals who I felt presented (1) relevance to the quintain, (2) diversity across contexts, (3) opportunities to learn about complexity and contexts. While there were a total of 36 individuals in the ITEN Teacher Fellowship who taught STEM across early childhood through high school levels, I selected a sample of individuals for a pilot study from among the 27 individuals who participated consistently in the program since May 2019, and who participated in a mid-term leadership interview. (These leadership interviews were developed and executed by me in collaboration with my colleague, Dr. Carmen del Pilar Suárez Rodríguez, in early 2020).

For the pilot interviews, I selected three individuals across all grade ranges–a decision to focus exclusively on early childhood teachers came at a later stage. To narrow down the group of

potential candidates for my pilot study and select those three individuals, I identified teachers who demonstrated evidence of strategic leadership in their *thinking* about science education (if not action) in their mid-term leadership interviews in 2020, which suggested that teachers were indeed budding strategic leaders who aspired to impact teachers beyond their own schools. To do so, I looked for indicators of strategic leadership wherein teachers were oriented toward change in science education, had a long-term vision for that change, and understood science education as a complex system. A total of 11 individuals (a combination of seven early childhood educators and four secondary level educators) met that criteria mid-term through the fellowship. Of those individuals, for the pilot, I then considered their overall documentation of strategic leadership engagement (evidenced by submission of contents to ITEN's annual reports in 2019 and 2020) and gave particular preference to teachers who we had observed grow in their leadership during the program.

While I could have selected pilot participants from among any of the 11 individuals, I selected the three most outspoken and expressive individuals who I felt represented the geographic and educational diversity of STEM teacher strategic leaders from the ITEN Teacher Fellowship. By selecting individuals who I knew would be highly responsive to my questions, I would be better able to refine my interview protocol and more easily analyze data by having a potentially more complete picture of their leadership experiences.

The pilot interviewees included Ana, a bilingual early childhood teacher living in North America who migrated from a Spanish-speaking island in the Caribbean, Beatriz, a Spanish-speaking high school teacher from a Latin American island in the Greater Antilles, and Cara, an English-speaking preschool teacher from the Lesser Antilles. Each teacher had over 20 years of

teaching experience. All interviewees were female. A summary of their demographics can be found in Table 3.3.

Table 3.3
Case overviews for pilot study

	Gender	Teaching Responsibility	Geographic Area	Language	Leadership Overview (during ITEN engagement)
Case #1 (Ana)	F	Kindergarten (5-year-olds)	Caribbean migrant to North America	English & Spanish	Ana has partnered with various local non-profits and a government agency to provide STEM professional development to early childhood teachers in her home state, including **face-to-face workshops** in Honduras and Mexico, **virtual communities of practice** across the Caribbean and Mexico, and **ITEN Project Tean work**.
Case #2 (Beatriz)	F	Secondary	Greater Antilles	Spanish	Beatriz has coordinated with her regional office of education to acquire support to **lead face-to-face workshops** across her province, has documented lessons learned from teacher-led workshops in a **professional publication**, has **founded a physics teacher association** on her island, and has served as a **representative on the Inter-American Dialogue Table for Scientific Literacy**. She also serves on an **ITEN Project Team**, where she has co-developed and co-taught a **course on gender equity in physics**.
Case #3 (Cara)	F	PreK	Lesser Antilles	English	Cara **co-designed a guide** and **co-taught a series of one-day face-to-face workshops** along with her ministry of education, impacting 500+ early childhood teachers on her island alone. She co-designed and co-led a **virtual community of practice** across the Caribbean (along with Ana), and has shared her transformation by **publishing in a Caribbean education newsletter.**

Antecedents to Interviews.

To ensure that teachers had a shared understanding and language for describing their leadership, starting in early 2020 (after the mid-term interviews and at the start of the second year of the fellowship), I worked with my Teacher Fellowship Coordinator to introduce all the Teacher Fellows to a proposed framework for STEM teacher leadership (Appendix C). This

framework is based on a more physics-contextualized framework originally developed by the AAPT Physics Master Teacher Leader Taskforce (AAPT Master Teacher Leader Task Force, 2017), which, in turn, takes much of its inspiration from the National Education Association (2016) Teacher Leadership Competencies. I selected this framework both because I served as editor of the associated *Aspiring to Lead* report from the task force, and because it is only one of three teacher leadership frameworks developed specifically for STEM contexts that have been identified in recent literature (Natchigall, 2019).

The Teacher Fellowship Leadership Plan process required each teacher to read the framework for STEM teacher leadership and explicitly reflect and self-evaluate themselves against each dimension of leadership—with the support of the ITEN Teacher Fellowship Coordinator. This process ensured that all Teacher Fellows (and subsequent research subjects) had a broad view of what kinds of activities might be considered teacher leadership in the domains of instructional, association, and policy leadership at local, state, national, and international levels. The framework also describes general skills, attitudes, and broad mindsets. However, as opposed to being a prescriptive list of actions that teachers must undertake to be considered leaders, the indicators were presented as examples, and Teacher Fellows were encouraged to use these concrete illustrations within the framework to reflect on leadership in their contexts.

Interviews.

I carried out the pilot final interviews in February and March 2021, recorded via Zoom, after participants completed a revised consent procedure approved by the University of Maryland Institutional Review Board (IRBNet ID 1411851-4) to permit recording for research purposes.

All participants had previously completed a consent form at the start of their fellowship which permitted me and ITEN staff to collect Teacher Fellow artifacts, survey responses, as well as unrecorded interviews. Teacher Fellows were asked to re-complete the consent form every 3-6 months (upon administration of regular surveys) to demonstrate continuing consent throughout the process. I led these interviews in English or Spanish, depending upon the participants' native languages. (Note: I am a native English speaker and a highly fluent Spanish speaker, having earned a Berlitz score of C1-professional at the start of my three-year tenure at the OAS).

At the start of the interview, I introduced to my participants my definition of STEM teachers' strategic leadership as "*the actions of STEM teachers to influence policy and/or underlying norms to improve STEM education systems at scale*". I urged them to specifically think about their strategic leadership as activities influencing other STEM teachers or the science education system (i.e., the *science teaching profession*), particularly activities that went beyond the traditional boundaries of their classroom, school, or district.

I asked about half of the protocol questions verbatim, as each participant's monologue often naturally addressed many of the other questions. When appropriate, I used probing questions to help the participant move toward greater clarity, specificity, and depth. I used the questions to help teachers tell the story of their strategic leadership trajectory, and then to urge the participants toward identifying the moment or set of experiences that they felt launched them into strategic leadership for science, specifically. Rather than explore supporting contexts, I wanted to deeply root teachers' stories from the perspective of what was going on internally, anchoring my investigation on teachers' affect—their tendencies, motives, emotions, etc., and most certainly their sense of self-efficacy as leaders in science education.

I perceived that each of the research subjects was very comfortable. The formal interview session lasted between 50 and 60 minutes. However, many participants started or ended with casual conversations (family updates, current teaching challenges, etc.) that lasted between 15 and 30 minutes. After the interviews, I used automated services to transcribe the audio (*Temi* for English and *Sonix* for Spanish), and then edited the transcriptions for accuracy and manually translated them from Spanish to English for Beatriz's interview.

The first few questions stimulated the interviewee to reflect and tell their leadership story, which, upon probing to get deeper, uncovered the source of their self-efficacy, helping to address the first research question, "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* In many cases, their responses addressed many of the other questions in the protocol without being prompted to do so, revealing how that initial source of self-efficacy impacted their thinking and their behaviors as a leader, which responds to the second research question, "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?"

Working downward from the top (from behaviors to sources of self-efficacy), the interview protocol included questions that aimed to help interviewees describe their STEM leadership work, reveal if they had a sense of agency, and uncover the sources of the self-efficacy that propelled them into strategic leadership. This protocol provoked a high-quality response from each of the teacher leaders, leading to preliminary findings, which are discussed later in the chapter. The transcripts for Ana, Beatriz, and Cara are found in Appendix D, Appendix E, and Appendix F, respectively.

Analysis of the Framework-Aligned Protocol

To determine the utility of the framework and the framework-aligned protocol, and to make any final revisions, I analyzed the pilot interviews. The interview protocol produced fruitful interview responses from the pilot study, but also led to some additional questions being added to the protocol for future interviews.

Single Interview Analysis.

Using an interpretive approach, I aimed not to only categorize specific utterances during my pilot analysis, but to focus on broad themes apparent in the development of each participant's storytelling. During my first pass of the pilot transcripts, I annotated those moments, expressions, or passages that seemed particularly notable, and considered their role in the storytelling. Using the templates provided by Stake (2006), I completed a synopsis for each case (Table 3.4.), described the prominence of self-efficacy for STEM teacher leadership in the storytelling, listed tentative findings based upon my first pass of the interview, pasted possible excerpts that illustrated evidence of the tentative findings, and included additional commentary.

Table 3.4
Abbreviated synopsis of each case

Ana	**Beatriz**	**Cara**
Ana credits her first step toward self-efficacy for strategic leadership with her school administrator noting her interest in science and her dissatisfaction with her current teaching scenario. After receiving encouragement to take part in a STEM-focused teacher workshop, she was recognized by the workshop leader for her outgoing	Beatriz credits her first step toward self-efficacy for strategic leadership with a friend who previously worked as a science teacher evaluator on behalf of the Ministry of Education. She says that she was initially more interested in spending time with this friend, who asked for her help when visiting science teachers, than in taking on a	Cara credits her first step toward self-efficacy for strategic leadership when she saw children and teachers in Peru doing STEM—in doing many of the things she does with her own children, particularly when she saw how it was possible to do so with limited resources. By seeing what is possible in other contexts, she feels that no preschool teacher

nature (singing a song about butterflies in front of the cohort) and bilingualism. This experience led to her being actively pursued for an opportunity to lead teacher workshops in Central America, and ultimately led to a very close friendship with a program director, with whom she continues to collaborate. The recognition she receives on a regular basis from peers, parents, and children themselves continues to propel her to continue her leadership work, rarely saying no to any opportunity. Now, she is actively involved in building virtual communities of practice across the Caribbean, between her home country and Mexico, and in supporting a strategic plan for preparing STEM resources for teachers in an ITEN Project Team that includes collaborators from Colombia, Costa Rica, and Honduras. At the core, Ana feels dedicated to this work because she wants to give back to Spanish-speaking (and often underserved) communities both in her local area and throughout the hemisphere. She feels indebted to her parents for having brought her as a migrant to where she lives now while emphasizing to her the value of her native language skills. She also wanted to have a project to show herself that she could do great things following the end of her marriage.	leadership role. This friend became like a second mother to her, supporting her personally as well as professionally, shifting the direction of her career. This experience led her colleagues and the public ministry to see the work she was doing and helped her become a resource person in general for her peers. Now, she is actively involved in offering in-person laboratory methods workshops to teachers in her country on behalf of her regional Ministry of Education, creating a national physics teachers association, and developing and executing a course on gender perspectives in STEM education with partners in Mexico. At the core, Beatriz feels dedicated to this work because she believes it is in her nature to help others. This personal inclination is something that even her own preschool teacher saw in her, and she believes she emulates the generosity she saw in her own parents, who were of humble origins. She recognizes the potential she has to use her voice and be a multiplier for good practices. She also has a nuanced understanding of the political system in her home country and understands both the formal role she might play in the future to impact policy, as well as when the timing might be right for a change.	should feel that STEM is impossible because of a lack of resources or knowledge, and she passionately wants other teachers (and their students) to feel the joy that she (and her students) feels when they do STEM. While her ministry of education initially engaged her following her trip to Peru through an island-wide series of workshops, much of her official work with the ministry on STEM has come to a halt because of COVID. Now, she has been actively spreading her enthusiasm for early childhood STEM through her work with the STREAM Virtual Community of Practice with pre-service and in-service early childhood teachers enrolled at the University of the West Indies, as well as with local schools, including two Islamic schools with which she has a personal connection. At the core, Cara exudes joy in her teaching, and she wants to share that joy: “I think the most important thing for me is, I feel like I want them to experience what I am experiencing.” She attributes her appreciation for education and teaching to her mother, who did not have the advantage of advanced education. Although the invitation from the Ministry to be a leader might have been unexpected, her development as a STEM teacher leader has been paired with careful contemplation and intentionality to perfect her craft and influence those in her school, while carefully assessing the readiness of those around her for embracing STEM.

Member Checking and Triangulation: Strengthening Assertions.

To verify the tentative findings for each pilot case (and thereby assess the utility of the framework and the framework-aligned protocol), I pursued two strategies. First, I presented my synopsis and list of findings to each pilot participant individually and allowed them to reflect on

the accuracy of my interpretations. All three felt that I accurately represented their leadership journey and their underlying sources of self-efficacy, and none of them requested any substantial additions or changes. Both the member checking and triangulation proved helpful to me in improving the trustworthiness of my tentative findings. In Table 3.5, I include the individual case study assertions for the three pilot participants.

Table 3.5
Individual case study assertions: Sources of self-efficacy for STEM teacher strategic leadership

Ana	**Beatriz**	**Cara**
● Administrator support/recognition of science identity in service of teacher leadership identity ● Being invited and continually motivated by a close friend (even going to each other's houses) ● Personal empathy and philanthropic motives—service-minded (seeing self in others, being grateful for contributions of others to own life, and wanting to mimic it) ● Migrant status, serving as a bridge between English and Spanish-speaking worlds ● Identity as a "do-er"	● Administrator support/recognition of science identity in service of teacher leadership identity ● Being invited by a close friend (even going to each other's houses) ● Values placed on social work, political influence for equity ● Generational advancement from humble origins, serving as a bridge between privileged and underserved communities. ● Identity shift - Did not see herself as a leader until recently; recognizing that she has greater competencies than others in leadership positions over her	● Administrator support/recognition of science identity in support of teacher leadership identity ● Expectation from the Ministry of Education to share back what was learned through curricular and instructional reform ● Muslim faith, serving as a bridge between the public and some private (Islamic based) schools ● Mother's influence in valuing education, serving as a bridge between those who have quality educational experiences and those who have not had them ● Identity shift - Did not see herself as a STEM teacher until the ITEN experience and did not see herself as fully competent in STEM until she began to go through the curriculum reflection process with the Ministry.

Second, I reviewed each participant's available data sources and applied inductive coding, using the tentative findings of each case as a code, to determine if teachers' cited sources of self-efficacy for STEM teacher leadership were verified by at least two similar references across their engagement in the fellowship (pulling from documents including the application,

yearly reflections, previous interviews, etc.). Most of the inferred findings per case based on the final interviews could be supported by two or more separate pieces of evidence. In contrast, some of the very specific moments or events to which participants ascribed their self-efficacy were not always present in other documentation because of their specificity or, in some cases, because they occurred later in the fellowship. However, these concrete descriptions of self-efficacy sources can likely be taken as valid because of their explicit presentation by the research participant. In reviewing each participant's multiple data sources, I again annotated those passages that supported statements with inferred meanings that the participants made during their final interviews.

Drafting the Codebook.

Using both the interim and final interview transcriptions, I used a coding process to look for unifying themes across the pilot cases. I did not create these codes to quantify teachers' experiences and thereby potentially lose sight of the stories that they told. Rather, these codes served more as a short-hand approach to categorize themes and look for similarities across stories.

I attempted to use an inductive process to see what naturally emerged, with the hopes that I would find some threads of similarities in teachers' sources of self-efficacy for strategic leadership in STEM that were shared among the stories of each individual. While I tried to ground myself in the data, the reality is that I was likely influenced by leadership constructs I had seen previously. As I reviewed transcripts, I saw expressions of leadership vision, practice, and identity, akin to Sina & Hanuscin, 2017, and—unsurprisingly—in alignment with the kinds of questions I asked per the protocol. I also saw some examples of how teachers' disciplinary

identities and transformative experiences were precursors to their leadership, which was also present in the findings of the literature review.

However, my goal with these detailed passes of the transcriptions was to not simply re-categorize responses according to my theoretical framework (as might be the case with deductive coding), but to rather develop codes that described how moves toward strategic leadership manifested themselves in particular. I especially focused on instances that seemed to result in shifts in self-efficacy for strategic leadership in STEM education (what I term *transitions*), especially those moments wherein the research subjects gave a thick description of the moment or event that spurred their first steps as a strategic leader—moments that have not yet been well-described in academic literature.

Using a constant comparison approach, the codes in Table 3.6 emerged from the data. I also include simple descriptions and one or more examples from the data. (The absence of an example from any given subject in this table does not imply the absence of the code in that teacher's data). All the following codes in Table 3.6 were prevalent in each teacher's stories, with a few exceptions. INTENTION, which refers to planning to move toward strategic leadership in STEM, was absent in the cases of Ana and Beatriz (a secondary-level pilot subject who is no longer included in this study). In contrast, LUCK and FRIENDSHIP were absent in the case of Cara.

Table 3.6
Initial codebook for analyzing the interim and final interviews

Theme	Code	Description	Example from Data
Vision	LUCK	Initiation into leadership as a result of happenstance	**Ana:** "I hope that this, you know, this, uh, tactical serendipity that, that, uh, has led, um, getting [Colleague 1] and I to, to have this, this, uh, partnership, uh, never ends."

	INTENTION	Initiation into strategic leadership as a result of prior planning (**this is distinct from ongoing strategic leadership*)	**Cara:** "And know if I'm going to introduce this to teach us who did not have my experience. I had to know exactly what I was gonna to say to them and how I was going to help them to include this and to let them know how important STEM was and what it did for children's learning. So it took me a little, a little while until I eventually, which I did." *Counter example -- **Beatriz:** "Specifically in this Eastern part in fact, via a focal point what we are looking for is not just to keep [our work] in the Eastern part nor just in the capitol region where [colleague] is, but that through that interaction from us we can continue to transmit to other partners of the country what we, our community, have done and have impacted here."
Practice	INV-LEAD	Subject received a direct invitation to become a STEM teacher leader	**Ana:** "And I had just gotten back from [island] and she says, there's an opportunity for a teacher leadership program."
	FRIENDSHIP	Engagement in activities because of, for, or with a very close friend	**Ana:** "And she's great at getting back to you and she helps you in whatever, and she'll come to your house if she has to..." **Beatriz:** " I even went with her to her house to prepare the material and all that we were going to do. I was practically like her daughter and whatnot. She would always say to me, my daughter, how are you, my daughter?"
Identity	SCI-ID	Perceives self as a science person.	**Beatriz:** "I can teach you even with little more than a small piece of paper, that I let it fall, and with that I'm teaching about gravity to my students. I like science more because I think it's more practical, more multidimensional. I think that's why I fell in love with the sciences." **Cara:** " I feel I could just go around the schools and I could just, uh, you know, I show them how to incorporate STEM stream into their curriculum and, and, and help teachers. I said at that time, that is how I was feeling. I feel I could just move straight into STEM, full-blown STEM."
	LEAD-ID	Perceives self as a leader.	**Beatriz:** "...in reality, I said, inside of myself, why is she saying this? If I, in reality, don't see myself as a leader. But after, during the second interview, I start to become it. Time passed, and we didn't realize what happened. ... I, in reality, I say but God, what is happening. Then Pilar says, I think so [participant], and she starts to explain to me certain situations of her lived experiences, how she become a leader, and I say hey, but that's really similar. What you are telling me, to what is happening to me And that's how it starts. I think that was the first moment where I really realize that…"
	OUT-OF-FIELD	Challenge or lack of familiarity with science	**Ana: "**I wasn't comfortable with the subject, but I really wanted to take it on and, uh, engage the children that way."

			Beatriz: "I looked for all of the available science books. I wasn't sleeping. I spent long nights studying because I said Wow! I can't stand in front of kids without dominating the discipline for myself." **Cara:** "I really did not know much about STEM. We, I used to hear about STEM in the primary school and the secondary school, but I never thought much about it"
	SOLIDARY	Sense of connection with a particular group of people	**Ana:** "...but to give to the people that, that were like close to my heart, because they spoke the same language, they came from similar backgrounds that was like really, really huge to me." **Cara:** "Uh, so that was the teachers or in a, in a government side of it. But when, as I, as I got to experience more, more about STEM, learn more about STEM. And as I saw what it did, I knew I, I, because I was working with schools beside, uh, like our ministry school and our ministry teachers, I said, but I have to introduce this to these others, if it is that I am helping these schools."
Transition	SPARK	Subject received external "nudge" because of perceived curiosity or interest	**Ana:** "I said, I'm really excited about simple machines. I still love simple machines. And they say, you know, I bet you, the preschool teachers have not ever taught the simple machines class. So why don't you make a simple machines class?" **Beatriz:** "My principal, who at that time was my supervisor, says to me, well, the teacher is leaving, and I see in you the knack for teaching science. Wouldn't you like to raise yourself up to that level?"
	SHOCK	Surprise or unexpected outcomes	**Ana:** "I was shocked because for what I did think that I was going to be chosen to go, and then I was more in shock because I had said that I would do this." **Cara:** "I said, but I can't believe this is me talking about STEM. And I can't believe this is me sitting with the people way up in curriculum."
	IMPULSE	Taking quick action after experiencing a sense of agitation or unease	**Beatriz:** "I couldn't stay in my seat, like others, just listening, rather something inside of me opened up, causing me to stand up and bring something to the table, but I didn't realize it until now." **Beatriz:** "So she, seeing in me what she saw, she invited me to accompany her. Let's go. And like that, without me knowing it, I started collaborating without even knowing anything about it " **Beatriz:** "I don't know where I learned it, but I tend to throw myself at things "
Self-Efficacy for STEM TL	REC-LOW-SE	Subject recognized low self-efficacy for STEM teacher leadership	**Ana:** "So I was thinking to myself because I didn't have very much confidence. I was like, oh my God, I opened my mouth. And I don't know if I could do this. And so, uh, but I stuck with it. I said, I'll do it if you want me to do it, then I, and I was thinking, she knows so many more people that are so much more intelligent than I, and can do so much more than I can do."

		Beatriz: "And then invitations started to come, to council administrators on giving courses and things like that. They make the invitation, but I still say nothing. I can't. I, I don't have that ability."
REC-HI-SE	Subject recognized high self-efficacy for STEM teacher leadership	**Ana:** "So for me, it was more of like, I can do. I said, I can do it and I will do it. And I will do a good job at doing it."

Findings

Whole Group Analysis

Looking across the developmental stories shared by the pilot participants as well as the codes that emerged, I found four major similarities among the participants that contributed to the final revision of the protocol. Interestingly, codes that emerged from secondary educator Beatriz's interview were often present in those of her early childhood colleagues. This finding suggests that there are elements to strategic leadership in STEM education that are shared across grade levels.

Finding #1.

STEM teacher strategic leadership VISION is driven by an interior restlessness and acceptance of unexpected opportunities, sometimes despite low self-efficacy. All three of the research participants attributed their initial desire to be leaders to their innate inability to sit still, and their natural tendencies to take advantage of unanticipated events that provided them with an outlet for their agitation. Ana referred to herself as an "Energizer bunny," and as someone who stands out from the others not necessarily because she has a greater sense of self-efficacy, but because she feels she is more willing than her peers to do the work that needs to be done. Likewise, Beatriz mentioned that she felt it was not possible for her to just be a passive recipient of the professional development opportunities she received—she expressed how it became

impossible for her to notice when others needed help, and to not lend a helping hand. With her insight into the workings of the regional and national education system, she understood the open opportunity that was available with government changeovers, as well as the value of her inside view to potentially acquiring a more directly influential role in teacher education. In contrast to Ana and Beatriz, who expressed long-term unrest throughout their careers (both personally and concerning the leadership of others), Cara felt that her awakening for her vision of leadership in science is a very recent one. Her transformation in the past two years has only recently unleashed a desire and sense of ability to help others feel the joy she feels in incorporating STEM in the classroom.

The participants also demonstrated a spectrum of impulsivity in response to STEM teacher leadership opportunities. Ana shared how surprised she was at herself for having agreed to go to Honduras. Initially, she seemed to not consider an assessment of her abilities, and she shared how concerned she was that she had agreed when she was not ready, so much so that she made it difficult for her inviting colleague to contact her to continue the conversation. (This suggests that self-efficacy might *not* have been a major determinant in her initial response to the invitation to lead). Beatriz took a different approach. In her invitation to become a fully certified STEM teacher and then to become an ITEN Teacher Fellow, she immediately expressed her interest but sought approval and encouragement from her inviting colleagues before moving forward. Perhaps because of her more recent introduction to STEM, Cara was the least impulsive of the participants, explaining how she felt it was essential for her to improve her own craft in the classroom and with her school's teachers before she felt it was appropriate for her to begin leading beyond those bounds.

It might be notable that all these teachers felt that their first step toward strategic leadership in science was an unexpected one, and therefore might not be directly derived from a sense of self-efficacy, but natural urges to do more than they were doing at the time. These opportunities might have presented themselves because each teacher had a particular disposition or gravitated toward a particular context or people that would encourage it, but the first invitation was always unexpected. Teachers regularly expressed their sense of surprise or shock at both the opportunities that have been presented to them and how they have grown as leaders. There is no evidence that these teachers entered the profession with an intended professional trajectory that would include the kinds of activities inherent to large-scale strategic leadership.

Finding #2.

STEM teacher strategic leadership IDENTITY is strengthened by internal and external recognition of personal skills or privilege, particularly as it relates to STEM instructional self-efficacy and boundary-crossing self-efficacy for specific groups. All three research participants identified that *others* saw leadership ability (or practice) in them before they saw it in themselves. It seems particularly notable that all their stories involve recognition from both administrators and peers for their STEM teaching ability, especially given the fact that all three of the teachers came to teach from out-of-field. All three mentioned that they recognize that teachers can be intimidated by it or off-put by STEM—because they once experienced those same fears about their intellectual abilities to understand and convey science, or because they believed that they needed resources they did not have access to. The revelation that they could learn about and teach science helped launch them into leadership roles of other teachers.

As early childhood teachers, neither Ana nor Cara had previously received formal training in science or science education beyond their public-school years. Ana naturally gravitated toward STEM because of the challenge and engagement it brought to her classroom, a fact which was later recognized by her school director, who encouraged her to get professional development in science and who even created a STEM-specific role for her. Cara was directly selected for the ITEN Fellowship without any prior experience in explicit STEM education at all, with the hopes that she would be trained in such a way that she could contribute to the national plan for early childhood STEM education thereafter. Beatriz began her career in teaching as a primary and middle school civics teacher, and only moved toward science upon an invitation presented to her by her school principal, who was looking to fill a science teaching position in the high school. In addition to this recognition from supervisors, all three teachers explained how their peers began to see them differently over time, calling upon them for support in their practice. By being called leaders by others, these teachers began to see themselves as teachers.

However, it seems that the importance of external actors in calling the teachers "leaders" was less about the teachers feeling honored for their superior practice but served more as a form of self-assurance to bolster their self-efficacy in both instruction and leadership. Ana was unique from the others in that she independently brought science into her instruction to better engage her students. For Beatriz and Cara, overcoming the challenge of learning and being able to teach science successfully—particularly as standouts from their peers—increased their overall confidence, and, ultimately, self-efficacy as leaders of other teachers. For all three, however, seeing themselves evaluated against norms by those they held in esteem, these teachers were then more likely to feel capable to take on tasks that led other teachers. In turn, these teachers

began to develop co-identities as master STEM teachers and as STEM teachers. All three teachers expressed multiple cycles of growth in self-efficacy as teachers and as leaders.

Each research participant also identified other non-instructional, non-science skills or forms of privilege that helped them to build self-efficacy for science strategic leadership and serve as boundary-crossers for underserved groups of teachers and their students. Importantly, this awareness of personal traits helped these teachers to feel compelled to lead beyond their schools, as they viewed their community as much wider than their job description.

As a migrant whose parents impressed upon her the value of bilingualism, Ana realized that she could use her ability to speak both Spanish and English to support Hispanic teachers who have little access to quality professional development in science for their teachers (both in her home country and abroad). She expressed a sense of solidarity with Spanish-language teachers across the Americas, particularly in less developed countries like Honduras. Beatriz recalled her childhood growing up in humble means in a rural area of her country. Having known life outside of the big cities and now living in relative privilege, she felt that it was her duty to do social work in those areas of the country that are not touched or supported by national policies. Because of her faith affiliation as a Muslim, Cara felt a connection with the country's network of Islamic-based schools. While her government called upon her to contribute to the national science education plan for early childhood (most of which was put on pause because of COVID-19), she continued her efforts to reach out to two Islamic-based schools in the meanwhile.

Finding #3.

STEM teacher strategic leadership PRACTICES were developed at the direct invitation of and engagement with very close friends and respected supervisors and supported by long-

lasting positive impacts of their own prior teachers. While all three teachers received direct invitations and encouragement from supervisors and peers, two of them, Ana and Beatriz, mentioned the role of friendship in engaging in leadership. Ana's friendship with her collaborator who invited her to Honduras developed over time, helping her to blossom as a leader and sustain and expand her involvement. As her collaborator does not speak English, Ana plays a role in her leadership that could not be easily filled by another person. However, their relationship goes far beyond one that is for mutual benefit. Ana shared how her collaborator would come to her house, and their posts on social media show that they enjoy each other's company socially as well as in work settings. My observation of them suggests that they work together in a way that helps them to complete each other's sentences, so to speak. Beatriz, likewise, explained that she began to help other teachers not because she was interested in science or in being a leader, but because she was responding to a request from her friend for help. She did not necessarily want to do what her friend was doing, but she wanted to be *with* her friend. Far more than a mentor, she says that she and her friend (who was older than her), referred to themselves in common language as "daughter" and "mother."

All three teachers also shared the direct impact of other teachers in their education in seeing themselves as science-competent or as teachers. Ana and Cara, coincidentally, began their professional careers in business and banking, only to later turn toward teaching. Ana did so partly because she wanted to have the same schedule as her young children, but also because she had remembered how a college professor had suggested that she had a natural inclination for teaching. Cara shifted her career trajectory after reflecting on her mother's observation that she had the heart of a teacher, while she also poignantly recalled how one of her middle school teachers praised her for her authentic work on a volcano project, in which she collected volcanic

rock from a volcano. While Beatriz did become a teacher from the outset, she expressed that her leadership of teachers is simply an extended expression of her natural inclination to want to help others, something that her prior preschool teacher tells her about even to this very day.

Finding #4.

Sparks, impulses, and shocks served as levers for changes in STEM teachers' self-efficacy for strategic leadership. In addition to my exploration of how self-efficacy influenced various dimensions of STEM teachers' strategic leadership, I also classified the nature of the pivotal moments in each teacher's story. My analysis of each of these three teachers' leadership stories suggests that self-efficacy for strategic leadership in science shifts through a series of *sparks*, *impulses*, and *shocks*. Sparks refer to the external "nudge" that teachers received. In some cases, these are observations by outside individuals (supervisors, peers, friends) that are expressed to the teacher and draw their attention to natural inclinations they had not previously noticed, such as Ana's supervisor who first took note of her interest in science, or Beatriz's school director who felt that she could become a high school STEM teacher. In other cases, sparks might be expressed in the form of an invitation, such as Ana's invitation to lead a workshop in Honduras, Beatriz's friend inviting her to help with STEM teacher observations, or Cara's invitation to join the ITEN Fellowship. Impulses refer to teachers' gut response to the spark, such as the acceptance of an invitation. Shocks refer to the internal emotional response of teachers, often described as a personal awakening—the surprise they feel in themselves after engaging in an activity, such as when Cara realized that the national ministry of education was seeking help from her, not some other experts, on STEM education for the direction of the country's education.

Utility of the Theoretical Framework

The framework-aligned protocol led to the generation of rich data, including some unexpected themes, that will support an understanding of teachers' self-efficacy for strategic leadership in STEM education. (I provide a full treatment of findings from this pilot group and a wider group of research participants for the research question in the following chapter).

Ultimately the framework was useful to this study throughout multiple parts of the methods. First, the framework supported my selection of pilot participants. A clear listing of the nature of strategic behaviors (oriented toward change in STEM education, long-term vision, and complex systems) helped me to identify the best-suited candidates to interview. Second, the framework supported the development of the interview protocol. The hierarchy of indicators of agency, self-efficacy, and sources of self-efficacy provided a framework for both the type and order of questions I should ask to get to the root of teachers' self-efficacy for leadership. Third, the framework guided my interactions during the interview, including my selection of probing questions. The listing of indicators of agency, self-efficacy, and sources of self-efficacy, as well as Bandura's Social Cognitive Theory broadly, helped me to be attentive to both the internal and external factors that motivated strategic leadership, as well as to always question the source of those motives. Fourth, the framework aided my identification of important moments for interview analysis. When reviewing the transcripts, I was attentive to those instances in which teachers expressed agency or self-efficacy (as defined by the framework). Although I coded inductively (i.e., the code itself was not restricted to the components of the framework in any way), it helped me be attuned to pivotal experiences that were most relevant to the research question.

Final Protocol

From the four findings of this study with the protocol group, two elements emerged that I believe need to be included in the final protocol. The first is the important role of personal friendships in professional settings (as opposed to power relationships). The second is the sudden or unexpected nature of leadership opportunities and teachers' impulsive response to get involved in new opportunities.

Because I anticipate that unanticipated experiences and personal friendships might be critical for answering questions about teachers' development as strategic leaders in STEM, I want to ensure that they are not overlooked in future interviews. As a result, I included additional questions in the final protocol (see Table 3.7, in **bold**).

Table 3.7
Revised semi-structured interview protocol

Dimension	**Questions** Questions in **bold** were added after the pilot interviews.	**Correspondence to Theoretical Framework**

Source of Leadership Identity
 	
Identity refers to the person's self-image, including underlying sociocultural influences that shape that identity over time (Penuel & Wertsch, 1995).
	● Think about the moment or period in your life when you <u>first</u> had the opportunity to really be a STEM teacher leader beyond your classroom/district, beyond the scope of your official "job description":
	  ● What was the opportunity? Describe the opportunity. (Tell me the story–where were you, what was going on, who else was there, how did you feel? Was this opportunity presented to you, or was it something you sought out?)
	  ● Why did you take the opportunity (or not)?
	● Do you attribute your taking the opportunity (or not) to something inside you, something external, a combination of both? Describe. / Was taking this opportunity something "of your nature," or a totally new experience? Describe.
	● **Was taking the opportunity something you had contemplated for a while, or was it more spur-of-the-moment?**
		Tying the story together → consider that this story might only peripherally be about STEM. Accept general stories, but try to get to STEM-specific leadership.
		
		Sources of Self-Efficacy >> All
		
		Agency >> Intentionality
		
		Agency >> Intentionality & Forethought

	○ **If you had contemplated this for a while, what had made you think along those lines?** ○ **If spur of the moment, why then? What had been happening in your career that made this opportunity feel like an opportunity rather than a chore?** ● What made you think that you could be successful / take advantage of the opportunity? What did you think was going to happen? ● Did you receive any support or discouragement from those around you? Tell me about it. **What was the role of your friends?** ● How did taking this opportunity make you feel? (Look for expressions about being excited, hesitant, worried, empowered, etc.)	**Agency** >> Self-Reflectiveness **Sources of Self-Efficacy** >> All **Sources of Self-Efficacy** >> Verbal Persuasion & Vicarious Experience **Sources of Self-Efficacy** >> Physiological States
Development of Leadership Vision *Vision* refers to the changes that participants believe can result from strategic leadership in the future.	● What has happened in your story as a STEM teacher leader since that <u>first</u> experience leading outside of your school/district? How does that first experience fit into your life leadership story? ● Tell me about a few times after that initial experience about other opportunities you took. (Again, describe the opportunity, and share why you took it). ● Looking forward now, what do you think you can do as a STEM teacher leader? What makes you so sure that you can accomplish that?	*Tying the story together* *Tying the storying together* **Agency** >> All **Self-Efficacy** >> All **Sources of Self-Efficacy** >> All
Engagement in Leadership Practice *Engagement* refers to the leadership actions that participants have taken or are taking.	● Tell me about what you feel you have accomplished in STEM teacher leadership. ● How did the <u>first</u> experience as a leader beyond your school/building get you to where you are today? ● **Was your leadership development planned, or happenstance?** ● How have your views about leadership and the impact you can make changed over time? ● Tell me about an obstacle you have encountered in your STEM teacher leadership, and how you have (or are working) to overcome it. ● Tell me about what you think made your efforts effective. ● What do you expect you will achieve in the future as a STEM teacher leader?	**Self-Efficacy** >> Drive *Tying the story together* **Agency** >> Self-Reactiveness **Self-Efficacy** >> Drive **Agency** >> Self-Reactiveness **Self-Efficacy** >> Challenge **Self-Efficacy** >> Levers of Change **Self-Efficacy** >> Drive

Discussion

The theoretical framework and framework-aligned interview protocol in this study contribute to the literature bases on both leadership self-efficacy and STEM teacher leadership.

Most extant literature on self-efficacy has come in the form of measures of self-efficacy using Likert-type survey questions (Bobio & Manganelli, 2009; Honicke & Broadbent, 2016; Klassen, 2004) or identifying sources of self-efficacy using predetermined potential sources, again using surveys (Tschannen-Moran & McMaster, 2009). Limited research exists on systematic, qualitative ways to explore sources of self-efficacy for leadership (Versland, 2015).

At least one study thus far has specifically explored STEM teachers' sources of self-efficacy for policy advocacy (Velasco et al., 2021), a form of strategic teacher leadership in STEM education. The authors performed individual semi-structured interviews, a focus group interview, and triangulated findings against fellowship documents from the participants. However, the specific nature of the interview protocol was not fully revealed in the publication. Importantly, while the authors shared their codebook to categorize teachers' sources of self-efficacy using Social Cognitive Theory (Bandura, 1986), the codes themselves do not shed light on the nature of those sources. For example, under the code category of *Vicarious experiences*, the authors list "observing STEM teacher leader models: mentors", and under *Verbal persuasion*, the authors list "encouragement" and "discouragement" (Table 3). Further, although Ventura et al.'s quantitative treatment of utterances was fruitful, suggesting that *Enactive mastery experiences* were the primary source (61%) of teachers' self-efficacy for STEM policy advocacy, the finding appears to contrast with the findings of my own more narrative-driven qualitative protocol, which suggests that verbal persuasion—especially from family and friends—and unexpected invitations to engage in leadership drove teachers' leadership development. Taken together, further research comparing these approaches (frequency coding versus narrative focus) might enrich the understanding of teachers' sources of self-efficacy for leadership.

Methodological Limitations

The theoretical framework I have used to develop my data collection and that has undoubtedly influenced my data analysis is limited in two ways: it is built on research grounded in the U.S. educational experience (which in turn is strongly influenced by the searcher on business leadership) and it is built on teacher leadership research that has been historically agnostic to disciplinary nuances. Therefore, I now describe how high levels of contextual complexity and STEM identity might limit methods for the application of this framework, as well as how researchers might attend to these limitations.

Contextual Complexity in Leadership.

My pilot study included teachers from multiple countries and contexts. While the teachers in this study had a shared understanding of STEM teacher strategic leadership and had a shared cohort experience throughout the ITEN Teacher Fellowship, this might not be the case with future studies that make use of the framework or the protocol. Teacher participants might have received wildly different forms of preparation, operated under different policies, and been a part of very different social, political, and cultural environments. Further, Wenner and Campbell's (2017) review of the literature demonstrated that teacher leadership is no longer perceived as fitting nicely within the confines of a school building, so STEM teacher leadership might take place in distinct locations, potentially straying far from the traditional view of the classroom and the school building as the teacher's sphere of influence. STEM teacher strategic leadership might involve complex actors in the educational ecosystem, consisting of ministries/secretariats/boards of education, traditional universities, teacher education (normal)

schools, professional societies, private foundations, political organizations, etc., in addition to their school communities composed of students, parents, peers, and administrators. Researchers who make use of this framework should be acutely aware of how teachers' contexts might color their experiences. Additionally, if researchers attempt to make comparisons across teacher experiences, it is critical to know if teachers share similar definitions of strategic leadership, and therefore are measuring their self-efficacy against the same standard of practice.

However, not only might teachers' leadership contexts look different, but what we know about how leadership works might not apply directly to other cultures. The majority of early leadership research is based on "Western industrialized culture [and] prevailing theories of leadership [that] are rather distinctly American in character: individualistic rather than collective, assuming hedonism rather than a commitment to duty or altruistic motivation, assuming centrality of work and democratic value orientation, and emphasizing assumptions of rationality rather than asceticism, religion, or superstition" (House & Aditya, 1997, pp. 409-410). Social Cognitive Theory, in particular, is anchored in the idea that self-efficacy for tasks is the primary input for determinants that tend toward that specific task (Bandura, 2006). However, the behaviors of teachers in other cultures may be more compelled by factors such as social commitment—as seems to be the case with more collective cultures (Klassen, 2004)—than a belief in their own capabilities. Researchers who use this framework should be attentive to the possibility that other factors might overshadow the role of self-efficacy in their leadership.

STEM as Context.

This framework is situated within the idea of STEM education, a branch of education that might be influenced by political leanings, educational initiatives, popular perceptions, as well as

personal experiences. Although recent findings by Natchigall (2019) challenge the idea that STEM teacher leadership is a unique flavor of leadership, as opposed to a more general leadership framework that is applied in a specific context, some of the pilot study responses suggest that the development of a personal STEM identity was pivotal to their development as strategic leaders. Researchers who use this framework should be attuned to making the distinction between self-efficacy for STEM education leadership versus self-efficacy for education leadership in general. Although there is likely some overlap, it would be helpful to consider if these characteristics are truly distinct.

Conclusion

This paper presents the creation and revision of a theoretical framework for teachers' self-efficacy for strategic leadership in STEM education. Building off of the framework, this paper also describes the evolution of an interview protocol to reveal teachers' nuanced sources of self-efficacy for this kind of leadership. In piloting these tools with three teachers, the framework and protocol were useful for revealing teachers' STEM education leadership-oriented vision as fueled by an internal restlessness, identity and solidarity with others, practices guided by the encouragement and mentorship of friends as well as colleagues, and the importance of unexpected leadership opportunities. Moving beyond survey-driven measures of self-efficacy, the framework, and protocol presented in this paper might support a more narrative-driven understanding of *why* some teachers choose to lead in STEM education.

Chapter 4: Exploring Early Childhood Teachers' Sources of Self-Efficacy for Leadership in STEM Education

Introduction

Although teacher leadership has been recognized for the value it can bring to educational reform in general (York-Barr & Duke, 2004; Wenner & Campbell, 2017) and STEM education in specific (National Research Council, 2014; President's Council of Advisors on Science and Technology, 2010; Hite & Milbourne, 2018; Hite et al., 2020), research on the STEM-related leadership experiences of early childhood teachers is scarce. Within the United States, programs that explicitly identify or support STEM teacher leadership often exclude pre-school years (PAEMST, n.d.; U.S. Department of Energy, n.d.; Knowles Teacher Initiative, n.d.), which compose a large portion of early childhood.

However, the high value of quality STEM education experiences in early childhood–often defined as the period from birth through approximately age five–is well-supported by research (Aldemir, Jale, & Hengameh Kermani, 2016; Chaillé and Britain, 2007; Early Childhood STEM Working Group, 2017). Critically, early childhood teachers can have a particular influence on the STEM identity of young girls and their long-term engagement with the STEM field (Hachey, 2020; Stephenson et al., 2021).

Despite their impact on STEM education, early childhood teachers typically report low self-efficacy for teaching STEM topics (Hong Wan et al., 2020), in line with the trend that the younger the students, the less confident the teacher in STEM disciplines, particularly physical science and engineering (Trygstad, 2012). Worldwide, teachers' limited knowledge of STEM and STEM pedagogies across all grade levels merits further attention to achieve global goals of high-quality education and equitable opportunities (IDB, 2016; UNESCO, 2015).

These challenges suggest that early childhood educators might serve as levers in the STEM education experience of children. Likewise, it is worth investing in learning more about how to support early childhood educators in their work of introducing children to STEM– particularly through the leadership of early childhood teachers themselves.

Purpose, Definitions, and Research Questions

One possible direction to systematically build early childhood teachers' self-efficacy for STEM teaching is to identify and support potential and existing strategic teacher leaders in early childhood STEM education. This kind of leadership, which pulls from the strengths of classroom teachers, can provide the kind of job-embedded collaboration, mentorship, and long-term coaching that is essential to the effective teacher professional development (Darling-Hammond et al., 2017) that is necessary to build up the knowledge and skills that most early childhood teachers need to teach STEM.

To limit the scope of this work, I define strategic teacher leadership in STEM education as *the actions of STEM teachers to influence policy and/or underlying norms to improve STEM education systems at scale*, and I limit it to the actions of early childhood teachers who teach children ages 3-5 years old (the general equivalent of most preschool programs). This definition draws from teacher and business leadership and is treated in-depth in Chapter 1.

To advance research on the kinds of teacher leaders who can provide this STEM-specific and systematic support to their peers, I wanted to identify those who were already engaged in leadership through a specific STEM teacher leadership program, and to come to understand *why* they chose to lead, building on Social Cognitive Theory (Bandura, 1986) and a theoretical

framework focused on sources of self-efficacy for teachers' strategic leadership in STEM education (see Chapter 3).

The research questions guiding this study focus on teachers' self-reported origins of their leadership and their eventual leadership trajectories: "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?" By answering these questions, we may hope to be able to identify other potential or actual leaders and capitalize on their desires and capacity to expand their influence on others.

Method

To answer the research questions, I used a multi-site case study methodology (Merriam, 1998 & 2009; Stake, 1995), selecting seven early childhood teachers and their lived strategic leadership experiences in STEM education as my cases. My approach to data collection and analysis was built upon a theoretical framework grounded in Social Constructivist Theory (Bandura, 1986) and literature on self-efficacy for leadership.

Pilot and Transition to Final Study

This study is built on a theoretical framework, framework-aligned protocol, and analysis approach that was refined by its application to three pilot cases. I describe the testing and evolution of my methods in Chapter 3. Notably, during this transition from the pilot to the full study, I chose to focus exclusively on early childhood teachers. The pilot study involved two early childhood teacher leaders and one secondary teacher leader who had participated in a

STEM teacher leadership program, yet the resulting themes I saw in the narratives were coherent across teachers' grade levels. I anticipated that the similarities might have been the result of the fact that all three educators participated in the same professional development experience (the ITEN Teacher Fellowship), and none of them had originally been prepared to teach STEM, as even the secondary teacher had begun as a primary school teacher, and only later earned a master's degree in science.

However, it is clear to me that secondary teachers' contexts, and therefore their pathways in leadership, are differently complex at the secondary level, particularly because of the attention that already exists with regards to disciplinary teacher preparation and curriculum. Whereas secondary STEM teachers' leadership stories are often about resistance and reform of existing structures or norms for STEM education, early childhood teachers' STEM leadership stories are more about cultural awareness and embracing instructional innovation. Both types of stories are valuable, but I choose to limit the scope of my research to early childhood teachers as the more understudied population.

Participant Context and Selection.

I selected individuals from a group of 13 early childhood teachers who had completed their involvement in a two-year program, the Inter-American Teacher Education Network (ITEN) STEM Teacher Fellowship, an initiative of the Organization of American States (OAS, n.d.). As part of the fellowship, these teachers took part in an eight-day STEM-focused professional development experience in Lima, Perú, where they (a) spent five days learning about Regio Emilia-inspired inquiry-based teaching at the Dinámica Professional Development Center and area schools, (b) one day focused on visionary teacher leadership to improve STEM

education, and (c) two days participating in an international seminar with policymakers and teacher educators from across the Americas. Additionally, teachers participated in approximately 40 hours of virtual professional development focused on inquiry learning and receiving personal coaching in the development of a STEM-based learning sequence. Each teacher was also required to carry out a leadership project of their choosing that would significantly impact no fewer than 20 of their peers.

I ultimately selected seven early childhood teachers across the Americas who demonstrated strategic teacher leadership for STEM education for participation in this study (Table 4.1), based on their mid-term submission of teacher leadership portfolios as part of the Fellowship requirements. Two of these individuals participated in a pilot study, documented in Chapter 3. (The pilot study entailed analyzing data from three teachers–two early childhood teachers and one secondary teacher who participated in the secondary-level Fellowship cohort. Tentative findings were similar across all three teachers, and I determined that the resulting outcomes from that pilot study would likely prove useful for my more specific, early childhood-only study).

To make this selection of early childhood education research participants, I adhered to Stake's (2006) case selection principles, including cases' (1) relevance to the quintain, (2) diversity across contexts, and (3) opportunities to learn about complexity and contexts. While other individuals demonstrated steps toward strategic leadership, the individuals I selected had carried out concrete strategic leadership actions.

Table 4.1

Final case overviews: Geographic area, language(s) spoken, and leadership activities

	Geographic Area	Language(s) Spoken	Leadership Activities (during ITEN engagement)
Ana	North America /Greater Antilles	English & Spanish	Ana has partnered with various local non-profits and a government agency to provide STEM professional development to early childhood teachers in her home state, including **face-to-face workshops** in Honduras and Mexico, **virtual communities of practice** across the Caribbean and Mexico (along with Cara), and **ITEN Project Team work** with partners across Central and South America.
Cara	Lesser Antilles	English	Cara **co-designed a guide** and **co-taught a series of one-day face-to-face workshops** along with her ministry of education, impacting 500+ early childhood teachers on her island alone. She co-designed and co-led a **virtual community of practice** across the Caribbean (along with Ana) and has shared her own transformation by **publishing in a Caribbean education newsletter.**
Amanda	Greater Antilles	Spanish	CA collaborated with colleagues Jesica, Miranda, Vanessa, and Andrea to **develop and execute a 6-week early childhood STEM regional course**. As part of this effort, she recruited 10-20 teachers from her networks to join the course and provided mentoring and assessment. Additionally, while maintaining her role as a classroom teacher, she was hired by the ministry of education to **host a government-funded weekly TV program** that included STEM topics to be used for at-home family-based education.
Jesica	South America	Spanish	Jesica collaborated with colleagues Amanda, Miranda, Vanessa, and Andrea to **develop and execute a 6-week early childhood STEM regional course**. As part of this effort, she recruited 10-20 teachers from her networks to join the course and provided mentoring and assessment. Additionally, she was one of the first teachers to **lead an ITEN-sponsored webinar on early childhood inquiry** within the first months of the pandemic and **authored a paper in an international journal** to describe how to engage students with active STEM learning through the school day.
Miranda	Greater Antilles	Spanish	Miranda collaborated with colleagues Amanda, Jesica, Vanessa, and Andrea to **develop and execute a 6-week early childhood STEM regional course**. As part of this effort, she recruited 10-20 teachers from her networks to join the course and provided mentoring and assessment. Additionally, she works with the ministry to **create student and family guides** that pair with the TV programming hosted by CA and supports a group of 12 families with their implementation of the activities.
Vanessa	South America	Spanish	Vanessa collaborated with colleagues Amanda, Jesica, Miranda, and Andrea to **develop and execute a 6-week early childhood STEM regional course**. As part of this effort, she recruited 10-20 teachers from her networks to join the course and provided mentoring and assessment. Additionally, she **authored a paper in an international journal** to describe how to carry out project-based STEM activities in early childhood classrooms. She has also **appeared on numerous TV programs to advocate for STEM** education in early childhood and **led an ITEN-sponsored webinar on integrated STEM** for early childhood.

Andrea	Central America	Spanish	Andrea collaborated with colleagues Amanda, Jesica, Miranda, and Vanessa to **develop and execute a 6-week early childhood STEM regional course**. As part of this effort, she recruited 10-20 teachers from her networks to join the course and provided mentoring and assessment. Additionally, she works with her ministry of education to **create a video and virtual workshop series showcasing early childhood STEM education activities**. She has also **authored a blog** to share with teachers internationally how she is maintaining hands-on STEM education through communication via smartphones. She also participates in **Project Team** work with Ana, and collaborates with other partners across North, Central, and South America.

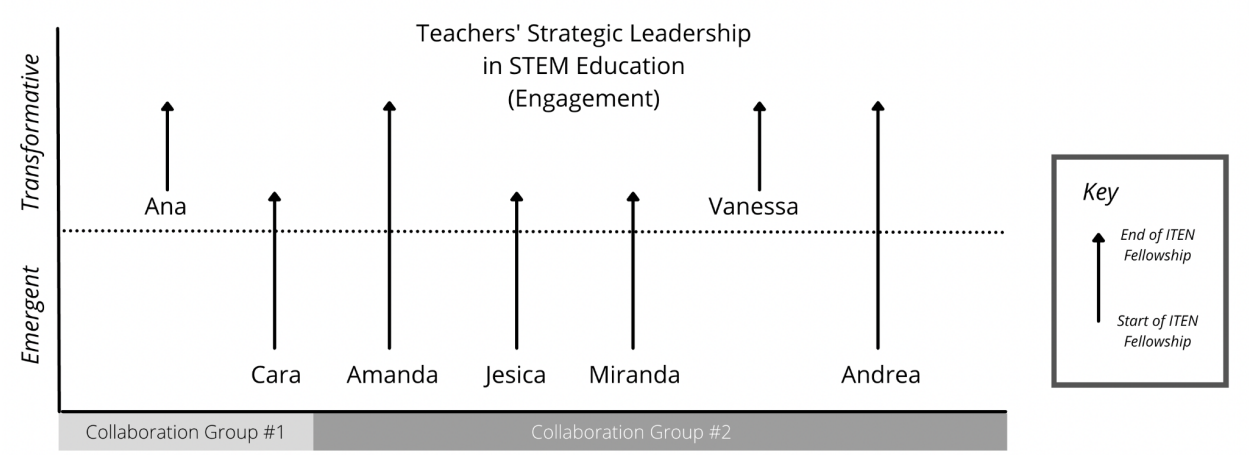
While the teachers I studied live and work in vastly different geographic areas, all of them have experience working in under-resourced public communities and schools, and the group often reflected on the similarities of the challenges they and their students faced. Importantly, these teachers had a shared experience in the ITEN Teacher Fellowship, including an opportunity for them to collectively share their visions of change in science education across the hemisphere. Additionally, my experience of over 18 months of working with teachers and teacher education policymakers internationally suggests to me that while contexts can be varied, the challenges teachers encounter—and the spirit of teacher leaders to overcome them—are markedly similar.

To give an overall sense of teachers' levels of strategic leadership engagement, I reviewed their completed teacher leadership portfolios and compared them to the *Framework for STEM Teacher Leadership* (Appendix C). It was very evident that teachers were at different levels of engagement at the point of joining the ITEN Teacher Fellowship. Five of the seven teachers reported that they had no or very limited knowledge about STEM at the time of their nomination, while only two (Ana and Vanessa) had been recognized for their STEM teaching skills and were involved in coaching or leading workshops for teachers on STEM-related topics. All teachers, except one (Jesica), had previous experience formally mentoring other teachers in general early childhood education practice either through their affiliations with professional

organizations (Ana), as a school leader (Cara), or through government-run teacher education programs (Amanda, Miranda, Vanessa, and Andrea).

Despite not having known each other at the outset, as a result of their Fellowship engagement, some teachers became linked to one another through collaborative projects. The two early childhood educators that I interviewed as part of the pilot (Ana and Cara: Collaboration Group #1) undertook a major activity together: the development and execution of a 5-week STEM-focused professional community for educators earning a professional certificate from a major Caribbean university. To have a similar group of study across Latin America, I selected individuals (Amanda, Jesica, Miranda, Vanessa, and Andrea: Collaboration Group #2) who had engaged in significant strategic leadership actions: the development and execution of a 6-week course in early childhood STEM education for 10-20 teachers from each of their countries, in which participants were evaluated on the development and presentation of a STEM-focused project for their classrooms. Using participants' reflections on their initial status concerning the *Framework for STEM Teacher Leadership* and my knowledge of their engagement, I display in Figure 4.1 an approximation of these teachers' leadership activities from the start to the end of their Fellowship experience.

Figure 4.1
Teachers' strategic leadership engagement in STEM at start and end of fellowship



Data Sources.

Each case study made use of numerous data sources in Teacher Fellows' portfolios to understand teachers' sources of self-efficacy for strategic teacher leadership in STEM as well as how that self-efficacy mediated their leadership engagement. My primary data sources are interviews that my colleague, Dr. Carmen del Pilar Suárez, and I carried out in the mid-term of the fellowship (in December 2019 and January 2020) and again near the end of the ITEN Teacher Fellowship (in February and March 2021 for pilot interviews). However, I draw from multiple sources to test and verify through triangulation any conclusions that resulted from the interviews. Of the three cases I selected for the pilot study, each had at least seven unique data sources (see Table 3.2), all of which had the potential to reveal teachers' self-efficacy for STEM teacher leadership, and which proved to be useful for validating my preliminary findings. For my full study, all of the selected individuals have substantial complementary datasets from which I can draw. Some individuals, such as Miranda, have a more limited set of original documents because she was nominated very late by her ministry. However, I have substantial additional

documents and communication from which I can draw. I describe the various sources of data below.

Table 4.2

Data sources for each case, including applications, reflections, and interviews

	Teacher Fellowship Application (May 2019)	**Public Reflection at Seminar** (Aug. 2019)	**Written Reflection** (Sept. 2019)	**Mid-Term Interview** (Dec. 2019/ Jan. 2020)	**Teacher Leadership Plan** (May 2020)	**Teacher Leadership Fund Application** (June 2020)	**Final Interview** (March-June 2021)	**Teacher Leadership Fund Application** (June 2021)	**Other**
Ana	✓	Did not present	✓	✓	✓	✓	✓	Did not apply	✓
Cara	✓	✓	✓	✓	✓	Did not apply	✓	Did not apply	✓
Amanda	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jesica	✓	Did not present	✓	✓	✓	✓	✓	✓	✓
Miranda	Late nomination	Did not present	Did not complete	Did not complete	✓	✓	✓	✓	✓
Vanessa	Late nomination	?	✓	✓	✓	✓	✓	✓	✓
Andrea	✓	?	✓	✓	✓	✓	✓	✓	✓

The Teacher Fellowship application, completed near the start of the fellowship in May 2019, included essay prompts that asked teachers to explain their motivation for joining the fellowship and being teacher leaders, to share their expectations for improving their instructional and leadership practice, and to illustrate how they advocate for high-quality STEM instruction in their context. Sample questions included "Give one example of how you are a leader for promoting high-quality teaching for STEM (for early childhood teachers) or physics (for upper-secondary teachers)" and "Explain how you might be able to support other teachers,

administrators, policymakers, or other educational stakeholders to promote high-quality practices and policies for STEM instruction."

To affirm the presence of teacher voice, at the August 2019 Seminar in Peru, I invited a limited number of Teachers Fellows to speak during the opening and closing reflections of the two days that involved policymakers. I issued invitations to speak publicly based upon my observations (and those of my team) of which teachers were most engaged and appeared to have been greatly impacted by the prior week's activities. Of those who spoke, I was able to capture segments of video and audio recordings of most of these teachers. Their statements were either impromptu or prepared the evening before, revealing their in-the-moment emotional reactions to the professional experiences. I also coached these teachers to use the time at the podium to explicitly make their *asks* to the policymakers in the room, revealing these teachers' aspirational vision for change in science education, and their definition of what they believed their potential role to be in that change.

Written reflections on the Peru experience in late 2019 and early 2020 also provided insights into their thoughts about leadership as they were developing. In the final year of the fellowship, the Teacher Leadership Plan and the Teacher Leadership Fund Application required teachers to reflect on their growth as STEM teacher leaders up to this point and to develop concrete plans for their skill development in addition to directly impacting 20 or more of their peers. Other products of teacher leadership that I pulled for verification of findings, included webinar presentations in which the individuals spoke to others about their vision for leadership, curricular materials prepared by the individuals in the courses they taught, and publications they authored, be it through blogs or peer-reviewed journals.

Additionally, I experienced a closeness with these research participants. This is a somewhat unintentional outcome of my role that multiple ethnographers believe can cause tensions (Dwyer & Buckle, 2009), yet can also enhance qualitative data collection and analysis (Toma, 2010). As ITEN's program manager, and as supervisor to their Teacher Fellowship Coordinator, these individuals regularly contacted me to get extensions to programmatic deadlines, to process paperwork to issue stipends, to get letters of recognition to share with their administrators, and to provide me with direct updates about their achievements. Most teachers preferred to communicate via *WhatsApp* messaging (either in the Teacher Fellowship *WhatsApp* group or with me personally) rather than by e-mail, so our communication tended toward informality. As a former teacher myself, I became very close to these teachers on a personal and a professional level, taking interest in their everyday classroom and leadership practice. Many of the teachers, including the individuals I selected for this study, regularly updated me with photographs of their classroom work, evidence of their leadership (such as workshop plans, templates, etc.), and expressed their affection through inspiring messages of hope throughout the weeks and months of the project.

All teachers consented to data collection upon acceptance to the Fellowship, and continuing consent was ensured by requesting renewed consent at the point of data collection approximately once every three months. Ethical compliance was assured through approval from the University of Maryland Institutional Review Board (IRBNet ID 1411851-4).

Interviews.

The purpose of the interviews was to explicitly draw out sources of self-efficacy for strategic teacher leadership in STEM as well as to uncover how their sense of self-efficacy

mediated their strategic teacher leadership actions across their professional careers. Both sets of interviews used a semi-structured protocol previously described in Chapter 3. I designed the final interview protocol to be highly aligned with this study's theoretical framework. Interviews lasted approximately 45 to 60 minutes and produced rich narratives about their developmental journeys as teachers, teacher leaders, and STEM educators. Anonymized interview transcripts for Ana, Cara, Amanda, Jesica, Miranda, Vanessa, and Andrea are available in Appendix D, Appendix F, Appendix G, Appendix H, Appendix I, Appendix J, and Appendix K, respectively.

Single Interview Analysis.

Using the methods of Stake (2006), and mirroring my pilot study, I completed a case study card for each of the interviews. Each case study card included a 3-5 paragraph synopsis, my initial impressions about the prominence of self-efficacy for strategic teacher leadership in STEM education, tentative findings that answered my research questions about the source(s) of self-efficacy and how it mediated leadership engagement, possible excerpts illustrating my tentative findings, and uniqueness among the other cases. Case study cards can be found in Appendix L.

Most teachers spoke about pivotal moments or periods in their lives that represent sources of self-efficacy for strategic leadership in STEM education–opportunities, conversations, or experiential recollections. To verify the substantial nature of these moments or periods, I looked for evidence of them in the other data sources I had (application materials, reflections, teacher leadership project plans, or other documentation that had been shared in their portfolios). Most of my tentative findings from the case study cards were supported by one or more independent data sources. Evidence of this triangulation can be found in Appendix M.

Whole-Group Analysis.

I then developed and applied a codebook to determine if there were any prevalent themes shared across the narratives. My goal was to identify broad themes (illustrated by the moments or periods in teachers' interview narratives), not to quantify utterances. To accomplish this, my codebook included indicative codes that emerged from the data (Corbin & Strauss, 1990), as well as deductive codes based on assumed categories of sources of self-efficacy described by Bandura (1977).

Inductive codes

The initial codebook developed from the pilot studies (Chapter 3, Table 3.6) became the foundation for my final codebook (Table 4.3). As I progressed from the original pilot study to the full seven interviews of my research group, I modified and expanded the codebook as new codes emerged. The original codes continued to be productive, but I made the following changes:

- LUCK → FLO-LUCK: This change reflects that while some teachers spoke about luck, many others spoke about the fluid, unexpected nature of leadership opportunities.
- INTENTION → INT-VISION: This change reflects that some teachers had specific plans for their development trajectory, while others had specific visioning activities for the end goal of their leadership, even if explicit plans did not exist.
- OUT-OF-FIELD: I removed this code, as all early childhood teachers were naturally out-of-field in terms of their preparation in STEM fields.
- CHALLENGE: I added this code, as many teachers implied that their leadership was related to overcoming a challenge, obstacle, or making a sacrifice.

Deductive codes

Additionally, to more precisely identify the categories of sources of self-efficacy, I did an independent pass of the interviews using Bandura's (1977) categories (accomplishments/mastery achievements, vicarious experiences, verbal persuasion, and physiological change).

Table 4.3
Final codebook for analyzing the interim and final interviews

INDUCTIVE CODES

Theme	Code	Description	Example from Data
Vision	FLO-LUCK	Initiation into leadership as a result of happenstance or unsolicited opportunities	**Ana:** "I hope that this, you know, this, uh, tactical serendipity that, that, uh, has led, um, getting [Colleague 1] and I to, to have this, this, uh, partnership, uh, never ends."
	INT-VIS	Initiation into strategic leadership as a result of prior planning or a visualization experience (**this is distinct from ongoing strategic leadership*)	**Cara:** "And know if I'm going to introduce this to teach us who did not have my experience. I had to know exactly what I was gonna to say to them and how I was going to help them to include this and to let them know how important STEM was and what it did for children's learning. So it took me a little, a little while until I eventually, which I did."
Practice	INV-LEAD	Subject received a direct invitation to become a teacher leader	**Ana:** "And I had just gotten back from [island] and she says, there's an opportunity for a teacher leadership program."
	FRIENDSHIP	Engagement in activities because of, for, or with a very close friend or family member	**Ana:** "And she's great at getting back to you and she helps you in whatever, and she'll come to your house if she has to..."
Identity	STEM-ID	Perceives self as a STEM person.	**Cara:** " I feel I could just go around the schools and I could just, uh, you know, I show them how to incorporate STEM stream into their curriculum and, and, and help teachers. I said at that time, that is how I was feeling. I feel I could just move straight into STEM, full blown STEM." **Vanessa:** "In those times I was involved with art, not math generally. So I began to discover that mathematics was everywhere, in the concrete elements that surround us, as

			well as in these paintings by Kandinsky…"
	LEAD-ID	Perceives self as a leader.	**Ana: "**I wasn't comfortable with the subject, but I really wanted to take it on and, uh, engage the children that way." **Cara:** "I really did not know much about STEM. We, I used to hear about STEM in the primary school and the secondary school, but I never thought much about it" **Miranda:** "Well, you know that generally sometimes we are leaders, but we don't identify as a leader. Moreover, other people who observe you and who see your work and see your work, identify themselves and want to continue. You know that the leader, the leader is like a mirror of others."
	SOLIDARY	Sense of connection with a particular group of people	**Ana:** "...but to give to the people that, that were like close to my heart, because they spoke the same language, they came from similar backgrounds that was like really, really huge to me." **Cara:** "Uh, so that was the teachers or in a, in a government side of it. But when, as I, as I got to experience more, more about STEM, learn more about STEM. And as I saw what it did, I knew I, I, because I was working with schools beside, uh, like our ministry school and our ministry teachers, I said, but I have to introduce this to these others, if it is that I am helping these schools."
Transi-tion	SPARK	Subject received external "nudge" because of perceived curiosity or interest	**Ana:** "I said, I'm really excited about simple machines. I still love simple machines. And they say, you know, I bet you, the preschool teachers have not ever taught the simple machines class. So why don't you make a simple machines class?"
	SHOCK	Surprise or unexpected outcomes	**Ana:** "I was shocked because for what I did think that I was going to be chosen to go, and then I was more in shock because I had said that I would do this." **Cara:** "I said, but I can't believe this is me talking about STEM. And I can't believe this is me sitting with the people way up in curriculum."
	IMPULSE	Taking quick action after experiencing a sense of agitation or unease	**Andrea:** "No, I have never thought about it. Never. I don't know if that's good or bad, but let's say. And with the adviser, she told me, could you help me with something? And one of my answers is 'Yes, of course, how can I help you? What can we work together on?' I still didn't know what it was about…"
	CHALLENGE	Overcoming a challenge, obstacle, or making sacrifice to grow as a leader	**Jessica:** "So if they block a little, especially, let's say here in [my country] it happens a lot with private institutions that already have, like all classes, their way of working. Then everything is done as systematized, as if we all must march in the same way. So there is like, as we say colloquially, they cut off your wings."

Self-Efficacy for STEM TL	REC-LOW-SE	Subject recognized low self-efficacy for STEM teacher leadership	**Ana:** "So I was thinking to myself because I didn't have very much confidence. I was like, oh my God, I opened my mouth. And I don't know if I could do this. And so, uh, but I stuck with it. I said, I'll do it if you want me to do it, then I, and I was thinking, she knows so many more people that are so much more intelligent than I, and can do so much more than I can do."
	REC-HI-SE	Subject recognized high self-efficacy for STEM teacher leadership	**Ana:** "So for me, it was more of like, I can do. I said, I can do it and I will do it. And I will do a good job at doing it."

DEDUCTIVE CODES

Theme	Code	Description	Example from Data
Sources of Self-Efficacy	ACCOMP/ MASTERY	Subject describes how prior success bolster personal leadership	**Vanessa:** "I always try to share what I learn, right? And that's what motivates me the most."
	VICARIOUS	Subject describes how viewing others' success bolster personal leadership	**Amanda:** "But he was an electrical technician, a master's in electricity. He was the best, not because he was my stepfather, but I do remember that everyone was looking for him to do very hard jobs in very expensive places or companies."
	VERBAL	Subject describes how verbal motivation from others bolster personal leadership	**Andrea:** "My dad was this, a very active person and he always told me opportunities are not to be wasted. He tells me today that you have to use links to take advantage of and you learn from everything, from everything you learn. So, that's why I said yes, and it's tiring and everything, but it was worth it."
	PHYS	Subject describes feelings that bolster personal leadership	**Miranda:** "I have also wanted to inject into [others] that dynamic that of the emotion that I am feeling through after I got to know STEM and the improvement that I have had as a professional and how we are really at the forefront."

Results

This research set out to answer the following two questions: "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?" Findings from this study

suggest that early childhood teachers' sources of self-efficacy derive from their sense of STEM identity and a pre-existing tendency toward impulsivity to accept new opportunities. These teachers appear to be highly sensitive to emotional and physiological states (feelings of joy and a sense of desire to share that joy with others) and act upon those states to engage in strategic teacher leadership in STEM education when opportunities present themselves.

Part 1: Codes as an Entryway to Identify Sources of Self-Efficacy.

The application of the codebook revealed three codes that appeared across each interviewee (Table 4.4): *Perceives self as a STEM person* (STEM-ID), *Taking quick action after experiencing a sense of agitation or unease* (IMPULSE), and *Subject describes feelings that bolster personal leadership* (PHYS—physiological states). As these codes are an indicator merely of presence, and not of frequency. Their presence alone is not necessarily representative of the quality or nature of the experiences. However, what these codes do is direct an observer's attention toward the specific stories within teachers' narratives, looking for generalizable themes. I describe these themes below briefly but elaborate upon them in the Finding section.

All seven teachers spoke at length about feeling awakened after learning about STEM. However, teachers did not describe their sense of STEM identity as an accumulation of technical knowledge or skill, so much as (a) self-recognition that much of what they were already doing as a teacher can be qualified as STEM, (b) the satisfaction of overcoming their fears to embrace STEM in their teaching, and (c) realizing the long-term impact that their engagement with STEM in early childhood can have on their students.

A sense of impulsivity also emerged from all of the interviews. Teachers described their personalities as impulsive, often taking on leadership experiences upon the request of a respected

peer or friend, regardless of knowing their ability to be successful with the task or not. Teachers viewed themselves as do-ers with service-minded hearts that are ready to jump in to help whenever the need presents itself. This code did not always first appear associated with STEM-specific leadership activities, but with multiple life experiences that gave them a taste of empowerment through leadership. Numerous teacher participants suggested that their impulsivity is associated with their upbringing, work ethic, and personality, and implied that these traits transferred to their engagement as STEM teacher leaders.

Finally, among the deductive codes composed of Bandura's sources of self-efficacy, all teachers reported that emotional or physiological states (primarily joy and desire) were a primary motive behind their STEM teacher leadership. Multiple teachers also provided very poignant anecdotes about close family members, friends, or colleagues who provided strong verbal persuasion to lift them up after expressing their doubts about being able to carry out a teaching leadership task to which they had committed themselves. Teachers reported very few mastery experiences or vicarious experiences among their initial sources of self-efficacy for STEM teacher leadership, although these were mentioned as motives for their continuing engagement as leaders.

Table 4.4

Presence of codes in final interviews. A gray highlight indicates the most prominent codes.

		Ana	**Cara**	**Amanda**	**Jesica**	**Miranda**	**Vanessa**	**Andrea**
Vision	FLO-LUCK	✅		✅	✅	✅	✅	
	INT-VIS			✅	✅			
Practice	INV-LEAD	✅	✅	✅		✅	✅	✅
	FRIENDSHIP	✅				✅		✅
Identity	STEM-ID	✅	✅	✅	✅	✅	✅	✅
	LEAD-ID		✅	✅	✅	✅		
	SOLIDARITY	✅	✅	✅	✅		✅	
Transition	SPARK	✅	✅	✅			✅	✅
	SHOCK	✅		✅				
	IMPULSE	✅	✅	✅	✅	✅	✅	✅
	CHALLENGE	✅		✅	✅		✅	✅
Self-Efficacy for STEM TL	LOW-SE	✅			✅	✅	✅	✅
	HI-SE	✅	✅		✅	✅		
Sources of Self-Efficacy	ACCOMP/MASTERY	✅	✅				✅	
	VICARIOUS	✅		✅		✅	✅	
	VERBAL	✅		✅	✅		✅	✅
	PHYS	✅	✅	✅	✅	✅	✅	✅

Part 2: Narratives about Sources and Role of Self-Efficacy.

Teachers' anecdotes about why they chose to become strategic leaders in STEM education provide authentic views into teachers' motives. To illustrate these findings in-depth, I have selected to share excerpts from the interviews of just four of the seven interviewees: Ana, Andrea, Cara, and Amanda.

Finding #1: Impulsivity as a Precursor and Sustainer of Leadership Engagement.

All seven teachers described how their leadership resulted from an impulsive component of their personality. This impulsiveness was often realized in their decisions to say yes to STEM teacher leadership opportunities they often felt they knew little about and for which many teachers initially had a non-existent sense of self-efficacy. Only after committing to leadership opportunities did many teachers come to a realization of what their commitment entailed, followed by expressions of low self-efficacy for being a STEM teacher leader. This finding is evidenced by how they often immediately expressed concern about their decisions. Teachers typically attributed their impulsiveness to a service-minded ethic and sense of solidarity with particular groups that were established from childhood and modeled by their family members.

Ana's Impulsivity.

Ana recalls the exact moment she was called into STEM teacher leadership. She was at an English-language STEM workshop when she was identified by one of the workshop leaders as being a Spanish speaker. The workshop leader mentioned that she had an opportunity through an embassy to do a STEM workshop in Honduras, but didn't have a teacher who could speak

Spanish, so she was planning to turn down the invitation. Ana recalls her response at that moment:

> And I said, 'I'll do it for you.' She [the workshop lead] goes, 'But you're working like, full-time,' [and I said] 'I'll quit my job and I'll do it for free if I have to, just for the experience.' And she goes 'Great!' So I was thinking to myself because I didn't have very much confidence. I was like, oh my God, I opened my mouth. And I don't know if I could do this…. And so from there, like I, um, I was shocked because, for, what I did think that I was going to be chosen to go, and then I was more in shock because I had said that I would do this. And I had never spoken in public, you know, to a group of professionals ever in my life in Spanish, or even translated anything or, you know, stood beside somebody and translated what they said ever in my life." [Final Interview 2021]

Ultimately, her sudden expression of commitment to go to Honduras launched her into a major leadership role with the workshop leader's organization that she maintains to this day, motivated by her desire to help provide Spanish speakers with the same access to materials as English speakers. Indeed, she attributes much of her desire to help Spanish speakers to her own experience as a migrant from a Spanish-speaking nation to an English-speaking one. She routinely described that her underlying urge to lead originates from the inequity of resources in each language and spoke of her solidarity with Spanish-speaking educators:

> I would also love to return to my home in [my country] to bring desperately needed professional development and resources to the educators there. I am hopeful this teacher fellowship might lead to an avenue for pursuing this dream I have. [Teacher Fellowship Application 2019]

> If I could change something [as a leader], I'd like to have resources to support another 20 teachers, especially Spanish speakers because they want to improve their education. [Mid-Term Interview 2020]

> We don't have, um, professional development that is in Spanish. Uh, every, everything that's coming is, it doesn't touch that population of people. … You know, it just put me in their place and just, and we were from, you know, [my country] is, it's not very dissimilar from, from Honduras. [Final Interview 2021]

Ana's impulsivity helped her launch herself from a classroom teacher to an international asset for a major professional development organization, and finally lead her new initiatives across the region, including the establishment of communities of practice across Latin America and the Caribbean with multiple other ITEN Teacher Fellows. However, her initial impulsivity was primed and reinforced by the impact she knew she was specially positioned to make as a migrant and as a Spanish speaker, not just for increasing access to education generally, but to STEM specifically: "As a female, Hispanic early childhood educator, the other way I advocate for the inclusion of underrepresented groups in STEM fields is through my own modeling and excitement for everything to do with STEM" [Teacher Fellowship Application 2019].

Andrea's Impulsivity.

Andrea's first steps toward strategic teacher leadership were also on an impulse. She described her evolution toward STEM strategic leadership in two phases. First, during her early teaching years, an external evaluator visited her classroom and took note of the innovative approaches she was using. Seeing that Andrea was being stifled by the school's rigid nature, the evaluator invited her to support an early childhood teacher education program, leading her to now be both a classroom teacher and an affiliate of a government university teacher education program. Second, she was directly invited by the government's national teacher education institute to take part in the ITEN Fellowship. When asked how she approached decision-making for these opportunities, she explained that in both cases she took them right away–inspired in part by her father, who always reminded her that "opportunities are not to be wasted" [Final Interview 2021].

She described her initial experience with the evaluator's invitation to be a teacher educator as follows:

> No, I've never given [these decisions] any thought. Never. I don't know if that's good or bad, but let's say…And with the evaluator, she said to me, "Can you help me with something?" And my response is, "Yes, of course, what can I help you with? What can I do with you? And me, without knowing what it was really. Just saying I want to, I want to. … If they are asking for my help, it's maybe because I really can do something. So, it's at that point I throw myself at it. [Final Interview 2021]

Her impulsive nature again revealed itself when she received an invitation from the national government's teacher education institution to be part of the ITEN Fellowship. In reflection on how she felt about the invitation–which she learned was an opportunity to become a STEM teacher leader, she described the experience as follows:

> Fear. In fact, I began to explore what this [STEM] really was. I said, "Yikes, not this, but how, how? But I'm not so good at math, right? O rather, I, I, I wasn't so good at math in high school. I never failed or anything, but I remember that in math I had to study a lot. I was fascinated by physics, and it demanded a lot of me, but in math…well, and I didn't have a good teacher.

Despite this trepidation–which persisted for the first few months of the fellowship until she was able to meet with fellow members of the cohort at the seminar in Peru–she remained committed to the task, even though she vocalized her concerns about her low self-efficacy in STEM. She described this commitment as a response to a call that needed to be answered. In her application to the fellowship, she illustrated this commitment as follows:

> I personally take on this challenge, willingly and responsibly, being clear about my commitment and what I am called to as part of this team. I believe that each activity in which I am involved, each meeting, each reading, each visit or interaction space will be an opportunity to grow and learn, which will allow me to have more mastery of STEM and thus transmit with more ownership and share more effectively with others. The greater my effort, perseverance, determination to do an excellent job in this process, the greater the learning and the greater the possibility of making significant contributions to early childhood education. My attitude must be one of openness to share and transmit

> with clarity and conviction my positive experience about STEM in the classroom and the benefit for all. It is a chain that can gradually expand, the first is me, my students, parents, colleagues from the institution, community, circuit, educational region and other areas of the country and even share with other nations of America. [Teacher Fellowship Application 2019]

At numerous points throughout the fellowship Andrea expressed her commitment to education despite her own perceived limitations in STEM, echoing the words of Mother Teresa that "A life not lived for others is not a life" [Teacher Fellowship Application 2019]. She described her teaching as a vocation: "Being a Teacher Fellow there is a great commitment to try to be a person who is at the service of other colleagues, willing to build experiences and share knowledge that help us in our teaching work" [Teacher Leadership Plan 2020]. She felt that this commitment through STEM teacher leadership could help pull her community out of poverty: "Since I live in a very underprivileged area, imagine that our area stands out and think that if we manage to make the children who are children who are categorized as children of prostitutes, of drug dealers, be different and we can make the area recognized by another thing" [Mid-Term Interview 2020].

Ana and Andrea both epitomize the kind of impulsivity found in all the interviewees to answer the invitation to be STEM teacher leaders. Teachers ultimately accepted new opportunities for STEM teacher leadership as a response to their impulsive nature, not because of explicit self-efficacy beliefs about specific STEM teacher leadership actions.

Most of the teachers admitted to not knowing much about STEM or having a sense of what teacher leadership might look like, prohibiting them from having any specific sense of self-efficacy for STEM teacher leadership. It was only after becoming aware of their commitments that teachers openly expressed low-self efficacy. Although teachers shared their early dismay at not feeling ready to become a STEM teacher leader, many displayed patterns of growth in

general self-confidence as professionals across their careers, likely reinforcing their impulsive tendencies to accept new opportunities, whatever they might be. It was their lifelong experiences that shaped their personality–and perhaps their passion–that made them eager to step forward when invited to fill a leadership role.

Finding #2: STEM Identity Establishment as an Ongoing Source of Self-Efficacy for Leadership.

All seven teachers described an identity shift as a major source of their ongoing self-efficacy to transform into STEM teacher leaders (although typically *after* accepting the leadership opportunity, not *before*). Importantly, teachers described this shift as one of self-recognition, more than of knowledge accumulation. This shift was so important for teachers themselves–and so empowering–that it resulted in much more than changes in their own classroom practice. They wanted other teachers to be empowered by this knowledge, as well, through their leadership.

Cara's STEM Identity Establishment.

Cara's first exposure to the concept of STEM education came through communications from her national ministry of education, but they were directed only at primary and secondary school teachers: "Nobody spoke about it at my level at early childhood" [Final Interview 2021]. As she participated in the professional development and school visits in Peru in 2019, she describes how she came round to realize that she was already a STEM* teacher (*Cara spoke at length about STREAM, which incorporates research and the arts in addition to STEM):

> We do all of these in our activities, but we never, we really did not know they were referred to now as STEM or STREAM. And now you can actually, um, pull out those outcomes and you can make your activity plan so much more meaningful, and you can actually know your children will be doing all of these things. And you will know, because here it is now, you know, exactly like I could look at an activity plan and right away I could, I could identify all of the components that are in STREAM. And that was one of the most important things we had to do when we changed our activities, to include the STREAM components. [Final Interview 2021]

Cara found great joy in sharing this realization with other teachers as well–STEM need not be overly complicated. She felt most teachers and their administrators struggled to understand STEM and were challenged to see how it could apply to younger students. She provides the example of what is meant by technology, the T in STEM:

> You know, that technology is not just about the computer, the laptop, the tablet, or those electrical devices. And, I realized that out of all of STREAM, I really, really love explaining technology to teachers because when we had our teachers workshop also, um, that the, the presenter, the host asked me whenever, wherever we would go, to explain technology. 'Could you explain technology? What is meant by technology?' And I just, um,…I was there constantly explaining technology. And I would say to them, well, you know, technology is anything that you can do. And I tried to make it as simple as it could be and not let it feel as though it is so overwhelming for them. So I would say, you know, technology is so simple, right? It is anything that you can do to help you to accomplish a task, to do your job. [Final Interview 2021]

Her first concrete strategic leadership engagement was to carry out a multi-day workshop in early childhood STEM with ministry officials in October 2019, just a few months after her experience in Peru, as part of her follow-up commitment as part of her nomination to the ITEN Teacher Fellowship. However, by early the following year, throughout the remainder of her fellowship, the government had put a hold on most new teaching initiatives due to COVID. Despite the formal governmental support, her strong STEM identity slowly helped Cara to come out of her shell as an independent and truly international STEM teacher leader.

Continually sensitive to other teachers' perceptions about STEM, Cara was a bit more hesitant than other teachers to jump into international leadership. She wanted to ensure that she

was first "capable enough to do justice. I did not want them to feel confused. And I did not want them to feel it was something new I was talking to them about." In an article she authored for a regional university early childhood teacher education program, she wrote the following, encompassing her belief that all teachers can truly transform themselves and their classrooms by better understanding how their pedagogies already fit into STEM:

> STEM, STEAM, STREAM gives a label to what some of us in early education are already doing, that is, helping children to explore, observe, ask questions, predict and integrate learning. It is what we have always advocated in early childhood education since we are aware that it is how young children build their knowledge and understanding of the world. When a child builds a tower with blocks, he or she acts as an engineer as he or she tries to make a tall, yet stable structure. The child also takes on the disposition of a scientist when he or she explores how blocks of different materials, shapes and textures affect the strength and stability of the tower. That child might also use mathematics and technology as he or she uses tools to measure the heights of the towers. …
>
> As teachers we need to honestly reflect to overcome our own relationship with Science, Technology, Mathematics, Reading, The arts and integrated learning. As early educators many of us have to educate ourselves about engineering and its place in 21st century learning. STEM, STEAM, STREAM. If we learnt that science and math for example is hard and no fun, then how can we teach children that those disciplines are doable and enjoyable? To do so, we have to build our own confidence, knowledge and competence in STREAM, so in turn we can support and empower our children to be confident in their knowledge and competencies. As teachers, we have to overcome the fear of not knowing all the answers in science and math and focus on reeducating ourselves through lifelong learning. [*UWI Caravan* newsletter, Teacher Fellow Portfolio]

Soon, Cara had lost most of the self-consciousness she might have felt earlier on in being placed on a pedestal as a model early childhood STEM educator. She eagerly contributed examples of her classroom STEM practice to a collaborative ITEN team from Colombia and Chile that was authoring a formal government-sponsored document on early childhood STEM education and its relationship to gender equity. She provided samples of student work, showing how a single students' interest in some cardboard boxes outside her classroom led to a full unit including experiments on material science and the strength of different kinds of cardboards and a

science and engineering activity to build a cardboard cave habitat for bats (Figure 4.2). Using these and other examples, Cara started to share examples of her classroom practice with teachers across the Caribbean, going so far as to help two teachers on another island begin their own STEM community of practice.

Figure 4.2
Cara's evidence of STEM integration in her early childhood classroom. (a) Students test the strength of paper materials that have been soaked in water. (b) Students build a model bat cave with recycled materials. (Source: Cara, used with permission).



Cara's new sense of identity permeated her activities in her final year of the ITEN Fellowship. Using highly emotive language, she describes her drive to lead others:

> I just have this strong feeling about the STEM activities and STEM teaching that, you know, I feel like I could just do that. I feel I could just go around the schools and I could just, uh, you know, I show [teachers] how to incorporate STEM/STREAM into their curriculum and, and, and help teachers. I said at that time, that is how I was feeling. I feel I could just move straight into STEM, full blown STEM. I just want to be a STEM teacher. [Final Interview 2021]

Amanda's STEM Identity Establishment.

All the other teachers likewise expressed that they felt empowered because of a sense of STEM identity, but Amanda, in particular, regularly talked about how teaching STEM, for her, was an act of "stepping toward that which scares us" [Personal Communication 2020]. In comparison, however, Amanda's identity shift occurred prior to the ITEN Fellowship, inspired in part by her stepfather, who taught her that she could only learn by doing:

> Just like my classmates, I thought that STEM was something for rich people, for people from far-away places like Brussels, Europe…people far from our reality. But once I attained it, and I saw through it how people modeled and did STEM, I said to myself, I can do this! I stopped resisting myself, and I think that can happen to others as well. … I feel that teachers have a lot of fears, because when one introduces them to the process of STEM and what students can get out of it, it's like going to the Moon–it's far. But, despite the fact that they don't believe it themselves, it's just the fear of breaking teaching paradigms, ways of teaching children and the general population, because teaching STEM… In our country, we should educate ourselves and break those barriers of fear of believing that we can do it. [Mid-Term Interview 2020].

Echoing her words almost verbatim more than a year later, Amanda shared how a desire to spread her empowerment motivated her to lead others: "[I have the] condition of being a leader transformed by STEM. [I want to] reach teachers who need help, who don't know about STEM, with the goal to offer my help so that they can become leaders. … The biggest challenge is change, the possible resistance of teachers to the new age, to breaking paradigms, like resistance to STEM" [Leadership Plan 2021].

Together, Cara and Amanda's feelings about building a strong STEM identity and how it is a source of their self-efficacy come through across all seven of the interviewees. In some ways, these teachers feel privileged, and they feel compelled to share what they have gained and what they have created with others, pushing them to be agents of change.

Finding #3: Dominance of Verbal Persuasion and Physiological States as a Source of Self-Efficacy for Leadership

The deductive codes, which comprised each of Bandura's (1977) presumed sources of self-efficacy, provided slightly different information about each of the interviewees. Teachers provided very limited examples of accomplishment/mastery experiences or vicarious experiences when describing their initial sources of self-efficacy for STEM teacher leadership. Of the three that did, they described it for self-efficacy in STEM, not for STEM teacher leadership explicitly. This included Ana's positive responses from parents who enjoyed seeing their children do science in her preschool center, Cara's interaction with a science teacher who acknowledged her work on a volcano project when she was a middle school student, and Vanessa's success creating a math-focused thematic lesson as part of her master's degree. Vicarious experiences were also referenced, usually as they pertained to dedication to learning STEM (as in Amanda's admiration of her stepfather, an engineer) or commitment to teaching as service (as in Miranda's admiration of her aunt, who was her teacher mentor). Neither mastery experiences nor vicarious experiences served as direct sources of self-efficacy for STEM teacher leadership, although teachers do see these experiences interweave into the motivational factors that ultimately made them ready for STEM teacher leadership.

In contrast, many teachers described receiving verbal support that served to bolster their self-efficacy for STEM teacher leadership, usually after having made an impulsive decision to accept an invitation for something for which they very soon after did not feel qualified–most notably, for their nomination to the ITEN Teacher Fellowship. Ana described the support from a colleague who helped her when she doubted her abilities to support STEM workshops in

Honduras: “she just always trusted me. She said, you, you, Oh, she never, like once says I don't. She says, I, I have the, the, the confidence that you can do it and you will do well. She like never like said, she never gave any doubt that she had made the wrong choice. So that to me was huge that she entrusted me so much” [Final Interview 2021]. Similarly, after being recognized as a model teacher for her work with mathematics education, Vanessa described how an external evaluator helped her to trust in her capabilities to become an evaluator of other teachers: “Delia invited me for this program…I said Delia, I haven't received any monitoring course because you have to monitor the teachers, manage [teacher] reflection, provide follow up. And she tells me ‘Vanessa, but look, I've seen you in action and your classroom,’ she tells me. ‘And I, I want you to work with us…’” [Final Interview 2021]. Many of these teachers described how friends and colleagues placed trust in them, helping them to trust themselves in their own abilities.

Among all categories of self-efficacy, physiological states were prominent in each teacher’s stories. Teachers used words that expressed discomfort, dissatisfaction, and restlessness, and a desire to make change, as illustrated in Ana and Andrea’s stories. Likewise, teachers routinely spoke of their STEM teacher leadership work with emotive language to convey love, passion, and affection toward STEM and toward those they influence through their leadership. For example, Cara describes her leadership engagement as follows: “I do it because I think I just, I just, I just love teaching. I love sharing, sharing experiences, and I love sharing knowledge. … I think the most important thing for me is I feel like I want them to experience what I am experiencing.” [Final Interview 2021], while Miranda also says “I also have wanted to inject others with that dynamic of the emotion that I am feeling after getting to learn about STEM and the improvements I’ve had as a professional” [Final Interview 2021].

While much of this language aligns with teachers' expressions of impulsive decision-making about teacher leadership opportunities, physiological states were also important for those who really struggled to become engaged as leaders because of their later self-doubt after having accepted the invitation to be a leader. For example, Jesica described herself as a quiet leader, but shared how emotion motivated her to become the leader she otherwise thought she might not be on her own: "maybe I let myself catch the enthusiasm of the others [in the fellowship], in saying that [STEM] will take us a long way or that we are going to do a lot with it. So now I know, when we became a team, I took it all in with more affection and more enthusiasm for taking action." [Final Interview 2021].

Trustworthiness.

To ensure the trustworthiness of my findings, I turn to Stake (2006), who emphasized the importance of member checks and triangulation, without being methodologically limited to strict protocols that leave no room for researcher interpretation. After completing each case study card (Appendix L), I reached back out to the interviewees to seek approval (or modification) of the summaries I had written about them. Three interviewees asked for minor corrections to details, and all seven of the teachers confirmed the final versions of their summaries. Using the tentative findings in each case study card, I then proceeded to review all other available data sources per teacher and pulled out excerpts that supported each tentative finding. The results of this triangulation can be found in Appendix M. I was able to triangulate data for many tentative findings across multiple documents per teacher. There were limited cases in which I could not find three documents, but these were often supported by pivotal storytelling events, such as a

teacher's thick, explicit description of a pivotal life experience or encounter, and did not necessarily warrant its appearance in other data sources.

Significant concerns during the research study were my role as the program developer and the fact that teachers received stipends to compensate them for their time spent in the program. As a result, participants might have attempted to please me during their interviews and through the submission of their documents. To mitigate this threat, numerous individuals were involved in the data collection process, including Dr. Carmen del Pilar Suárez, who served as the ITEN Fellowship Coordinator and staff of the Dinámica Professional Development Center in Peru. Critically, as part of the interview protocol, teachers were told that the interview process was not evaluative of them, nor were they expected to evaluate (criticize or praise) the ITEN Teacher Fellowship. They were encouraged to consider their full teaching careers, including experiences before and outside of the Fellowship. When teachers did refer to the Fellowship, I used probes to ask them to reflect on any experiences before or outside of the Fellowship that might have also influenced their feelings of self-efficacy and their leadership engagement.

Discussion

Reflections on Bandura's Self-Efficacy Theory.

The three findings of this study support and push back in different ways on elements of Bandura's Self-Efficacy Theory (1977). Six of seven teachers explicitly described how their beliefs about their abilities to be STEM leaders, which often developed after their initial acceptance of leadership opportunities, were an important part of their personal and professional growth, often using the language of confidence, if not self-efficacy explicitly. Similarly, Bandura posited that people make decisions based on a reasoned judgment of their abilities to achieve a

particular goal. In this way, Self-Efficacy Theory is a natural and expected fit for exploring teachers' ongoing leadership development.

Elements of Findings that Push Back on Bandura's Theories.

Perhaps the most important nuance in this study's findings is that *STEM identity and self-efficacy as a STEM educator did not drive most teachers' first steps toward STEM teacher leadership*–rather, it was teachers' impulsive response to an invitation to STEM teacher leadership that ultimately led to opportunities to build STEM identity and self-efficacy for STEM teacher leadership. Bandura's Self-Efficacy Theory, embedded within his broader Social Cognitive Theory (1986), would suggest that self-efficacy is a major personal determinant in making a decision such as choosing to join a two-year Teacher Fellowship that explicitly commits the participants to become STEM teacher leaders.

Most teachers reported committing to the fellowship despite not knowing much about STEM or having had prior STEM teacher leadership experiences. Unlike the findings of Zinn (1997) and Katzenmeyer and Moller (2013), most teachers in my study did not display high self-efficacy for STEM instruction before accepting leadership opportunities. Performance accomplishments/mastery experiences and vicarious experiences in STEM teacher leadership were effectively non-existent before the fellowship for five of seven participants. Social persuasion typically only appeared in teachers' narratives after having already accepted leadership opportunities.

In contrast, many teachers were very expressive about the role of physiological or emotional states upon being confronted with and accepting initial leadership opportunities. However, while teachers reported responding to opportunities for STEM teacher leadership on

impulse (a physiological state), what is less clear is if those physiological states were associated with teachers' beliefs about their abilities, either as a source or result of those beliefs. Rather than well-reasoned judgments about their capacity to take on specific STEM teacher leadership tasks, teachers reported being eager to generally take advantage of opportunities or feeling obligated to answer a call to service, whatever the outcome might be.

Elements of Findings that Support Bandura's Theories.

After first accepting the STEM teacher leadership opportunity, experiences that built STEM identity, including STEM-related self-efficacy, were an important element for persisting as a STEM teacher leader. Rather than learning new STEM content or skills, these experiences often entailed (re)defining STEM, and recognizing that they were already teaching fundamental STEM skills in the classroom. Instead of feeling like accomplished STEM experts, teachers described how they learned to think about STEM as a learning process in which they could engage alongside their students. Over time, teachers' mastery experiences in teaching STEM to students and colleagues, and verbal persuasion received by respected friends and peers, contributed to their continued engagement with STEM, including STEM teaching and STEM teacher leadership. This outcome both supports Bandura as well as more recent researchers in the context of education (Zheng et al., 2019) who have found that teachers' successful experiences with leadership can have a positive effect on instructional self-efficacy.

In considering these findings, it is important to note the relationship between self-efficacy for STEM-related topics and gender, especially considering that all individuals in this study were female. There is ample evidence that suggests that many people perceive STEM as difficult and misaligned with personal interests and values, particularly women (Van Tuijl & van der Molen,

2016; Kaleva et al., 2019). As a result, the teachers in this study may be particularly positioned for this shift in STEM identity to influence them profoundly–an effect which was then expressed through growth in self-efficacy for strategic leadership in STEM.

Complications in Applying Bandura's Theories to Intersecting Domains.

The fact that research participants emphasized their improved STEM identity as primary support in their desire to *lead* others complicates the alignment of the finding to Bandura's Self-Efficacy Theory. This potential transferal of self-efficacy from one domain (engaging with STEM as a teacher) to another (teacher leadership) potentially contradicts Bandura's principles that self-efficacy is highly differentiated by specific tasks. Of course, the fact that leadership in STEM education occurs at the intersection of STEM identity, STEM instructional self-efficacy, and leadership might suggest that these domains are less distinct than they seem.

In general, Bandura's theories emphasize the reciprocity of many complex variables. Despite the strong associations between self-efficacy for leadership and leadership engagement and effectiveness (Anderson et al., 2008; Paglis & Green, 2002; Stajkovic & Luthans, 1998), Bandura does not claim that self-efficacy is the only or necessarily the strongest of all competing factors. Later in his career, Bandura (1998) acknowledged that 'fortuitous determinants' can confound all other factors in his theory, and that while fortuitous determinants cannot be planned for, they tend to favor extroverts–individuals who seek experiences and exposure.

This study suggests that despite the importance of self-efficacy across long-range trajectories for teachers, it is not the primary determining factor for *initiation* into STEM teacher leadership. Indeed, some teachers suggested that while they were primed to take on commitments, they often did so despite a low sense of self-efficacy for STEM, teacher leadership, or STEM teacher leadership combined. While all teachers eventually overcame their

low self-efficacy for the kinds of tasks they eventually all took on, from giving webinars to developing and managing communities of practice to creating and teaching courses, all across international contexts, *having a high self-efficacy for STEM teacher leadership was not a prerequisite for their initial induction into these kinds of activities*.

Relationship between Personality and Impulsivity in Initial STEM Leadership Acceptance.

Although impulsivity to accept STEM teacher leadership opportunities was a strong theme in my study, it is important to note that the literature reports that there is only a very tenuous relationship between personality traits and leadership engagement (Anderson, 2006). Although Anderson (2006) discusses a plethora of studies that specifically reviewed the relationship between personality and leadership emergence, most relationships were weak, perhaps because of the diversity in the range of leadership contexts and forms of enactment.

Further, it should be noted that while teachers in my study displayed impulsivity at taking on new STEM teacher leadership opportunities, I am not certain that I could ascribe these individuals to be broadly impulsive throughout leadership engagement. On the contrary, many of these teachers were very thoughtful when it came to acting in implementing STEM with their students or with crafting professional development experiences in STEM with others. Teachers were highly conscientious that what they were doing was important, and needed to be done well, crafting detailed objectives, minute-by-minute plans, and aligned assessments for their workshops, and spending hours testing activities in their classrooms before bringing them to the wider community. Their willingness to take risks on themselves by accepting new opportunities was not reflected in more general impulsive behavior.

Contributions to Teacher Leadership Literature.

Findings from this research provide unique insights into teachers' initial transitions into teacher leadership that are otherwise understudied in the literature (Smylie & Eckert, 2018), especially into teacher leadership contexts that are beyond the scope of administrator-appointed building-level distributed leadership (Spillane, et al., 2001b, 2006; Leithwood & Louis, 2011). Additionally, this research helps to draw out what might be potential differences in leadership development between early childhood STEM teachers who are prepared as generalists and secondary STEM teachers who are prepared as specialists.

First, findings from this research support the idea that confidence-building activities unrelated to teacher leadership can result in leadership, such as building a STEM identity. While the teachers in this study were encouraged and expected to be leaders, teachers instead attributed their leadership motivation to their identity shift, not to any kind of leadership training they received. There are indicators that similar findings have existed in the literature for some time. For example, using the language of confidence, teachers have reported how particular confidence-building experiences unrelated to leadership spurred them to desire to lead others (Alemdar et al., 2018; Bundy et al., 2019; Gareis et al. 2011; Howe & Stubbs, 2001; Klentschy, 2008; Mentzer et al., 2014; Sinha & Hanuscin, 2017; Pike, 2009), even if the experience was unrelated to STEM teaching or STEM teacher leadership, such as the engagement of teachers working alongside professional scientists (Howe & Stubbs, 2001).

Second, these findings support general research on leadership that suggests that attitudes and disposition–including embracing impulsivity to accept opportunities–for early childhood teachers in STEM are more important than knowledge–or self-efficacy–in any pdomain (Day et

al., 2009). The teachers in this study built a vision for leadership on their acceptance of unexpected opportunities even when they did not yet feel prepared to lead.

Their stories illustrate that their leadership was often informal, recognized first by those around them before they realized that they had become leaders. Their experiences resonate with the findings of Hanuscin et al. (2012), Criswell et al. (2017, 2018), and Sina and Hanuscin (2017) that STEM teachers often fail to initially recognize as leadership those activities (in which they lead others) that fall outside the bounds of formally recognized roles. This limited initial vision for leadership might be a boon for teachers with low strategic leadership self-efficacy, as they do not necessarily recognize what accepting an invitation to partake in an activity (that includes leadership) might entail.

Over time, these teachers came to understand their role in influencing the profession, leading to an increased sense of leadership identity that was built on their own STEM identity. This finding for early childhood teachers is a bit different than the work of Hite and Milbourne (2018), whose empirically based model for STEM teacher leadership development begins with evidence of scholastic effectiveness (e.g., knowledge of STEM and how to teach it) *before* leadership development, although their own work is restricted to secondary teachers. Additionally, it supports very recent work by Velasco et al. (2021), who found a correlation between STEM teachers' self-efficacy for instruction and their self-efficacy for advocacy, a form of strategic leadership. Findings from this study suggest that self-declared non-experts in STEM can both build up their STEM identity while working toward leadership, at least at the early childhood level where teachers can feel comfortable being explorers and learners alongside their students.

Implications.

This research reveals the potential of early childhood educators as strategic STEM teacher leaders. While early childhood teachers often display low-self efficacy for STEM teaching (Hong Wan et al., 2020; Trygstad, 2012), this fact need not be a barrier to becoming not only STEM implementers in their classrooms, but even teacher leaders, provided they receive the appropriate support. In turn, professional development providers should not overlook early childhood teachers as critical levers in the STEM education ecosystem.

Findings about building early childhood teachers' STEM identity also suggest that programs that aim to build STEM teacher leadership should aim to be a *mirror* for teachers' practice. Programs should not exclusively add to these teachers' existing repertoires, which are bound to already have elements of STEM in them. Effective leadership programs will help teachers to more fully recognize who they already are.

Finally, to maximize opportunities for STEM teacher leadership, pre-service and ongoing teacher education in early childhood should prepare teachers for how to respond to leadership opportunities. These case studies suggest that most teachers' engagement in science education and STEM teachers' strategic leadership was the result of unanticipated events and opportunities in their lives. Leadership came to these teachers as a surprise, and they acted impulsively to accept them. To maximize the potential for encountering these opportunities and to more strategically build skills to influence the profession, teachers could be supported from early in their careers to develop personal attributes that make them more likely to take advantage of opportunities when they come along–tempering teachers' sometimes highly-disciplined attention

to planning and control by rewarding them for risk-taking and saying *yes* to new opportunities, and supporting them when they doubt their abilities.

Limitations.

This study should be interpreted in light of several contextual factors. Teachers came from a wide variety of backgrounds, including different levels of teaching experience, age, personal privilege, STEM education preparation, and country. Critically, this research is limited by the small sample size and an exploration of only seven female teachers' experiences. Below, I describe these limitations and further elaborate upon them in **Chapter 5: Conclusion**.

Cultural affordances and constraints. This study encompasses teachers' experiences across North, Central, and South America, as well as the Caribbean, representing highly westernized countries with a history of colonialism that often turn to U.S. and European social and educational models. Despite this shared cultural foundation across the hemisphere, and research participants' acknowledgment that they felt strongly connected despite coming from different countries of origin, there were local and national tensions that likely influenced the selection of participants for this study.

Effects of the ITEN Teacher Fellowship. This study also looks at a group of teachers who participated in a unique, STEM- and leadership-focused program, the ITEN Teacher Fellowship. As part of their nomination, most of these teachers had been recognized as exemplary teachers in general (if not in STEM). Additionally, the fellowship specifically aimed to build teachers' self-efficacy for strategic leadership in STEM education from an international perspective. The program might have influenced teachers' perceptions about the origins of their strategic leadership engagement through a lens that teachers might not have had on their own. In

effect, the program might have had a persuasive effect on them, leading them to make connections between their early experiences and their engagement in strategic leadership that otherwise might not have occurred.

Gender-linked norms and tendencies in STEM and education. Further, this sample includes perspectives about self-efficacy for strategic leadership from female teachers alone. While the early childhood education teacher community across the Americas is predominantly women, findings from this study might not be simply a matter of STEM teachers' strategic leadership, but reflect a mostly feminine experience that might not adequately capture the self-efficacy perceptions of the smaller percentage of men who teach early childhood. Given that perceptions of gender identity are strongly related to self-efficacy and engagement in STEM (UNESCO, 2017), this study's findings must be interpreted through a gendered perspective, and do not claim to generalize to the wider population of teachers without caveats.

Other considerations. Within the case studies themselves, it is important to note that there was a tension between individual cases and cross-cutting themes. Individual cases led to tentative findings that were highly nuanced and closely linked to very specific, personal experiences. It was only after engaging in coding across interviews that themes such as *STEM identity* and *impulsivity* came to light. In effect, the initial case study cards revealed the most prominent elements of their stories, while the codes revealed the most prevalent themes, even if they were not the strongest, most recognizable themes.

Because of these limitations, findings from this study might not be fully generalizable to all early childhood educators. However, what these findings will do is shed some light on the possibilities for supporting STEM teachers' strategic leadership at the early childhood level, and specifically provide insights on how to foster teachers' self-efficacy for leadership.

Conclusion

This study set out to answer two research questions: "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education*?" My multi-site case study of seven early childhood teachers in the ITEN Teacher Fellowship revealed that it was not a sense of high self-efficacy for STEM teacher leadership that led them to engage as leaders, but rather teachers' impulsivity that led them to respond to the call to leadership opportunities (Finding #1). However, after answering that call, STEM identity establishment was a major source of self-efficacy for their ongoing teacher leadership engagement (Finding #2). Teachers established their impulsive natures by embodying an ethos for service to others, especially those with whom they felt solidarity. Only later, through those opportunities, after commitments had been made and teachers explicitly registered their self-doubt about their abilities, did teachers develop their self-efficacy to engage in STEM teacher leadership. Teachers navigated their initially low self-efficacy for STEM teacher leadership with the support of verbal persuasion from colleagues and fellow leaders, and, most especially, with the emotional satisfaction they received from building their STEM identities and seeing their impact as leaders (Finding #3).

Chapter 5: Conclusion

This study approached teacher leadership through a focus on systems-level change (strategic leadership) rather than on direct instructional impact, and from a disciplinary perspective (STEM education), in a unique context (crossing political and cultural borders within the Americas). By researching an understudied population (early childhood teachers), the study's findings lend new insights into *why* and *how* teachers develop as leaders and have the potential to broaden not only the scope of teacher leadership research that goes beyond the traditional system but has direct implications for how teachers themselves and those who support them can broaden their vision as change agents.

This study pushes against many of the norms of leadership literature: various theories of leadership have taken root in studies of educational management (Amanchukwu et al.m 2015), most of which focus differentially on the roles of personality or traits (Bono & Judge, 2004), knowledge and skills (Mumford et al., 2000), and external contexts (Vroom & Jago, 2007). Teacher leadership literature has primarily emphasized external markers of change through the adoption of structures, policies, and practices intended to improve student learning (Wenner & Campbell, 2017), which explores power dynamics among teachers and administrators. In contrast, I anchor my findings on the personal experiences of early childhood teachers as systemic change agents in a world that sometimes overlooked their STEM competence and leadership capacity.

Answering the Research Questions

This study aimed to answer two questions: "*What do early childhood teachers perceive as their original sources of self-efficacy for strategic leadership in STEM education?"* and "*How*

does their initial self-efficacy for strategic leadership mediate their eventual engagement as international leaders in STEM education?" Self-efficacy for STEM teacher leadership was not found to be a substantial component in teachers' decisions to accept opportunities and commit to being leaders. Underlying my research participants' initial engagement in STEM teacher leadership activities of this type was an impulsive spirit that both propelled them to respond positively to opportunities that they did not fully comprehend at the outset, as well as to continue to accept invitations to support other teachers through leadership. My research also found that, after committing to leadership, early childhood teachers' STEM identity establishment was an overarching source of self-efficacy for strategic leadership in STEM education. Finally, verbal persuasion from friends and colleagues helped to solidify teachers' commitment to leadership when their sense of self-efficacy for leadership began to waver.

Further Considerations

The above findings should be interpreted in light of several considerations about the context of these teachers. Some of these considerations include the international nature of their leadership experiences, their participation ITEN Teacher Fellowship, and gender norms associated with their profession and with STEM.

Cultural Affordances and Constraints

This study does not provide an in-depth analysis of teachers' specific local or cultural contexts, largely because the strategic leaders I studied felt that there were far more similarities among themselves than differences. Most affordances or constraints in their contexts were highly localized, seemingly unrelated to their countries of origin. The belief that their students and

classrooms were no different from those of their peers came across very strongly in the mid-term interviews, where many teachers expressed that the school visits in Peru helped them to realize that language was often the only notable distinction that they observed.

The only time in which I heard teachers speak about explicit, widespread cultural differences in instructional approach was from teachers in the English-speaking Northern Antilles, a group of teachers which I did not include in this study because I was unable to identify strategic leadership in the evidence they provided to the program. These teachers described their early childhood curriculum as strongly influenced by the British educational system, and very rigid. At least two of them described the irony of their school system, which both expected them to wear professional clothing such as dresses and pantsuits while catering to the needs of young children, often by working on the classroom floor. They expressed a desire to include STEM in their teaching, but ultimately felt limited by their national pacing plan, which allowed little room for open exploration. It is perhaps because of these curricular limitations placed on them by the national curriculum that few of these teachers demonstrated explicit strategic leadership in STEM education and were therefore not included in this study.

Some of the strong strategic leaders in my study did describe local constraints on their instructional or leadership practice, but these constraints were less widely cultural or systemic. Instead, these constraints tended to be associated with specific administrative relationships, more at the building level than a result of national mandates.

For example, Jesica described how she saw a stark difference between the private and public-school sector within her country. In her first school, teachers were asked to “march to the same tune” [Final Interview] and she described how she was disillusioned that she was not able to use some of the more creative approaches she had learned about in her pre-service education.

Once she transitioned to a public school, she felt that she was able to do what she wanted instructionally, although she still did not get the support she had hoped to have from peers. She called herself a "local disappointment", even though she believes she is an effective leader at a higher system level: "I'm frustrated, because I would like the five of us [in my school] to work in harmony…but it's not been possible" [Final Interview]. She was able to do what she desired in her classroom, but only in isolation. However, her nomination by the national ministry of education and her engagement in the Fellowship provided her with some of the community support she was lacking in her school when she felt validated that "these desires I have, these ideas that I had, they aren't so crazy, they aren't so unhinged or bad, and they might give good results" [Final Interview].

Likewise, Andrea shared a specific incident with me in which a district evaluator reprimanded her for receiving public recognition as an ITEN Fellow, telling her that "it is not seemly for a regular, everyday teacher to stand out from the crowd of other teachers who are working just as hard as her." Receiving this kind of feedback was extremely distressing to Andrea, and temporarily put a damper on her enthusiasm for her leadership activities. However, at the same time, she received direct support and encouragement from ministry officials to continue her engagement as a strategic leader, including through an offer to be featured in a live-streamed teacher workshop series to make the country's teachers more aware of STEM.

More generally, what I see in this Fellowship was not the confluence of many highly distinct cultures, but a group of individuals who are working against a hemispheric-widespread schoolteacher culture that discourages its members from being different from the expected norms (Lortie, 1975). My observations of interaction across multiple countries in the region also lead me to speculate about those groups of teachers that were excluded from the study–teachers from

British-adherent educational systems where preference is frequently given to hierarchy and formality. However, there are numerous confounding factors, and these kinds of countries are often smaller, more nationally centralized, and teachers are more easily assessed by national leaders. Teachers in these systems might have been more likely to be chosen for their alignment with government policies. While all participants in the Fellowship were likely highly effective teachers in their own right, teachers who I did not select for this study might not have been nominated to the Fellowship for their tendency to deviate from expected norms and/or to lead strategically at an international level that was of limited interest to local education systems.

As a result, I suspect that restrictive national systems potentially discourage and stifle strategic leadership and that in countries where the curriculum is more permissive, local and national factors often work against each other. However, national and international systems often provide an outlet for teachers who are eager to lead yet are not well-accepted among their proximal peers. Because of this intra-country variation within teachers' home contexts, the international element of strategic leadership among these teachers is less likely to be about cultural mixing and more related to expanding social networks that permit leadership to take place within a community.

Effects of the ITEN Teacher Fellowship

Although this study did not attempt to evaluate effectiveness of the ITEN Teacher Fellowship, teachers reported the effect that it had on their trajectory, particularly for those teachers who were very new to leadership and to STEM (see Figure 4.1). For the majority of Fellows, it was an opportunity to become exposed to STEM formally for the first time, and to have access to a privileged identity that they now desired to share with the world. For all

teachers, being part of the ITEN Teacher Fellowship was a status symbol that gave them a platform from which to showcase their identity and a pathway to spread it to others.

As part of the mid-term interviews, almost all participants, including those individuals not included in this study, described the value of participating in the Peru experience to advance their understanding of culturally relevant STEM, and for thinking about themselves as teacher leaders for the first time. Andrea described this in her Final Interview as follows: "You helped us to understand that STEM was not just about doing math, and that STEM wasn't just about doing drop-in projects. Rather, it was really about developing critical thinking." Teachers did not describe STEM exclusively as a content field, but as a thematic, inquiry-driven approach to inciting students' curiosity about the world around them and serving as co-explorers alongside their own students. Likewise, numerous teachers in their Final Interviews described that they recognized their own leadership only after being told they were leaders by others around them.

Teachers valued various parts of the professional development program, from learning about the Reggio Emilia approach (which contrasted with some of the teachers' more structured, basic knowledge and skill-based curricula), to making use of everyday materials to do math and science in place of commercial materials or advanced technology (such as plants and animals in the schoolyard, to recyclable materials). None of these teachers spoke explicitly in the language of culturally relevant pedagogy, but most of them spoke about how their eyes were opened to the fact that they could teach STEM with materials they already had, as they had originally perceived the lack of scientific or technological equipment as a barrier to being STEM teachers.

The result of this professional development program varied widely, with student-driven scientific inquiry and mathematical modeling, and the use of everyday materials being the common factors. For example, submitted lesson plans demonstrated that Andrea had students

design and care for a garden composed of local crops, Amanda had students find caterpillars in the schoolyard to watch them develop into butterflies, Jesica created an experiential model on healthy eating including role-play and cooking based on the national nutrition guidelines, Vanessa help students create soaps with native herbs and helped students create a mini business to sell them, and Cara had students carry out durability tests with various types of cardboard and paper from recycled materials.

Before the Fellowship, only Ana and Vanessa explicitly described specific professional activities that had led them to have a strong sense of STEM identity: Ana was pulled into supporting science teacher workshops by a local professional development initiative, and Vanessa earned a master's degree with a specialization in mathematics education. Ana and Vanessa both saw the ITEN Teacher Fellowship as a recognition that would allow them to share their skills more widely. In Peru, Ana brought along multiple demonstrations and activities that she carried out during some of the dinners and after evening programs. Vanessa was somewhat more reserved, but she took advantage of the experience in Peru by giving an interview for a local TV station to showcase how her prior expertise and recognition were leveraged with a new international network.

Along the way of the Fellowship, teachers also expressed their appreciation for being better connected to leadership opportunities, and for having an experience of companionship to explicitly recognize and carry out leadership roles. The Fellowship Coordinator and I routinely looked for opportunities to feature the Fellows and their work, especially through their attendance and presentations at various conferences, or publications in blogs and journals. In our interactions, we often had to remind people that by engaging in these actions, they were already leading others. These opportunities were formally embedded into a required teacher leadership

plan across the final twelve months, which entailed reflecting on strengths and areas for growth as a leader, as well as planning and carrying out a project of their choice to impact no fewer than 20 other educators to improve the quality of STEM education through instruction or other systemic initiatives. The Fellowship Coordinator reviewed Fellows' goals and plans, and monitored their activities, providing motivational, technical, and even financial support. Notably, not all these activities rose to the level of strategic leadership (for example, some teachers chose to offer one-time webinars or work on non-systemic issues), but the majority of those who did have continued to engage in these activities on their own even beyond the fellowship.

In short, the Fellowship provided opportunities for developing a STEM identity through its professional development component, as well as a platform for pathways to leadership. The program itself likely had no bearing on teachers' initial acceptance of commitments to engage in strategic teacher leadership in STEM education, as teachers accepted the role of Teacher Fellow, with its leadership commitments, before joining the program. However, it is possible that the program's affiliation with the Organization of American States, a well-recognized organization across the region, might have influenced their commitment, although teachers did not express this outright in any of their interviews or documentation. Once in the program, I am convinced that teachers' innate desire for leadership became newly oriented toward STEM, as few of the teachers expressed an affinity for or knowledge of STEM before the program. Critically, this program included multiple structures that allowed teachers to act on their new STEM identities by providing the guidance and means to become vocal advocates and strategic leaders.

Gender-linked norms and tendencies in STEM and education.

All the actors in this study were female, from the researchers to the participants. Most participants' colleagues were also female. While we know that self-efficacy is STEM tends to be lower for predominantly female early childhood educators compared to other teachers who teach STEM at higher grade levels (Trygstad, 2012; Hong Wan et al., 2020), we do not know how self-efficacy for STEM education compares between early childhood teachers and the wider population and how those differences might affect teachers' motivation to teach STEM or be a strategic leader in STEM.

In particular, some cultures or economies are not directly reliant upon technical fields and therefore may have little conceptualization of STEM and its common gender disparities. For example, one thing I learned early on when working with secondary physics teachers across the Caribbean is that the demand is so low for careers in the physical sciences, that there is little impetus to encourage students–male or female–to pursue advanced studies in those fields. Agriculture and tourism receive much greater priority in meeting local needs, with physics and chemistry being a greater concern for the privileged few who might study and acquire a career abroad. Indeed, this Fellowship did reveal that even after the first year of the Fellowship, teachers still tended to focus on life science topics more than fundamental physical principles.

It is not clear if participants' gender had any influence on the development of their STEM identity and their eventual foray into strategic leadership in STEM education, but it is worth considering that early childhood teachers in this study may have different understandings of gender stereotypes than, for example, secondary teachers who specialize in STEM. It is also noteworthy that the two ITEN team members who most closely interacted with them were female, one who is a practicing physicist and another who specialized in secondary physics

education, meaning that these team members might have been these teachers' only direct link to professional STEM practice. As a result, it might not be possible to directly apply the findings from this study to more gender-diverse, upper-level educators who specialize in STEM, and who might harbor feelings of different intensity or nature about gender gaps, influencing their own STEM identities and their motivations to be leaders.

Future Research Directions

While not fully explored, there were several additional prominent themes in the findings that merit additional investigation. First, the teachers in this study often expressed identities that they shared with students and other members of the teaching profession, helping them to feel a sense of solidarity with others that extended beyond their classrooms or schools. Second, the teachers expressed how particular individuals–often close friends or colleagues–identified their potential or leadership or their engagement in leadership before they saw themselves as leaders.

Both themes are worth exploring more in-depth in future research, especially as these aspects of identity and social-emotional connection with stakeholders and other members of their profession are rarely listed among traits for effective professional development. Well-referenced resources for effective teacher professional development, such as Darling-Hammond et al. (2017) and National Academies of Sciences (2015) provide scant explicit attention to teachers' sense of identity or personal connection as part of those professional development activities.

Solidarity

The findings from this study poignantly demonstrate how the strategic leadership pathways of the seven teachers I interviewed orient their professional work both inside and

outside the classroom toward actions that express solidarity with those who might not have the same privilege. For example, Ana expressed solidarity with other Spanish-speaking teachers, Cara with Islamic-based schools that are not part of the public system, and Vanessa and Andrea with students living in high poverty. These teachers exuded a proactive, morality-based sense of obligation or duties that they could carry out through their leadership work that reflected an understanding of relational solidarity (Gaztambide-Fernández, 2012) because of their privileged roles. Further, while not explicitly identified by the research participants, many of their efforts to bring joy to the teaching and learning of science through their leadership echo the pedagogy of liberation ideals espoused by Paulo Freire (1972) that were often mentioned by teachers in the ITEN Teacher Fellowship.

I also expect that these feelings of solidarity are linked to a sense of pastoralism, or affectionate care, that these teachers now express through leadership among their peers. My personal experience as a teacher combined with what I observed in these teachers over two years suggest to me that teachers shift and expand their attention when they realize their community has growth. I suspect that effective and passionate teachers center their attention on systems they believe they can serve. For teachers inexperienced in leadership, these systems are usually restricted to the classroom, like-minded peers, and others within the school building. As teachers slowly start to realize that they are part of a larger system and make professional space to interact with other adults, they begin to realize that their leadership can influence other educators as well.

Although I did not fully explore how teachers felt their own STEM identities connected to the wider world of STEM professionals or STEM as a human endeavor, I anticipate that teachers felt empowered by being able to claim STEM identities. In my own experience, the ITEN team and I explicitly and frequently made note that “Early childhood teachers are STEM

teachers, too." As part of our recruitment efforts, we always clarified that we did not seek STEM specialists, but effective early childhood educators who took on the responsibility of teaching STEM, placing them on equal footing with their STEM-teaching peers in secondary education who also participated in the Fellowship. Further, we shared information with participants about gender discrepancies in STEM and the relevance of STEM to 21st century challenges as part of the Fellowship experience, emphasizing the centrality of STEM to educational equity and survival of humanity. I am curious to know if teachers felt that the way we discussed the importance of STEM, the importance of their roles as STEM educators influenced their resulting identity.

Questions remain as to how teachers' multiple, intersecting identities–as a teacher of students, as a colleague of other teachers, and as STEM people–might complement or conflict with their view of themselves as leaders. Solidarity, which is more typically associated with peace education and moral leadership, has also been associated with STEM teachers' advocacy work (Vieyra & Edwards, 2021). How STEM teachers' other identities (i.e. non-STEM) develop or can be developed through professional development might shed light on the roots of teachers' leadership commitment.

Friendship

Teachers' self-efficacy for leadership in science education sometimes originated through sustained invitations and encouragement from close friends. Friendship at the root of teacher leadership actions is not prominent in the leadership literature. Rawlins (2009) reported that the role of friendship in social systems was relatively ignored by scientists until the mid- to late-1980s. Rawlins explored the various types of friendships, identifying *true friendship* (a kind of

friendship in which both care for each other) versus *civic/political friendship* (a kind of friendship in which both collaborate to achieve a common good for all). Ana, Miranda, and Andrea illustrated the importance of true friendships at the start of their leadership careers, while many of the other participants referenced how they maintained civic/political friendships to achieve their goals.

Cases in this study also demonstrate that friendship with leaders engenders more leadership. Mehra et al. (2009) found from a social network study of a group of university students that: "...the friends of individuals who were perceived as leaders came themselves to be seen as leaders" (p. 159)." Taking my work and that of Mehra et al. suggests that perhaps a critical part of leadership development is to foster friendship among leaders and potential future leaders, like formal mentoring activities, but with an orientation toward more than professional relationships alone.

Additionally, the kind of trust that was established by their friends and supervisors allowed them to identify sparks of interest in the research participants. In effect, all of the teachers in this study received support for their self-actualization—the teachers were not just encouraged to attend professional development just to see better student outcomes, but to grow as individuals. The experiences of each of the teachers are somewhat reminiscent to me of the Developmental Assets® Framework (Search Institute, 1997), which has been used to help identify and nurture various internal and external assets to promote adolescent engagement and success (Scales et al., 2016). In effect, the various friends and supervisors viewed each teacher participant as learners themselves and saw specific sparks of interest and curiosity that they encouraged toward leadership action.

Both solidarity and friendship are worthwhile elements of teacher leadership to explore moving forward. In my study, the teacher participants often built communities of teachers around them–composed predominantly of women. As a result, I am impressed by the similarities my research shares with research on grassroots community-led change efforts and social work. Theological care, for example, adopts "a pastoral rather than a power-oriented approach to leadership" (Dreyer, 2002, p. 43). Similarly, certain feminist ideologies eschew associating leadership with the power to delegate, instead emphasizing relational approaches to leadership, such as Perrault's (2005) analogy of *leadership as friendship*. Connecting the ideas of solidarity, friendship, and leadership could help transform the vision of teacher leadership as a process whose end goal is to improve school building efficiency and student achievement to one that more equitably considers the positive impacts on the teachers themselves.

Recommendations and Final Reflections

It is my great hope that this study demonstrates that the educational community should recognize the potential of early childhood teachers as strategic STEM leaders and that the community should create leadership opportunities for them. STEM-related professional development providers should build teacher leadership supports alongside STEM training and identity development for teachers, recognizing that early childhood teachers are sometimes desirous of opportunities and outlets to share their transformation with other educators. Specifically, U.S.-based programs such as the Albert Einstein Distinguished Educator Fellowship, Presidential Awards for Excellence in Mathematics and Science Teaching, and Robert Noyce Scholars and Fellows programs should expand eligibility to explicitly include early childhood teachers.

I hope that the academic community sees that this study emphasizes the reciprocal benefits of strategic teacher leadership on classroom instruction, especially in the context of STEM education. As illustrated by the teacher participants, the opportunity to commit to and engage in teacher leadership became a channel for building teachers' STEM identity–not the other way around. While it is potentially feasible to build teachers' STEM identity and see leadership as an unanticipated outcome, this research study demonstrates that low self-efficacy for STEM teaching should not be an obstacle to inviting teachers to engage as leaders, seeing them become successful with instruction and leadership.

I also hope that those who support early childhood teachers on a day-to-day basis acknowledge the impact they can have by helping teachers act on their impulse to say yes to new opportunities–through direct invitation, follow-up encouragement, or, at the very least, removing obstacles to teachers' involvement in leadership. Administrators, students' families, colleagues, family members, and friends, should become aware of the impact they can have on helping teachers to see and accept new opportunities for leadership and on sustaining their engagement when they begin to doubt themselves.

While teacher leadership, broadly, continues to garner international attention for the solutions it promises to educational struggles, STEM teacher leadership holds special esteem for STEM's association with 21st-century skills, workforce readiness, and economic competitiveness. In this political and intellectual milieu, this study reveals a more human-centric approach to leadership. It illustrates the personal transformation of early childhood teachers as they developed a STEM identity and launched into the leadership of others, often despite low self-efficacy after accepting opportunities. The early childhood teachers I studied evoked their *acting on their impulsivity to say yes to leadership opportunities* and the *joy of being a STEM*

person (STEM identity) as the core motives behind their strategic leadership engagement. As the educational community continues to push for more leadership opportunities and more STEM, early childhood teachers can provide us with insightful lessons about the importance of emotive elements and identity in leveraging teachers' important contributions to strategic educational change.

Appendix A: ITEN Program Design

The U.S. Permanent Mission to the Organization of American States (OAS), a branch of the U.S. Department of State, currently supports a three-year (2019-2021) $2.5 million dollars effort to support STEM teacher leaders as change agents across the Americas through the Inter-American Teacher Education Network (OAS, n.d.). As science-specific teacher education and research on teaching is relatively novel across Latin America and the Caribbean (Medina-Jerez, 2016), this effort focuses on supporting STEM teachers' strategic leadership with the goal of networking and supporting individuals who intimately know classroom-level practice and can also be boundary-crossers to improve STEM teacher education through their interactions with policymakers.

History

The Inter-American Teacher Education Network (ITEN) contributes to the improvement of the quality of education in the Americas (North America, South America, and the Caribbean) by promoting knowledge exchange, capacity building, and technical assistance, through the use of virtual tools and in-person activities targeted at teachers and policymakers. It is a program situated within the Organization of American States (OAS), a multilateral organization composed of representatives from 34 member states across the Americas. ITEN was envisioned during the *Seminar for Teacher Educators* in the Americas held by the Ministry of Education of Trinidad and Tobago in 2006, in which Member States acknowledged the importance of teachers in assuring quality education. In 2009, the support of ITEN as a project became an institutional mandate arising from the *Declaration of Quito* at the Sixth Inter-American Meeting of Ministries of Education within the framework of the Inter-American Committee for Integral Development

(OAS, 2003). The mandate highlights the importance of strengthening teacher education in the region to respond to 21st-century education needs.

In 2012, the program received special funds from the U.S. Mission to the OAS (a branch of the U.S. Department of State), to significantly expand these activities and to make more formalized partnerships among OAS member states to support teachers. Five years later, the Inter-American Committee on Education, composed of Ministers of Education across the hemisphere, adopted the *Inter-American Education Agenda* in 2017 (OAS, n.d.), which set the stage for regional efforts to promote three pillars: (1) quality, inclusive, and equitable education, (2) strengthening of the teaching profession, and (3) comprehensive early childhood care. ITEN was assigned as a primary executing mechanism for the second pillar.

During its first three funding phases, ITEN focused on developing a multimodal approach to strengthen the teaching profession to promote general pedagogical practices, such as critical thinking, literacy skills, and civic responsibility. ITEN did so through a variety of technologies (audio, online learning, broadcasts), diversified online learning modalities (online courses, virtual toolkits, webinars, virtual communities and massive open online courses), and through both blended and face-to-face professional development opportunities.

According to the final evaluation report of the third funding phase, ITEN "demonstrated a strong level of relevance and alignment to OAS mandates" (Adrien, 2018) from the Inter-American Committee on Education. However, this phase fell short with regard to measurable changes in either policy at the institutional level or practice in the classroom. The evaluation suggests the program management team attempted to accomplish too much—it was not able to achieve a coherent pathway of sustained engagement for either Ministries of Education or their teachers and was unable to develop a robust plan for effecting the change that was intended.

Design Principles and Management

I was invited in April 2018 by the U.S. Department of State to participate in a face-to-face meeting in Panama, which was attended by institutional officials who had participated in ITEN. The purpose of my attendance was to view the outcomes of the project from my perspective as a teacher, and to provide guidance to the U.S. Mission for a fourth stage of funding. In the span of a few short months, I was unexpectedly recruited to re-design the program to better align with research on effective institutional change and to ensure greater sustainability.

In partnership with the desires of the U.S. Administration, I prepared a proposal for a three-year project that narrowed the focus of ITEN from general teacher education to science, technology, engineering, and mathematics (STEM) teacher education. I selected STEM, which was well-aligned with U.S. administration priorities, with the hopes that I would be able to support teachers in specialized high-demand STEM fields and also work toward closing gender gaps in STEM (in terms of educational access, performance, and career aspirations) by helping teachers to understand the reasons behind those gaps and work to close them. To do so, the program included teacher education about statistical gaps in student performance, affect, and career selection (UNESCO, 2017), and disseminated evidence-based interventions such as those available through the American Physical Society and the American Association of Physics Teachers at STEPUP.org.

I then selected an even narrower group of teacher populations with which to work: early childhood teachers (to address the traditionally limited physical science instructional self-efficacy (Trygstad, 2013) of this predominantly female group), and secondary physics teachers (to address the traditionally limited physical science self-efficacy and career aspirations of young

women at a time when they are making major decisions about higher education (Hazari et al, 2017)). For my purposes, I use STEM and science education interchangeably.

In selecting this focused subset of the field of teacher education, I aimed to build a strategic network that linked policy and discipline-specific, evidence-based practice. The program design was largely inspired by my own successful involvement with 100Kin10 (n.d.), a network of STEM education stakeholders in the U.S. that exemplified the kind of coherence and community engagement I wanted to engender across the Americas.

I ultimately designed the project around two main principles:

- **Increasing the cultural awareness of STEM-specific pedagogical needs of teachers**, including the promotion of (1) discipline-based or integrated-STEM specific educational research as a base for policy and practice and (2) improvement of educational opportunities in STEM fields, especially for girls and young women, through teacher education with a gender perspective.
- **Increasing the capacity for change in education by positioning preK-12 STEM teachers as leaders in partnership with their governing educational agencies and institutions**, by providing explicit training in leadership and including them as equals in conversations related to policies that affect them and practices they carry out in their work.

The specific goal of the project is “To contribute to the increase of the quality of STEM education in the Americas for all students,” with a more specific 3-year purpose “To increase the capacity of education leaders (teachers, teacher educators, and educational agency leaders) to work collaboratively to implement solutions to shared problems of policy or practice in STEM

teacher education" (OAS, n.d.). In turn, ITEN's multi-level objectives address the collaborative nature of work with the equitable inclusion of multiple stakeholders, improving teachers' capacities as STEM teacher leaders, and improving educational agencies' capacity for offering STEM teacher professional development. To meet these objectives, ITEN's major mechanisms include three components as part of an annual cycle that is renewed at the start of each calendar year: Project Teams, funding opportunities, and the Teacher Fellowship. All of these mechanisms interacted with one another, and the teachers involved in ITEN often benefited from one or more at a time.

Project Teams are collaborative groups formed by two or more Ministries or other institutions of teacher education that are committed to identifying, testing, or implementing a new or modified solution to a shared problem of policy or practice in STEM teacher education. Teams include a representative from a teacher education institution (typically a ministry, university, or professional society) and one practicing preK-12 STEM teacher from each of two or more countries who want to work on a shared goal. Over the period of 6 months, teams meet virtually with an ITEN team member to facilitate the development of vision, goals, logic model, and execution of their project to improve STEM teacher education in the region. To support the network of Project Teams, ITEN hosts virtual poster sessions and multi-day seminars. Teams that successfully pass through the Project Team cycle are then eligible to request competitive funds for international travel to learn from each other in-person or to create pilot versions of their collaborative solutions. All preK-12 teachers who were nominated to be a part of Project Teams in 2019 were asked to also accept the responsibilities of participating in the ITEN Teacher Fellowship.

Appendix B: ITEN Literature Review Summary

An overview of the nature of the literature' conceptualizations of science teachers' strategic leadership.

Authors	**Structure**	**Perspective**	**Reference to *Strategic Leadership*** In regard to the conceptualization of science teacher leadership overall.
AAPT Master Teacher Leader Task Force. (2017)	Model/ Framework	Researcher, Teacher	Essential: Provides explicit performance indicators for instructional, association, and policy leadership at state and national level.
Alemdar, M. et al. (2017)	Model/ Framework	Researcher	Peripheral: References 'vision for producing change in the system' (p. 3) and teachers' movement toward working beyond the walls of the classroom.
Author, (2019)	Descriptive Illustrations	Teacher	Essential: All activities describe state or national-level policy and advocacy work.
Cheung, et al., (2018)	Model/ Framework	Teacher, Administrator	Peripheral: Activities in the framework include 'contribute to the science teacher leader community' (p. 40) and 'keep abreast of science-related policies, expectations, and decisions' (p. 41).
Criswell, et al. (2017)	Model/ Framework	Researcher	Essential: The goal of the project was to 'move these...teachers...along a pathway toward influencing teaching and learning practices locally, regionally, and even nationally' (p. 814). The authors argued that by supporting professional vision, practice, identity, and purpose 'facilitates analysis and creation/modification of policy' (p. 832).
Criswell, et al (2018)	Model/ Framework	Researcher	Essential: As a result of seeing teachers move toward desiring to solve systemic problem beyond the scope of the districts, the updated conceptual framework includes 'teacher leader as policy voice' (p. 1281).
Davis (2009)	Descriptive Illustration	Teacher	Peripheral: Personal reflection on growth from an elementary science teacher to a university teacher educator who advocates for gender equity in science education.
Doraiswamy et. al, (2016)	Model/ Framework	Researcher	Peripheral: Teachers' leadership activities were assessed using the Teacher Leader Model Standard, and Domain #7: 'Advocating for students and the teaching profession' was dropped from the assessment due to the high number of non-applicable ratings.
Galosy & Gillespie (2013)	Model/ Framework	Researcher	Essential: The author argues that the studied program helped build '*professional capital*' (p. 215), a construct for leadership that is shared across the national-level Knowles teacher fellowship.
Galosy et al. (2017a)	Model/ Framework	Researcher	Essential: Of the 18 STEM leadership programs studied in this meta-analysis, about one-fifth were geared toward multi-state or national reach.

Galosy et al. (2017b)	Model/ Framework	Researcher	Essential: Of 12 STEM teacher leadership programs whose definitions of teacher leadership were analyzed, two included policy advocacy and one included specific types of reform advocacy.
Gareis et al. (2011)	Descriptive Illustrations	Researcher	Essential: On average, teachers who participated in the Einstein Fellowship decreased their engagement as school and district-level leadership, and increased their regional, state, and national-level leadership.
Gess-Newsom & Austin (2010)	Model/ Framework	Researcher, Teacher	Peripheral: Teachers leaders in the case studies described potential for impacting state policy and collaboration with pre-service programs.
Greitz Miller (2009)	Descriptive Illustrations	Teacher	Peripheral: Personal reflection on growth from a high school science teacher to grant coordinator to university faculty researcher and teacher educator, and the importance of the 'Master Plan' (p. 113).
Hanuscin et al. (2012)	Model/ Framework	Researcher, Teacher	Essential: Self-reports of physics teachers' leadership engagement rank involvement in pre-service teacher education and contribution to the profession as among the lowest forms of engagement. Even when teachers do participate in those forms of leadership, they do not consider it leadership.
Author (2018)	Model/ Framework	Researcher	Essential: Strategic leadership is described as the pinnacle of a developmental model presented by the authors. Professional association formal leadership and conference presentations are the most frequent mechanisms for strategic leadership.
Howe & Stubbs (2003)	Model/ Framework	Researcher	Peripheral: Strategic leadership was an unanticipated outcome of this program, but is emphasized as a culminating effect of confidence growth in each of the case studies.
Klein et al. (2018)	Descriptive Illustrations	Researcher, Teacher, Administrator	Essential: The authors noted that school administration sometimes see teachers' strategic leadership work as 'outside of [their] agenda' (p. 101).
Klentschy (2008)	Descriptive Illustrations	Researcher	Essential: The authors argue that 'teacher leadership at both the system and school level is an important part of...science education reform' (p. 57).
Lederman & Lederman (2010)	Descriptive Illustrations	Researcher	Essential: The authors describe a leadership-focused master's degree program that incorporates strategic leadership activities.
Luft et al. (2016)	Descriptive Illustrations	Researcher	Peripheral: The national program included curriculum on the systems of science education, including 'local, regional, and national policies that related to the science classroom,' but the actual program outcomes were not fully aligned with intended results.
Mentzer et al. (2014)	Descriptive Illustrations	Researcher	Peripheral: Participants in a teacher leadership program demonstrated significant gains in confidence in leadership skills,

			aligned with the leadership curriculum presented (based on the Teacher Leader Model Standards, which includes contributions to the profession).
National Research Council (2014)	Descriptive Illustrations	Researcher, Teacher, Policy Influencer	Essential: The roles and opportunities for STEM teacher leadership are discussed, including the 'influence on professional development in their schools, districts, states, and nationwide' (p. 5), as well as on policy changes 'which can have a more widespread effect than classroom improvements if they are system-wide' (p. 10).
Peterson (1962)	Descriptive Illustrations	State Administrator	Essential: Roles of state science supervisors described in terms of contributions to curriculum development and adoption, pre-service and in-service teacher education, science facilities, staff and public relations, and research. *Note: The assumption appears to be that this role would be held by a knowledgeable secondary science educator, but it is not explicit.
Pike (2009)	Descriptive Illustrations	Teacher	Peripheral: Personal reflection on desire to have impact beyond the classroom, to move into disciplinary administration (curriculum coordinator) and have impact at the state and national level.
Rice (1961)	Descriptive Illustrations	Professional Society Lead	Essential: The author applauds the work of secondary science teachers and university faculty to develop curricular resources for the nation.
Sato et al. (2010)	Descriptive Illustrations	Researcher	Essential: The authors propose a programmatic model that uses universities as hubs for connecting disciplinary science teachers across districts to serve as mentors for pre-service support and induction.
Sinha & Hanuscin (2017)	Model/ Framework	Researcher, Teacher	Essential: Teachers tend to recognize only formal positions of leadership. Despite perceptions of what leadership is not being a result of years of experience, actual leadership activities, including strategic leadership (most notably in terms of association leadership and pre-service education) do increase with years of experience.
Sublette (2013)	Descriptive Illustrations	Researcher	Peripheral: Teacher leadership should happen from the classroom, but teachers can get involved in wider activities such as grants and liaising with industry,
Yeotis et al. (2009)	Descriptive Illustrations	Teacher	Peripheral: Personal reflection on growth from high school science teacher to university teacher educator, including determination to overcome struggles of isolation as a female in STEM.

Appendix C: A Framework for STEM Teacher Leadership

This article is a slight modification of an excerpt from **Aspiring to Lead: Engaging K-12 Teachers as Agents of Change in Physics Education**, a publication of the American Association of Physics Teachers, edited by Rebecca Vieyra. The original document carries a Creative Commons Attribution 4.0 copyright, which permits its adaptation.

Framework Background

Teacher leadership development requires a continuum of experiences, starting in the early career phase. Teacher needs differ at different points along the continuum, requiring distinct experiences for early-, mid-, and late-career teachers. However, these experiences should build upon one another and align with a coherent framework for teacher leadership. These programs should also leverage existing master teacher leaders' expertise in all phases: for novice teachers, this might mean receiving mentorship to help with instructional strategy; for late-career teachers, this could mean advising novice teachers on how to advocate for effective STEM education policies. Regardless, master teachers should serve as integral components of this cycle, bolstering the community of master teachers.

The Framework

Teacher leadership behaviors can be demonstrated by both emerging and transforming teachers; emerging leaders are those teachers who are beginning to demonstrate leadership attributes, while teachers described as transforming have already demonstrated and/or have been recognized for their accomplishments in the instructional, association or policy realms.

Synthesizing these perspectives, a framework for STEM teacher leadership can identify both the behaviors and attitudes of teacher leaders along a variety of dimensions, including sphere of influence (instructional, policy, association), experience (emerging and transforming) and level of engagement (local, state, national in their home country, as well as international). Moreover, teacher leaders can be emerging or transforming at the local, state, or national level in any of the three areas. This framework builds on the National Education Association's Teacher Leadership Competencies, but is fine-tuned to the needs of STEM teacher leadership and the specific actions that STEM teacher leaders can take both to assess their leadership competence and engagement, as well as to plan for leadership growth.

This framework is built on the ideas of diversity, equity, and cultural competence, as well as overarching competencies. We detail leadership by sphere (instructional, policy, association) below.

Instructional Leadership

The majority of teacher leaders identify themselves as instructional leaders. Such teacher leaders believe that their pedagogical content knowledge is open to growth, they seek to improve their pedagogical content knowledge through reflective practice, and they learn about and provide research-based strategies for best practices for other teachers. STEM teachers who are emerging instructional leaders might attend local, state, or national meetings or events as an observer or an attendee, seeking ideas or mentorship from those experiences, and they implement initiatives in their classroom to improve their own practice. STEM teachers who are transforming instructional

leaders also attend local, state, national, and even international level meetings and contribute sessions to those meetings. They also lead initiatives to improve others' practice.

The following are *some* indicators of STEM teachers who demonstrate Instructional Leadership at emerging and transforming levels:

		Emerging	**Transforming**
		Instructional Leadership Performance Indicators	
Broad Mindsets and Beliefs ● Their general and STEM pedagogical content knowledge is open to growth. ● They actively seek to improve their STEM pedagogical content knowledge through reflective practice. ● They learn about and provide research-based strategies for best practices to other teachers. ● They mentor novice teachers. ● They attend, plan, and present professional development to other teachers. ● They participate in professional learning communities and share ideas through face-to-face interactions (departmental/district meetings, workshops, conferences, mentoring) and media (journal publications, webinars, blogs, curriculum development). ● They move collaborative teacher groups (professional learning communities) toward impactful changes in their teacher practice (leading with confidence as opposed to merely sharing). ● They advocate for STEM education for all students. ● They integrated student-relevant and appropriate cross-curricular topics into STEM education. ● They seek and are aware of	**Local / State / National**	● Participates in professional development events as an observer/attendee in the home country. ● Implements local initiatives (standards, missions) to improve own practice in the home country. ● Remains connected to pre-service teacher education institutions.	● Contributes a session, presentation, poster, workshop, or publication at a STEM education gathering in the home country. ● Leads initiatives (standards, missions) to improve others' practice in home country. ● Contributes to pre-service teacher education institutions through serving as a cooperating teacher, teacher-in-residence at a university, or recruit of future STEM teachers.
	International	● Participates in professional development events as an observer/attendee outside of the home country. ● Implements global initiatives into own teaching (i.e., UN Sustainable Development Goals)	● Contributes a session, presentation, poster, workshop, or publication at an international STEM education gathering. ● Supporting educational leaders in other countries to overcome STEM education instructional challenges. ●
	Attitudes and Skills	● Seeks out support from other teachers and professional societies for survival. ● Seeks out a personal mentor. ● Learns about STEM education through readings, workshops, and classes. ● Remains abreast of developments in STEM and recognizes personal content strengths and deficits. ● Uses innovative teaching approaches or strategies. ● Understands that STEM is contextual, and connects to other subject matters (society, art, etc.).	● Seeks out support from other teachers and professional societies for self-improvement in specific areas. ● Reaches out to novice teachers who need help and extends a personal invitation to others to become a leader. ● Implements STEM education research-based practices by using them in the classroom. ● Engages in authentic opportunities to deepen STEM content knowledge (courses, research experiences, internships, etc.) ● Uses multiple approaches or strategies from one's

financial, technological, curricular, and instructional resources that support STEM teaching.		● Develops or modifies lesson plans to meet the unique learning needs of one's students. ● Is aware of and works against implicit gender bias in the classroom. ● Makes appropriate curriculum and instructional decisions based upon the available financial, technological, curricular, and instructional resources. ● Utilizes culturally-responsive teaching techniques to meet the needs of diverse learners. ● Discusses new approaches with colleagues. ● Identifies academic environments or scenarios that promote their professional growth.	repertoire, and knows how to prioritize them. ● Proposes new ways to teach or develop new materials, experiments, activities. ● Develops the ability to adapt their teaching practice in different contexts or emergent situations. ● Encourages others STEM teachers to integrate the sustainability vision and natural environment care in the instructional activities. ● Teaches STEM in context by making it relevant to students' lives and other aspects of the world. ● Supports other STEM teachers through the creation of curriculum and instructional resources. ● Proactive works to promote social justice in STEM and STEM education. ● Seeks out funding for necessary teaching resources (writing grant proposals, requesting funds from ministries, being involved in school renovation plans, etc.) ● Encourages other STEM teachers to be culturally-responsive in their teaching. ● Models new approaches for colleagues, parents, and the community (through invitations to the classroom, etc.) and helps others to move from awareness to implementation of STEM. ● Create academic environments or scenarios that promote the professional growth of others.

Policy Leadership

Teacher leaders might also find leadership opportunities in educational policy. Such teacher leaders understand the relationship between policy and classroom practices and they understand how to effectively advocate for good policy solutions. They recognize that teacher voice is both necessary and credible in policy discussions. STEM teachers who are emerging policy leaders understand the context of district, state, and federal policies, as well as international strategies and initiatives. They can recognize the difficulties that arise from ineffective policy at these various levels, and they know how to shift from

problem-focused to solution-focused thinking in regard to policy. STEM teachers who are transforming policy leaders take steps toward influencing departmental/school-wide, district-wide, state-level, or federal-level policies. They generate ideas through innovative thinking, and they share those ideas with stakeholders. They assure that teachers' voices are heard in policy discussions and they encourage other teachers to develop policy understanding and action.

The following are *some* indicators of STEM teachers who demonstrate Policy Leadership at emerging and transforming levels:

		Emerging	**Transforming**
			Policy Leadership Performance Indicators
Broad Mindsets and Beliefs They understand how to translate best practices from their classrooms into viable policy solutions (or, conversely, use policy to solve problems that exist in their classrooms). They understand how to effectively advocate for good policy solutions. They understand the interplay between policy and politics, and understand how to navigate situations that require one, the other, or both. They have a strong network of professional contacts that can help them accomplish their policy/advocacy goals. They are comfortable engaging with policymakers and are willing to invite policymakers into their classroom (in-person, or through illustrations) to provide firsthand experiences of master teachers. They understand both the current policy as well as the way this policy came to be and the issues it intended to address.	**Local / State / National**	• Understands the context of and implements policy of the home country. • Identifies home country policy and hurdles (struggles, issues) that appear in the classroom as a result of "poor" policy or "poor implementation" of policy. • Identifies contact persons who are levers of policy change (department chair, school head, ministry or secretariat of education, colleagues). • Maintains an open-door classroom to keep a two-way conversation with policymakers.	• Influences and supports others to implement policies appropriately. • Takes steps toward influencing departmental/school/district/country policy (such as helping to write standards or curriculum or serving on a committee/council). • Makes new opportunities and invites others to join in policy leadership. • Invites policymakers into the classroom experience to understand the impact of policy on education.
	International	• Identifies other countries' policies and identifies differences with their own county policies and their impact in STEM education.	• Supporting educational leaders in other countries to overcome STEM education policy challenges.
	Attitudes and Skills	• Recognizes that educational policy is more than legislation (laws, mandates), and includes resulting implementation (school/district rules, curricular guidelines, standards, assessments, union rules, and historical tendencies).	• Engages in policy work alongside teachers who have experience in policy leadership (as a support to others, and then later as a guide to others). • Is unafraid to generate ideas through innovative thinking, and to share those ideas with stakeholders. • Makes new pathways for

		• Recognizes other teachers who are policy leaders. • Knows how to shift from problem-focused to solution-focused thinking in regard to policy. • Recognizes that teacher voice is both necessary and credible in policy discussions.	teacher voice in policy discussions directly and/or with the support of advocates.

Association Leadership

Teacher leaders might also find national leadership opportunities through various professional teaching associations, such as national STEM teacher organizations or groups, national teacher unions with STEM specialization groups, and communities built around STEM institutions such as museums and universities. Additionally, teachers often find opportunities for leadership within local, district, and state professional teaching associations or regional sections of national associations, and non-teaching professional societies. Teacher leaders use the associations as a way to develop an amplified voice, and they work to help all teachers succeed. STEM teachers who are emerging association leaders join and regularly attend association meetings at the local, state, or national level, and they represent themselves through their participation. STEM teachers who are transforming policy leaders serve in an elected or appointed role in a local, state, or national association. These teacher leaders represent others and speak on behalf of the science teaching community. They think and act strategically to enhance the experience of association members, and they are strategic thinkers working to improve the work of the association.

The following are *some* indicators of STEM teachers who demonstrate Association Leadership at emerging and transforming levels:

	Emerging	**Transforming**

		Association Leadership Performance Indicators	
Broad Mindsets and Beliefs They look for opportunities to include others in the association. They work in order to help all teachers to succeed, not just themselves in their own classrooms. They use the association as a way to engage the community in education through a magnified voice. They are strategic thinkers who look to improve the work of an association, not just to maintain the status quo.	**Local / State / National**	• Joins and attends meetings of STEM education professional societies in the home country.	• Serves in an elected or appointed role in a STEM education professional societies in the home country. • Propose the creation of a new society based on the own practice or result of the teachers needs.
	International	• Joins and attends meetings of STEM education professional societies outside of the home country.	• Actively being part of an international committee related to STEM education.
	Attitudes and Skills	• Accepts invitations from others to take part in association leadership. • Represents own voice. • Takes on personal responsibilities for an association. • Maintains the status of an association.	• Invites others to take part in association leadership. • Builds a team of people (with redundancies) for shared responsibility in an association. • Thinks and acts strategically to enhance the experience of association members.

Appendix D: Ana Interview Transcript

Speaker 1 (00:00:00):

Okay. And so you've signed the consent form. I saw that. So thank you so much. So, um, I want to go back to last year, around this time we did an interview and I think I did your interview--no--or Pilar did your interview. And so, the thing that we were looking at there was kind of your sense of identity as a, as a teacher leader, and what I'd like to do... And the reason why we've allocated a little bit more time is because we want to kind of get to the source of why you choose to lead. And specifically, before we begin, the kind of leadership that I'm interested in is a lot of the leadership that you've been doing. Like, you know, there are teachers who lead within their school building and see amazing changes in their school building. I'm particularly interested in what I'm calling professional strategic leadership, which is leadership that impacts teachers at scale.

Speaker 1 (00:00:52):

Um, and so it's typically beyond the school building to district level national level, state level, or even international level. And so, um, that's the kind of leadership that I'm interested in talking with you about is that kind of leadership that's beyond your scope of traditional work as a teacher. If that makes sense, even though much of teachers' work in the building is leadership, I'm specifically interested in the out-of-building, out-of-school-district, outside-of-contract-time leadership. Does that make sense? Yes. Okay. Fabulous. So just like before, I'm going to have questions for you. Um, I'm probably not going to ask you all the questions, um, especially if you, and you do a really good job of being really descriptive and kind of giving me a sense for your story. Right. So, um, I'll listen quietly and then I might interject with some questions. Okay, great. So my first question to you is to think about the moment or the period in your life when you first had the opportunity to be a STEM teacher leader beyond your classroom or district beyond, you know, the official job description. So tell me what was that opportunity. And again, specifically, we're talking about STEM or science teacher leadership, so focused on the content, focused on content and process related to STEM. So what was that opportunity? Tell me the story. Where were you, when did this happen? What was going on?

Speaker 2 (00:02:14):

I remember very specifically that that moment, um, actually started the day after I got back from Puerto Rico. Usually I go home to Puerto Rico for a whole month. And, uh, about three years ago I was working in this little preschool and I wasn't very happy there because I was doing mainly childcare and it wasn't, it wasn't giving me what I wanted to do, which was actually really teach because of the way the program ran. So I was about to quit and I told my boss, you know, I'm going to start looking for another job because I want to be a teacher and I didn't want to be always stuck in, in childcare. And so she says, you know, Carmen, with this much love that you have for science, I don't know if you were aware of this [Project]. And I had just gotten back from [island] and she says, there's an opportunity for a teacher leadership program.

Speaker 2 (00:03:13):

And I said, and she said, the application is due tomorrow, tomorrow is the deadline. So I was a little stressed out with that information, but I filled it out and sent it in. And I guess I didn't do a

very good job at, at, uh, filling it in or whatever the thing is that [Colleague] sends me a very kind rejection letter that, you know, they had already, um, had all their teachers in mind, but that I could apply the next year. But my, my, my supervisor says, well, you know, no, no matter that they didn't accept you this year, we can apply again for next year. And you can try again. She says, but I really want you to check out this program. And she says they have phenomenal professional development. At this point, I had not heard anything about this [Project]. I didn't even know who the [Colleague] was at that point, but I signed up immediately for a class that was going to be held on a Saturday at United Way.

Speaker 2 (00:04:15):

And so the very first time that I went, I was hooked because it was so engaging and hands-on, and it wasn't boring. Like the other classes that I have been to. Cause that was one of my biggest things with, with, uh, professional development, especially here in [Country], my other supervisor that says you're not like participating in any professional developments. It's like, when you show me a professional development that's worthwhile going to, then I will go until that time. I'm not going to just sit there just to fill a chair and just listen to them, talk and read from a, from a piece of paper that I can do myself. And so then when she presented this [Project], I signed up for it and then went to, I think it was two classes.

Speaker 1 (00:05:07):

Through the United way, but through [Project], okay.

Speaker 2 (00:05:11):

Was United Way, had a program, uh, that's called [Program Name]. And they hired, they contacted [Colleague], uh, to present these classes for teachers like professional development and they were held on Saturdays. And so by the third time that I went there, I remember we had a class that was held at the botanical gardens here in [Country]. And I went there and, um, I, it was about, it talks about Frida Kahlo. And, but more importantly, the botanical garden here has a, a butterfly exhibit that's phenomenal. And so the focus of those classes were art and then, um, insects and in particular butterflies. And I noticed in the person that presents, it did not have a butterfly song. And I love to teach with songssigns. So I say, Hey, I have this song that I like to share in my other coworkers were there from the preschool.

Speaker 2 (00:06:11):

And I said, I'll teach you this song. You guys can get up and sing with me. And then when it was time to sing, nobody's got up. And I was left up one myself singing to like 40 people and [Colleague] recorded me. And there was a lady there that, um, that she told him, no, you need to grab that girl because she's phenomenal. And so, uh, I left, nothing happened the last, the last, um, the last class that's the [Project] did was at the Pima Air and Space Museum. Uh, no, I take it back. We had another, another professional development class also at United Way. And [Colleague] came out that day and sat next to me. And another coworker of mine who was also a Spanish speaking. And she said, I just got this opportunity for, you know, to, to go teach in Honduras, but I don't have a teacher that speaks Spanish and that can translate.

Speaker 2 (00:07:08):

And she goes, and I don't know if I'm going to take it. And I said, I'll do it for you. She goes, but you're working like, full-time, it's like, I'll quit my job and I'll do it for free if I have to, just for the experience. And she goes great. So I was thinking to myself because I didn't have very much confidence. I was like, Oh my God, I opened my mouth. And I don't know if I could do this. And so, uh, but I stuck with it. I said, I'll do it if you want me to do it, then I, and I was thinking, she knows so many more people that are so much more intelligent than I, and can do so much more than I can do. She's not going to call me. And she asked me to leave her my contact. And I said, well, this is her, her professional development course.

Speaker 2 (00:07:49):

If she wants to contact me, she'll have the information. I didn't know that it wasn't, she wasn't the one that set it up. It was United Way. So I left and I didn't give her my information. So on the very last professional development class, uh, which was at the Pima air and space museum, [Colleague] is like literally waiting for me at the corner and just dancing. It's like, Oh, I'm so glad to see you. You left without giving me the information. And I got permission to take you to Honduras. And I went, and so that's how I started. And so from there, like I, um, I was shocked because for what I did think that I was going to be chosen to go, and then I was more in shock because I had said that I would do this. And I had never spoken in public, you know, to a group of professionals ever in my life in Spanish, or even translated anything or, you know, stood beside somebody and translated what they said ever in my life.

Speaker 2 (00:08:50):

And here I was committing to doing this in Honduras about, so, uh, I went, I, uh, prepared for that and we got started working right away and I, and I started like, like really digging into to her lessons and, and reading them carefully and making sure that the Spanish that I was using was correct. And the grammar and the pronunciation and all of that. It even, uh, as far as going to look for, um, the dialects of other countries, to make sure that I was saying it in the correct way that they say it over there because I'm Puerto Rican and we use weird words. So that's how it started. And I was hooked from then on. And [Colleague] was like, so impressed that she kept on using me. And so that's how our, our connection started. And it was an amazing thing. We did, uh, uh, just as a practice, we did a, um, uh, uh, professional development class in, um, in a place nearby us, which it took about maybe an hour and a half to get there.

Speaker 2 (00:09:58):

And we did an, a math and we only had seven people attend after all of that work that we did. And it was the same one that we were going to present in Honduras, but we did it in English. And we were very disappointed because we had worked so hard to get these lessons out and only seven people showed up at then we found out why only seven people showed up is because it was charged. We're charging teachers, a hundred dollars to attend and [Colleague] was furious about that. So we gave everybody that attended the rest of the materials so that they can give it and show it to the rest of the teachers. But that's how my journey with STEM started by just you like signing in so much. Why don't you go and do this program? Wow. It turned out that, it turned out that I, um, that I went to do even greater things than the teachers that did get into the program. And I wasn't the only one we have another teacher that works with us that had the same experience. So she says, [Participant DC] don't feel bad. She did the same thing to me, and we're still working with her.

Speaker 1 (00:11:05):

And so what year was that, that you first applied?

Speaker 2 (00:11:08):

That was, um, in, uh, it was actually, uh, I wanna say, um, 20, the end of 2016, you need a 2017, um, around that time, because it's only been like [Colleague] and I feel like we've known each other forever, but we've only known each other for less than four years. Yeah.

Speaker 1 (00:11:31):

Yeah, for sure. And, and so, and then it was a year from the time you got that rejection letter to then getting into

Speaker 2 (00:11:39):

No months, just months in a year. It was just months because I, even though I got the rejection letter, I still wanted to know what the program was about. And I was, uh, because of the description, I was really interested in science. As a, as a kid, I was never interested in science, but I got an opportunity to become a teacher in a hippie school in Colorado Springs. And I had 15 children. And then I had only, uh, like seven boys and I mean, seven girls and the rest were boys. And so I wanted to engage the children in something that was meaningful to both. And I chose science as my topic, because then it was a, uh, a play, um, curriculum school where I couldn't teach the numbers in the traditional way or the alphabet or writing. And so I had to get creative and I thought that science would engage them in every aspect, you know, across the curriculum.

Speaker 2 (00:12:40):

They can teach, we can teach math, we can teach, you know, reading and writing and all of that. So that's why I chose, uh, science. And in that school, everybody was doing like the cookie cutter, uh, lessons. And I did not want to fall in the cookie cutter plan. And I said, look, I'm choosing science as my topic. We're doing science the entire year, and I'm teaching everything through science. And so that catapulted me into like the, uh, everybody was like paying attention to what I was doing. The kids were excited. The parents were excited and the list for my class had a long waiting list because everybody loved the way that the class went. So that was really cool.

Speaker 1 (00:13:25):

Was that your first year where you, did you make that come, come in with that kind of an attitude, or did it develop, how long have you been teaching science now or teaching?

Speaker 2 (00:13:35):

So I started, I've been teaching science to preschoolers, I would say, uh, the better part of like 15 years now, although I've always touched on it in some way or another, but I really got into it when I went into the Colorado hippy school, I call it the hippy school, but it's a co-operative nursery school in Colorado, but, uh, that was the one that just like pushed me into pushing

myself for over one thing, because I wasn't, I wasn't comfortable with the subject, but I really wanted to take it on and, uh, engage the children that way.

Speaker 1 (00:14:13):

So just so that I understand your timeline. So you came to the mainland from Puerto Rico in like, what year?

Speaker 2 (00:14:19):

I, I came to, so, uh, my parents brought me to, to, um, the United States when I was eight years old, I only spoke Spanish. Uh, my father wanted me to learn French and my mother put her foot down and said, knows they're going to learn English because we're not going from one Island to another Island so that they can learn French. So, so I came to the United States when I was in second grade, but I only spoke Spanish. And, um, I learned English by singing songs, uh, for, through the songs. That's why I love the Beatles so much, uh, because it, while every other child was out at recess, I had a teacher that would write songs, the Beatles songs on the Blackboard, and she would make me see, we put the music on it, and then she would point to the words. And so I read the songs to the Beatles, like every single song and I, and then it helped me to develop my pronunciation, learned the words. And so that's how I learned English, but Spanish was my first language.

Speaker 1 (00:15:20):

So you've been, you've been officially a classroom teacher and not, um, not a, like a, a caregiver, a caregiver, um, for the past...

Speaker 2 (00:15:30):

Four. So I've been, um, more or less I've been, uh, teaching. I've always taught, even in the daycare situation, I've always had a plan. So, um, but officially, I would say the past, like 15, 20 years, the first five years was just learning the ropes because I didn't start out as a teacher, even though my love was for teaching, but I was one of those daughters that followed whatever the dad wanted me to do. That's what I did. And so my love was always teaching, but I went into the business area because that's what my father wanted me to do. And so I got a business degree and I worked in the, in the business, um, area for, uh, until my son was born. And then I said, I can't do this. He's going to be, I knew he was going to be my only child and I wanted to be part of his growing up.

Speaker 2 (00:16:28):

So, uh, one day I went to a preschool and, and I was, looked at the way the children were interacting with the teachers and they were doing Play-Doh and they just looked so like so much fun and everybody was having fun. And then I would lurk every time. And, uh, and my son wasn't like super, super independent from the get-go. So he didn't care if I was there or not, but the director says, Hey, you're always checking this out. You want to like work here? And that was, that was it. Then I was hooked with preschoolers twenty two years ago or so. Yeah, because my son is 30 years old and, and, uh, and so he was like three years old when that happened. So,

Speaker 1 (00:17:10):

So, um, going back to this experience that you had with a supervisor where you said, um, I think you said something along the lines of, you know, you wanted to officially go into teaching. I guess what I'm a little confused about is when did you, what, what year was it that you had that experience?

Speaker 2 (00:17:26):

So, so, um, so in, in Colorado's, I'll go back a little bit more because remember I used to be in the, in, in the business. So when I moved, I worked here in, in [City 1]. Um, I worked in [City 1] as a, as a teacher's aid. I worked in [City 2]. Then I moved and worked as a childcare provider. By the time I left [City 2] back 20 something years ago, I left as an assistant director. Uh, then I moved to [City 3]] and I became an assistant or an assistant director there, uh, working for a childcare facility in. But then, uh, the lady says, well, you can't, you can't work here as an assistant director, because even though you have your degree from [State], um, once you to have a director certification. So I went and did that. And then, um, I, I went to school with the director of the preschool that after I got the hippie school that I got a job with, and she says, I want you to come and work for us. And then I was working in the childcare and then somebody got sick and they said, [Participant DC], we would love for you to be a teacher. And I said, I've never been a preschool teacher in my life, except for taking care of kids and just teaching them what I know. And so that's when it started, like I say, about 20 years ago officially.

Speaker 1 (00:18:54):

Got it, got it. Um, but the person who ended up recommending you for the [Program].

Speaker 2 (00:19:01):

Was hearing in [City 2].

Speaker 1 (00:19:03):

Here in [City 2]. And that was only about four or five years ago.

Speaker 2 (00:19:06):

Yes. Okay.

Speaker 1 (00:19:08):

So is that, at which of those two points, um, which of those two points do you feel launched you into this STEM teacher leadership?

Speaker 2 (00:19:17):

I would say the [State] experience because that's when I really started teaching just science. That's when my love for science really started when they gave me that class with all of those boys and I needed something to really like capture their attention and manage the behaviors and engage the girls at the same time. That's when I, I started to have this little video that explains that on, on YouTube. We had to write our story for the [Project] and that's exactly.

Speaker 1 (00:19:55):

So that first experience, if I'm hearing you correctly, that first experience is what helped you really build your STEM teacher identity? Um, yes. But how about your STEM teacher leader identity? Is that…

Speaker 2 (00:20:07):

That started when I started working for [Colleague], the [Project].

Speaker 1 (00:20:12):

Got it. Okay. So that totally makes sense

Speaker 2 (00:20:15):

Because I was always like other teachers would come to me asking me for ideas for science, but I had never taught anybody anything until I started working with the [Project], and that was just three years ago.

Speaker 1 (00:20:32):

That really precipitated your supervisor, encouraging you to do [Project]. And why did you decide within 24 hours to go for it?

Speaker 2 (00:20:44):

Because, because, um, I already used the childcare program that I was with at that little preschool. I just, I just said, Hey, we're doing science every time you're in here and I was already doing it. And so when I told her that I was leaving, she didn't really want me to leave. And then she says, I want you to go to these [Project], um, classes so that you can see how they do things. Uh, and then she, she made, uh, she made, uh, a job just for me just to teach science to all of the kids. So, so that's, so I used to teach. So then I, then I didn't have a teaching position there as the regular teachers do, but I became a specialized STEM teacher for the school. So I taught, uh, there were 150 kids total, including two-year-old babies when she said, Oh, and I want you to teach the two year olds. It's like, they speak Cantonese. I can't explain. She goes, I don't want you to make them into Einsteins. I just want you to give them the science experience. Uh, I want you to go over there and do something that will wow them and that they can touch and that they can feel, and they can manipulate. And so it was hard at first teaching two year olds, but then it became like, like really cool to sit with the little ones and say, Hey, we're doing this. And so it was that's what started it.

Speaker 1 (00:22:16):

So tell me more about, um, tell me more about why you were planning on leaving that school and what you were hoping to do before she interjected with this new opportunity.

Speaker 2 (00:22:27):

So again, um, I just felt like I was, the kids really liked what I was doing in the afternoons, but it was, I was always filling in for other people and just working long hours. And I wasn't, and I, I don't think that I was getting, um, the satisfaction that I wanted. I wanted to be in that classroom. I wanted to call everybody like, these are my kids, and this is what we're doing. And I had

applied for the position then, and they would kept on being given to other people. And, and that kind of ticked me off a little bit, to be honest. And so I said, look, I'm just going to go to somebody else where they might appreciate me more. And so when I went to the supervisor and told her that she goes, well, how about if we made a special program just for you and you just do what you do and just teach it to everybody. And I said, okay, I'll try that out.

Speaker 1 (00:23:24):

No, sorry. I guess maybe, maybe what I'm not understanding is about the certification process, but when you were frustrated and wanting to leave that school, you were not a classroom teacher that you were a classroom teacher, regular classroom teacher

Speaker 2 (00:23:36):

Was, I was working in, in the childcare program, but see, they have, they have preschool preschool teachers.

Speaker 2 (00:23:46):

That get their kids every day or two times a day or three times a day. And I was not that, and I wanted that, but they would, I was still stuck in the childcare area.

Speaker 2 (00:23:58):

And we're like a supplemental and global teacher. And so you tried to become, so if I understood you correctly, you were trying to become a formal teacher with your own classroom and you,

Speaker 2 (00:24:11):

I think for whatever reason, they passed it to somebody else.

Speaker 1 (00:24:15):

And so the supervisor said, we'll tell you what, we'll make a special position for you where you're only teaching science to all the kids. Yes. Okay. Got it.

Speaker 2 (00:24:23):

And I did that for a whole year. And then, uh, then, uh, other another school, the idea of school heard about me. And I went to donate a drum set to the school that my son had. And then they offered me a job and I was like, what? And so they said, yeah, we'd like you to, we've heard a lot about you and we'd like you to, to be with the, with the first and with the kinder first class, uh, and teach what you do with, at the other schools teach the science. And they said, we know, you know, Spanish, so we want you to teach Spanish too. Um, so that was a good gig for a while until COVID hit. Yeah.

Speaker 1 (00:25:06):

Okay. Got it. Okay. All right. I think it's straightened my head and I thank you for walking me through that.

Speaker 2 (00:25:10):

Yeah. Sorry. It's I know I go all over the place.

Speaker 1 (00:25:13):

No, it's not. It's not just that. It's, it's um, it's also the complexities of, um, the fact that early childhood teachers have all these different formality levels, you know what I mean? Right. And so, um, you know, K-12, I think is a lot more cut and clear many times, but I think pre-K even into kindergarten, I guess sometimes there's still childcare component and, um, educational childcare, but not necessarily formal education, if that makes sense. So, um, so I think you've answered this question here. You know, the, the, the opportunity that you got from your supervisor, the recommendation to apply for STEM. Amazing. Although it was a real, like late switch, right? Like you, you, you immediately, you know, jumped at it. [Project] specifically was not something that you'd been contemplating, but there had been some kind of underlying things for awhile. Got it. And then, um, you, you talk a little bit about, you know, maybe not feeling appreciated. So what were you hoping that taking the [Project] opportunity was going to open up for you?

Speaker 2 (00:26:17):

Well, I was, I was hoping that people will notice that I have more to share than what they were allowing me to do. First of all, uh, I knew that I could be, uh, an impactful teacher for four children, uh, because of the experience that I had had with [State] and the reception that I got in the feedback from the parents and the teachers and the students that I, that I still follow.

Speaker 2 (00:26:44):

With in the, how, what amazing things they have been doing. Uh, and they always come back to saying, Hey, we really remember these experiences that you gave us from the get-go. And this has catapulted me to continue to follow this, and I've enjoyed doing this. And I haven't been so afraid of this and that, um, was really, was really meaningful to me. And I wanted that again, and I wasn't getting it. I mean, it was getting a little bit from, uh, from my students, the ones that would come to my aftercare stuff, because they say, Oh, what are we doing today, Miss [Participant DC], they were always excited to see it. And I would say, well, it's a wait and see experiment. Um, so I didn't always give them everything, you know, right away, because I wanted them to be excited about coming back the next day. And I wanted that for myself, but I really wanted to just not always be floating around and jumping from one place to another. I really want it just to like cement myself in a place where I can like continue with my, my craft, if you will, of perfection, perfecting what I was learning from other teachers and other people, and just helping to, you know, give that information to the students, just to get them excited about this stuff. And I wasn't getting that there for sure.

Speaker 1 (00:28:13):

So you're speaking a lot about your students, which is, I think super natural for an excellent teacher, the next steps that you talked about included, [Colleague] inviting you to go to Honduras, but I guess even before that it included you kind of stepping up and, you know, with the butterfly song at some of these events and that led to ultimately you working more with teachers. So I'm curious to know about your motivations. You're clearly motivated to, to do

amazing things for your students. So why, why work with teachers, um, what motivates you to, to do that beyond your own classroom? If that makes sense.

Speaker 2 (00:28:54):

So the first time this wasn't an easy process, uh, I thought I really was terrible the first time that I did a professional development class by myself. Um, I remember [Colleague 1] and [Colleague 2], [Colleague 2] was a teacher leader. Um, I remember [Colleague 2] and [Colleague 1] wanting me to do, I said, I'm really excited about simple machines. I still love simple machines. And they say, you know, I bet you, the preschool teachers have not ever taught the simple machines class. So why don't you make a simple machines class? And so I prepared lessons and I made a, like a, a board with simple machines that I had made at a cardboard to show like

Speaker 2 (00:29:42):

Examples, like little miniature examples of simple machines so that teachers can use it as of this play and instructional that's surely introductory, um, piece for when they taught students. And I got, like, I felt like it was like the worst, like PD, because people were coming in late. They weren't understanding the instructions. They thought that every child was going to build that. And I said, uh, no, this is for you as a teaching tool to teach this stuff. So I really had a really bad experience my first time alone teaching. This was, uh, this was before I think it was before Honduras. I can't remember exactly. Uh, it was kinda like a, like a trial trial run. Um, but, uh, anyway, [Colleague 1] and [Colleague 2] thought it was great. I kind of, I'm kind of hard on myself a lot, and I am critical of myself because I want to do everything great. And so, um, so yeah, but the, the, the Honduras stuff was really exciting because I had never had that opportunity. Right. And for, for someone to interest such a big, um, part of me, I'm, I'm going to be leading the whole session. I'm going to be talking with all of these people because [Colleague 1] only knows how to say [inaudible - uses a few simple Spanish phrases].

Speaker 2 (00:31:19):

So, um, so it was a really big deal for me. And, and to get over that first hump of Honduras and see the, the feedback that I got from not only the directors of the Honduras to Chiminike Museum, but then the teachers that were following me on Facebook and commenting and sending me messages about how great a PD that went. It was amazing. And then I, like, I was really hooked. It's like, yeah, this is, this is what I want to do. This is I want to, and be able to do it in Spanish. First of all, because we, as a Puerto Rican, I never had that experience even when I was going to school in college or my first years of, of schooling in Puerto Rico. And the one year that my parents decided you need to learn Spanish, go back to Puerto Rico by yourself.

Speaker 2 (00:32:13):

I never had any of that. So to, to be able to do that for people that I, uh, kind of, um, I would say, uh, see myself as, because they're Brown people like me, I'm not trying to be racist or anything, but, but to give to the people that, that were like close to my heart, because they spoke the same language, they came from similar backgrounds that was like really, really huge to me. Uh, and that just, that just like sends me to cloud nine that I couldn't, I wouldn't have cared if I, I didn't get paid very much, but I didn't care about the money. It was all about the experience. And it was all about, uh, meeting the people and being able to prove to myself that, Hey, you know, I can do

this. If you have a little bit more confidence in yourself, because I didn't have any confidence whatsoever that I could do anything like that.

Speaker 1 (00:33:10):

So, so then I guess that leads to the question. So why did you accept that opportunity if, if you weren't sure, maybe about your own confidence, um, and you weren't going to get paid a lot for it. I mean, it sounds like you got a lot of, like, not even say recognition, but a lot of appreciation. I know you mentioned for while you were seeking that, right, you were seeking appreciation and you got that at the end of it. Um, but at the moment that [Colleague 1] was like, I can take you to Honduras. Um, what, why, why put in all the work?

Speaker 2 (00:33:46):

Challenge? It was a challenge for myself because I had, I had just come from, uh, like I was married for 27 years and I had a really bad experience at the end of that relationship where my self-esteem like, went down like super, like, I didn't believe I could do anything. I was called all kinds of names. So my self esteem, like what rock bottom for me to prove to myself. And I was told that I would never amount to do anything or would never reach to do anything beyond the scope of being married and having that person like, feel like he did everything for me. Uh, I wanted to prove something to myself that I could push myself to become better at what I do and show people that yes, uh, I can, and I can survive by myself and I don't need anybody to like, do things for me.

Speaker 2 (00:34:43):

So that was the first motivation just for myself to prove that I wasn't stupid. I wasn't all the names that I was called, that I can be something then, and, you know, uh, help other teachers see that within themselves, that was like the main motivation for me, because I put myself in their shoes. Uh, when I listened to these people talk, uh, to amongst themselves, I can say, you know, I can never do. And I would say, yes, you can, can do it because I, I, you know, it just put me in their place and just, and we were from, you know, Puerto Rico is, it's not very dissimilar from, from Honduras. We have the same, if not worse issues where we're a territory of the United States, we don't have our own identity most of the time. And, and so we don't get that, that opportunity to like shine most of the time. So for me, it was more of like, I can do. I said, I can do it and I will do it. And I will do a good job at doing it. Um, and it was just a push for me, but also, you know, just to give back to people that I, I kind of relate with.

Speaker 1 (00:36:00):

So, and thinking about that, so it sounds like it came at a really good time. I'm a difficult time, but it was an opportunity to kind of fit what you needed for yourself. So, um, who was there anything, or anybody that made you feel like this was the right opportunity to prove yourself as opposed to other opportunities out there?

Speaker 2 (00:36:20):

Um, so I wasn't really, ah, besides myself and my parents, uh, they wanted to show my dad, especially because he was instrumental in making me fully bilingual and make it, make sure that I learned the language I wanted him. I wanted them to be proud. Like I wanted to give back to

even my own family, something to show that, Hey, their efforts in getting me to the States and all of the things that my parents went through to get us through school. You know, my mother, um, my mother was studying to be a teacher and she never finished. And I looked to my mother a lot for my Spanish language cause she was, she's really good at it. And so, uh, but it was an opportunity just to show my parents that their hard work and effort wasn't wasted on me and that I really appreciate it.

Speaker 4 (00:37:17):

All of the things that they did for me. And this was something that they can feel proud of as me as their daughter that, you know, I got an opportunity to go to Honduras and teach and talk in front of the us, embassy people, then all of these people in Honduras. So that, that was like, like major for me. And I didn't want to let [Colleague] down. I 'cause, I, I said she could have picked every, anybody. She knows so many people that are much more qualified in and she trusted me. So I wasn't gonna let her down. I was going to do the best job that I could within my power

Speaker 1 (00:37:56):

[Colleague 1]'s role in making you, and making you successful at this activity.

Speaker 2 (00:38:03):

Oh, she's I was, uh, let's see, uh, she just always trusted me. She said, you, you, Oh, she never, like once says I don't. She says, I, I have the, the, the confidence that you can do it and you will do well. She like never like said, Oh, I, she never gave any doubt that she had made the wrong choice. So that to me was huge that she entrusted me so much. She gave me

Speaker 2 (00:38:36):

That opportunity. And, and so that's the, that's the one thing that I've always and still appreciate about [Colleague 1] is she's like super smart, but she she's so gracious in the way that she shares her knowledge with everybody. And she's not a showboat of a person. You know, you've seen people sometimes that are like super smart, but they kind of rub it in your face and they make you feel bad. And these and [Colleague 1] is not like that. [Colleague 1] is like the most gracious person and she helps everybody. And she puts a lot of her time and, and, uh, she just wants everybody to succeed. And that's what I really love about working with her. That, you know, she takes the people that feel the less confidence and just lifts them up just with her words and her encouragement, and just always there to support us as teachers to become better at what we do. And everybody loves her.

Speaker 1 (00:39:40):

Um, let's see. I think you answered those questions. I'm just scrolling through my list here. Um, let's see. I think you've already told me about a few other experiences you've had. So, I mean, so it sounds like you did some kind of practice rounds before you went to Honduras and then you did Honduras and you felt pretty good about that. And the feedback that you say you got from the participants and things. So tell me about what happened since that, until now. How have you grown as a STEM or science teacher leader since then?

Speaker 2 (00:40:12):

So since, since then, um, well, I, after coming back from Honduras, uh, then comes the United way portion, right? Uh, where I am, uh, at a grocery store, which I hate grocery shopping and [Colleague 1] calls me on the phone. She goes, Hey, [Participant DC]. Um, so United Way called, and they needed a Spanish teacher. And I told them to stop looking because I had the perfect person. So are you going to do it? It's like what? Say that again, because she doesn't ask, she just kind of volunteers you, and then she expects you to like plow through. And so, um, that catapulted me to become even a better teacher by doing the community of practice for all these 20 teachers that I teach every year. So far, this is my third year doing it. The, the response that I've gotten from every single teacher has been phenomenal to like really, um, make me proud of what I've been doing and just give me that satisfaction because that's another job that doesn't pay a whole lot. And I do more than, than, than what they asked me, but I do it because I want everybody else to the same,

Speaker 2 (00:41:35):

Um, the same benefit that the English speakers are getting. And by that is why I chose to translate two books already, which I wasn't paid for. I did it because I saw the need for my teachers to do it because if they're going to be getting college credits, uh, for which is our community of practice now is offering two college credits for doing that. I can expect to give my Spanish speakers homework from a material that they don't understand fully. So, uh, my first, uh, community of practice, we had the *Big Questions for Young Minds*. And it's like, do you expect me to like, teach this with an English book to Spanish speakers and you want them to do homework, but the stuff is not in Spanish. And so we, I asked the teachers, how do you feel about this? And they said, well, we'll try it out.

Speaker 2 (00:42:36):

But then when it came to discussing questions and the chapters, everybody was silence. And I said, well, I'm just going to have to bite the bullet and just translate. So I started translating the book and then this year I just took the book and just did it from cover to cover, but I didn't even wait to ask. I said, I'm doing it because otherwise they're not in this one is about math, which is an excellent book. And I really wanted them to get the full benefit of having that. Uh, so the, the, the part of, you know, just having the appreciation and always the word of mouth running from, from one person to another person about joining [Participant DC]'s class, because she's really phenomenal at, uh, doing what she does. And she's great at getting back to you and she helps you in whatever, and she'll come to your house if she has to, and blah, blah, blah.

Speaker 2 (00:43:36):

To me, that means more than any reward, monetary reward that I can get. Just the, just to get the respect from those ladies and to see, and to hear them say, I couldn't have done it without your support just means the world to me. And just to see them also flourishing and just their centers, just being so amazing with the stuff that they're implementing and the things that they're also learning on their own. And just everything just kind of just snowballs, you know, you teach them one way and then they give finally it kind of clicks on them. And then they just continue because they have that enthusiasm and that passion for it. It just keeps on snowballing. And to me, that is like the greatest satisfaction of all. Like, I could, I can do this for, well, I need to support myself, but, but I, I do think the little money, but I don't ask for much because the satisfaction that I get from every time that I go over to their homes, most of my teachers are all, um, home care

providers, just, I have a very small portion that work at daycare centers or childcare to healthcare centers.

Speaker 2 (00:44:53):

Um, so for them to, to get the word also their centers expanding because other parents have said, Hey, they're not just being taken care of, but they're at the kids are actually learning. Something is like, by far the most amazing thing that I see with this community of practice.

Speaker 1 (00:45:15):

I, I don't know if there's any way to, to ask a question that that goes further than that, but I'm just curious to know if, if you know, why, why you feel so impacted by that, by, by, by what you see in others, if that makes sense, like the root of that satisfaction,

Speaker 2 (00:45:36):

Because, because, um, because I kind of see it in teachers that I've had before, you know, in, in my schooling, uh, I remember there was a teacher in college in Puerto Rico. That was, that she always said to me, I was her TA in her English class, in Puerto Rico. Uh, I went to college in Puerto Rico and, uh, she says, [Participant DC], I don't know why you decided to go into business, but if I were you, I switched into, uh, teaching because you have a gift that I've not seen in another. But just to see, like when I would look at other teachers teaching me as a student and just seeing the, you know, the, the, the students, when they get something in that light bulb that enthusiasm in their lights, you know, that's, that's always been like my, my greatest joy when I teach something to somebody, whether it's a teacher or a child, and I see those, those eyes go like this and they get big and they go, aha, I know how to do this.

Speaker 2 (00:46:41):

I get it. And this is fun. And I love it. I mean, that's what kind of inspires me to become better. Uh, I had a teacher in [City 3] that, that was so intimidating to me because she was always pushing me. And, uh, and she would come into my classes and do observations at one time, she came with a mask because I said, Karen, I can't even look at you because I panic. And then she comes with a mask into my classroom to do observations. Cause I, I kind of get still freaked out about that. Uh, but, but it was like, she would always say, you know, you do so much more. You go beyond what any other teacher here does. You really researched the subjects. And she says, and, and I love that about you and the kids feel that passion when you're passionate about something, it kind of like, like radiates. And that's what I saw in some of the teachers that I came across. Like everybody, like my science teacher in high school and grammar school, they were not like that. They were like a Ferris Bueller teacher. Uh, so, so for me to, to get that, that, see that in, in other instructors, like I want it to be that way.

Speaker 1 (00:47:59):

Great. Um, great. Let's see, I'm curious to know we're getting to the end of my questions here because you've done such a great job of telling me everything. No, it's, it's good. It's good. So thinking about where you are now, where you've come from, um, what do you think that you can accomplish as a STEM teacher leader moving forward? And why do you feel confident that you can do whatever it is you think you can do?

Speaker 2 (00:48:27):

Well, uh, one of my biggest hopes, uh, is to go and give back to my island and Puerto Rico right now, especially after the hurricane. Um, the Island is not like doing well in the educational part. And so one of my biggest goal is to go back there, takes them and kind of do a little bit of, uh, professional development there, whether it's with kids or with teachers, it would be fantastic. But I feel that just the recognition that I'm getting within our little group in [City 2] and in [Colleague 1], I'm always, including not only just me, but [Colleague 2] and [Colleague 3] and the teachers that we've been working with. It's, it's a, it's a great community. The word's getting out of the work that we're doing. Um, the word of mouth is always fantastic that, you know, everybody says, Oh, you got to go and take classes with [Participant DC].

Speaker 4 (00:49:28):

And even people that have taken classes with [Colleague 2], uh, we'll say, okay, I'm going to go to, and they're bilingual, they'll say I'm coming to, to [Participant DC] this time because so many people talk so many things about her. And I want to experience that for myself, even though I'm also in [Colleague 2]'s class in the English and I participate there, but I'm not the lead. So, um, just, just knowing that, that I have that following of just, just people that love being around me, love, you know, hearing what I have to say when I'm with them or helping them to do their work in whatever capacity that I can is. It's just really phenomenal. I don't, I hope that this, you know, this, uh, tactical serendipity that, that, uh, has led, um, getting [Colleague 1] and I to, to have this, this, uh, partnership, uh, never ends. And I, and I hope that that, uh, I will still be doing this until I can't do it anymore.

Speaker 1 (00:50:35):

Great. Um, if you were to summarize the impact that you've had as a STEM teacher leader, um, can you, what, what would you say that is? I know you've already shared with me a lot of things you snowballing is a word I've heard you say a lot, but, um, is there anything else you'd like to add to what you believe your impact has been?

Speaker 2 (00:50:56):

Well, I, I believe that my biggest impact, especially for the Spanish community, I think is just getting them, uh, that, that, you know, that recognition that they can. Um, and, and I'm going to tell you a little story that you can leave out. Um, but this is a story that happened to me, uh, during my first year as a community of practice teacher. Um, we had, uh, a science showcase at the end of the, the year, the semester, um, where teachers would present a lesson that they developed themselves, something that they haven't heard from me and presented to their peers, right? So for [Colleague 2]'s class to director of United Way canes, a director of, um, first things first, like whole bunch of people came for her presentation of her teachers. They did the worst like presentation. There was, it was terrible for my, for my presentation of my teachers.

Speaker 2 (00:52:10):

I had to present at a church because the day that we were going to be presenting, I didn't have the facilities that [Colleague 2] had. So I had to get with another teacher of mine and find a church where we can meet so that we can do this stuff. And not, not the big wigs came because it was all

in Spanish, even though I was translating and these teachers did phenomenally well, and they were not expected to do as good as the English speakers. So that alone to me was a testimony is because Spanish speaking people have pride, they have pride in their work and they want to show, they want to show it and they don't like to be let down. And they don't like to let other people that are counting on them, be let down. So to me that first year was so amazing because they really, um, surpassed the expectations that anybody had for them. Uh, although I knew that they would do well, but, uh, it was the biggest satisfaction that I ever had. And I'm still gloating over that because, because it keeps getting better.

Speaker 1 (00:53:26):

Um, let's see here, have you had any change in your views about your, you as a STEM teacher leader, your work as a STEM teacher leader or your impact over time? Like has any of that changed since the past, in particular, in the past five years? Right.

Speaker 2 (00:53:46):

Well, in the past five years, yes. I never expected to be in this position. I never expected to have traveled to Peru or Honduras or any of those things to teach, uh, teachers for one thing. So that, to me has been huge, but, uh, for my stuff, the growth that I've seen in myself, uh, the confidence that I, I feel that I project when I'm with these teachers, you know, the confidence, uh, that [Colleague 1] has in me, other professionals, other teachers, uh, that, that I have worked with, look to me as a, yeah, I want to, I want [Colleague 1] to teach me or have come to me for ideas or, I mean, that, that has been amazing because, uh, 10 years ago, I, would've never imagined that any of this was going to be happening. You know, I didn't, I never saw myself as, as, uh, in the scope of anything grand and, and just to have this impact where my name is being thrown all over the place and with reviews and positive feedback from everybody has been really amazing.

Speaker 3 (00:55:06):

Um, I think you've already touched on this, but, um, are there any other, any obstacles that you've encountered in your STEM teacher leadership, um, and how have you overcome them, or how do you work to try it over?

Speaker 4 (00:55:20):

Well, the, the major, the biggest obstacle for me is, uh, materials that are good in Spanish, right? There's not very many, uh, you know, I'm having to translate every time, everything, because we don't have good stories that relate to STEM in Spanish. We don't have, um, professional development that are in Spanish. Uh, every everything that that that's coming is it doesn't touch that population of people. And, and it just really irritates me that, you know, you got these amazing writers translate the darn thing into Spanish, make it available for everybody. Uh, you do that with novels. Why can't you do it with teaching materials? So that's the, my biggest obstacle and my biggest pet peeve that I have within the STEM community, uh, that there is not enough of, uh, of that going around. Sure. Now with the pandemic and social media, that's changing a little bit, but still, we got like, uh, a long ways to go to catch up.

Speaker 2 (00:56:36):

Uh, so that's why I, you know, take it upon myself to translate these books. And at least if I can't share it with the world, these, I can share it with the people that I'm teaching and they're getting the benefits of it. Um, so to me that that's, that's one of the biggest obstacles. Other than that, for me, I, I, I haven't encountered any like obstacles. It's a good thing that I'm bilingual because I can swing both ways. And I think my parents for, for, for that, um, because it's open doors. And so I tell these, that's another thing I tell these teachers is like, you know, always love to learn more and push yourself to, to learn more, even if, if it's just a little chunk of something, um, because you don't, you never know where it's going to take you. Right. I hated my father and mother for sending me to Puerto Rico and always yo-yoing me back and forth to Puerto Rico and putting me in a fourth grade class to learn how to write and read in Spanish. But if I hadn't done that, I would not be here talking to you. I wouldn't be working with [Colleague 1]. I'd be stuck, still doing, you know, some other worthless stuff who knows.

Speaker 1 (00:58:00):

I doubt that. But, um, yeah, I guess the last thing that I'm curious to know about is, you know, with your, with regards to your project teamwork, where you expect that to go, I guess, over the next six months, but even in general, so looking at your leadership from that perspective.

Speaker 2 (00:58:17):

Gosh, so this morning we touched a little bit upon that because, uh, you know, we don't have, um, Alison facilitating our, uh, our meetings anymore until March, right? So we've been getting together. And, um, and, and so this morning we were talking about the Facebook group that we started on, on, on there, and, um, how we can propel this to become useful for, for not only for us as a team, but for other teachers. And so, uh, we, we are planning to do a short PDF, uh, PD, uh, PD, um, for teachers, uh, via assumed sign up where they can do a little class for practice for our, um, team people, but we're also encouraging them to come up with their own lessons and present it at is a zoom presentation. And then we're going to be the participants because they're always expecting [Colleague 1] and I to do everything.

Speaker 2 (00:59:24):

And so we're pushing them to, you know, create their own little lessons presented to other people, and we're just spectators and, um, assisting where we can, but we're not going to be leading the classes. So to us, that's like, uh, I think that would be really great for them because, you know, they, for some reason they think that they don't have anything to offer, which is wrong because everybody has something amazing that they've done that we might not have looked at. Um, and so we want to push them in that direction where they feel comfortable enough to do their own presentations, put their own, uh, work together, facilitate these, these, um, activities, not only for us, but for people in their country. And, and it's, it seems like they're really on board with it. And so we're going to be starting that we have a projection date for doing that for February the 23rd, where we talk with the Colombian people first, because they didn't show up today for whatever reason.

Speaker 2 (01:00:35):

Uh, so that's our proposal right now, we're in. And, uh, another thing that we told them, um, is to share ideas on that Facebook page, because it can't just be [Colleague 1] sharing all the time.

They have to start conversations and, and, uh, you know, get questions out there to engage other people to participate. Otherwise we won't get anywhere with that group, but it's been really exciting. Uh, I've been loving working with these people. It's been really fun. And so we're hoping to do that a presentation on, we have a scheduled date for February the 23rd, but that could be, it's not engraved in stone yet. So until we talk to our Colombian partners, but, um, we're going to push, we're going to start and do a little one to give them an idea of how they can do a small, uh, professional development online for other people to participate. So we're going to take the lead on that one, but then we're hoping that they will follow through and get their own presentations and do a zoom meeting where people sign up and then put it on Facebook live and share it with the world. So that's our hope. Right.

Speaker 1 (01:01:54):

Fun. Excellent. Well, you've answered all my questions. Um, so thank you. And I, I should also mention, yeah. Um, these interviews we're doing with all the teacher fellows, um, and it's for the project, but, um, it also is part of my PhD. Um, I'm super grateful because I'm trying to, you know, kill two birds with one stone, but it's something that I'm personally really about is understanding people's life stories and particularly where it starts, because I think, um, you know, there's at least in the United States, but not so much hardly anywhere else, maybe with the exception of a couple of countries in Asia, there's just not a lot of thinking about teacher leadership. And even though we talk about mentorship and teaching, which I hear you talk a lot about mentorship through your leadership experience. Most of the time we talk about mentorship in terms of classroom practice. And I think, um, I'm just, it's always very exciting to hear from me about who it is that invites us and who it is that inspires us to, to, to, to go beyond. Right. So, so thank you. Is there anything else that you think I should know about your life story or your leadership practice as a STEM teacher?

Speaker 2 (01:03:07):

No, I think I've covered it all. Like I said, I talked too much. Um, I they're writing a story about us as, uh, as coordinators for United Way. They're writing a book about us. I also had an interview with them, the lady, the lady thought I was home Marius and that I should do stand up comedy, which I don't think I qualify for that. But, um, hopefully that will be something fun for other people to read a little bit about where I come from, how I got into this. Uh, so

Speaker 1 (01:03:38):

Yeah, that'd be fabulous. Share it when you get the chance. Um, okay. Well, I don't want to take any more of your time. I mean, it took us about an hour. Um, cause we were talking about some other things initially, which is actually, I just did [Participant TH] yesterday and it took about an hour or so. So, um, it seems like we covered everything in about the same amount of time. So you don't talk too much. Great. Well, all right. I mean, that's it for me so

Speaker 2 (01:04:05):

Well, thank you, Rebecca. I've really appreciated this opportunity. I mean, the connections that I'm making with all of these teachers, especially the UWI [University of the West Indies]], I'm very excited about. It's been phenomenal. The connections I've made with the other fellows,

students teacher, uh, has been amazing. So like, I feel like I've, I've have another extended family in little places in the world, which is stupid.

Speaker 1 (01:04:33):

You got to get a boat, then just go Island-hopping, you know, whole chain. Right. Basically. So, um, yeah. Thing to do. Good.

Speaker 2 (01:04:45):

It's been a great ride and in such a great opportunity that, um, I'll be forever grateful for this opportunity.

Speaker 1 (01:04:52):

Oh yeah. We've been so happy to have you. And uh, I mean, as you know, you light up the room and uh, you know, I love everything that you bring. So, um, our goal is just to help keep making connections without exhausting you too much.

Speaker 2 (01:05:06):

Well, thank you. Um, I'm like a little Energizer bunny. I, I really liked the keeping busy, so it's been great.

Speaker 2 (01:05:14):

Fabulous. Okay. Well, I'm going to let you go and get on with the rest of your day then. Thank you so much, Rebecca, take care of the baby.

Appendix E: Beatriz Interview Transcript

Speaker 1
[00:00:02] Hace un año hicimos preguntas acerca de tu identidad como líder y me gustaría entrar a mayor profundidad contigo sobre tu desarrollo. Qué te hizo volverte líder? Y para estar completamente clara.

Speaker 1
[00:00:21] Esto no necesariamente tiene que ver con, con, con la RIED, en el sentido de que mis preguntas no solamente se relacionan con la red sino, sino más bien con tu carrera como tal, con tu vida, tus del desarrollo de tu vida.

Speaker 2
[00:00:34] Ok.

Speaker 1
[00:00:35] Y específicamente lo que es lo que me gustaría enfocarnos es liderazgo respecto a la formación de otros docentes o lo que yo voy a llamar el liderazgo estratégico en STEM o en ciencias, así como como quieras pensarlo. Pero lo que yo llamaría pues no solamente hacer cambios dentro de tu propio salón, tu propia aula, sino también cómo impacta a la profesión como tal.

Speaker 1
[00:01:03] Así que bueno, entiendes eso? Necesitas mayor explicación?

Speaker 2
[00:01:10] En la primera pregunta, cuando la dijiste perdió un poco de conexión. Para estar cierta, podrías repetir? Te lo agradecería.

Speaker 1
[00:01:18] Es sobre sobre el liderazgo estratégico o que parte o todo.

Speaker 2
[00:01:26] Vuelve y repite todo porque fue como la conexión que le entregaba, pero no escuchaba nada. Oye, disculpa, por favor, no?

Speaker 1
[00:01:39] En general, sobre todo al final de esta entrevista me gustaría saber un poco más sobre la raíz de la razón por qué te volviste líder en el trabajo, en tu trabajo como como docente de ciencia, como docente de STEM. Así que específicamente me gustaría saber, pues, de dónde viene esa motivación. Y a lo que me refiero específicamente es el liderazgo estratégico en STEM o en ciencia. Es decir, no solamente cómo impactas a tu propia aula, sino también cómo impactas a los otros profesionales alrededor de ti a tu profesión como a nivel sistémico, no?

Speaker 2
[00:02:20] Ok, perfecto.

Speaker 1
[00:02:22] Esta una de las preguntas super simples cuántos años llevas enseñando ciencia y enseñando en general?

Speaker 2
[00:02:31] Bueno, de manera para escuela pública tengo aproximadamente 15 años. Ok, pero ya de manera privado tengo como 25 años ya la carrera docente y todo ese tiempo enseñando ciencia, matemáticas o otras.

Speaker 2
[00:02:52] Empecé en sentido de lo que es la historia, mi historia patria de mi país.

Speaker 2
[00:03:02] Luego de esto pienso, digo, como híjole. Hay algo más que que me interesa, no simplemente enseñar historia patria. Me. Me gusta la ciencia y de hecho, ya en el año 2004, en el centro donde trabajo el maestro de ciencia...

Speaker 2
[00:03:33] Es que cuesta.

Speaker 2
[00:03:40] Volví. Me quedé sin nada. No entiendo. Perdón. Bien, como te vale. [Connection lost, and then restored].

Speaker 2
[00:03:50] El maestro de ciencias...

Speaker 2
[00:03:51] A él le tocaba pensionarse. Mi directora, en ese entonces mi líder, me dice bueno, el maestro se va y yo veo en ti unas dotes especiales de enseñar ciencia. No te gustaría pasar a ese nivel? Y yo me pongo así todo así como nerviosa y ella me dice. Yo creo que tú lo puedes hacer bien. Le digo yo. Bueno, entonces si usted ha creído en mí, a mí me gustan los retos. Vamos. Y acepté el reto. Busqué todos los libros que hablaba de ciencia y. Y no dormía. Me pasaba largas noches estudiando porque dije Guau! No puedo presentarme ante los Chicco sin yo misma domine la disciplina.

Speaker 2
[00:04:52] Volví de nuevo. No te preocupes. [Connection lost, and then restored].

Speaker 2
[00:04:59] Ratos, estudiando, especializándome, luego de eso, ya el Instituto de Formación Docente (Inafocam) me invita a participar en un diplomado. Ese diplomado duró aproximadamente 6 meses. Luego de esto siguió dando seguimiento y me ofreció una especialidad en Ciencias Naturales. También la tomo y finalmente vuelven como a evaluarnos y me ofrecen la maestría en lo que es Ciencias Naturales, mención química y yo acepto. Así fue

desde ahí. Veo como esa esa necesidad en mis compañeros de avanzar en cuanto a esto y así empiezo a enseñarle lo que he ido, osea aprendiendo. Y ahí cada vez que había reuniones de docente yo me proponía, la compañera [Participant TH] puede ayudarme en ese sentido y yo toda como así asustadita, como que no quería ir y ellos me decían sí, sí, ve, muestra, muestra y comparte lo que tú sabes. Y ya después de ahí vienen haciendo como ese pequeño liderazgo sin yo saber que ya estaba influyendo en los demás docentes de mí, de mi contorno, de mi alrededor.

Speaker 1
[00:06:31] Me gustaría en efecto, pararte por un segundo, porque me parece muy interesante esto que me dices. Esta experiencia no sé si fueron varias experiencias, pero específicamente mi pregunta es verdad. Dejenme retomar mi documento. Puedes explicarme específicamente ese momento en que te diste cuenta que pudiste ser líder en ese sentido para apoyar a los demás docentes en ciencias? Así que me puedes decir específicamente cuándo fue? Y pues si hubo alguien quien te motivó? Qué es lo que sentías adentro? Que te hacía pensar que tú podías apoyar a los demás.

Speaker 2
[00:07:13] Bien.

Speaker 2
[00:07:14] Una preguntita un poco, pero te voy a decir la verdad, cuando ya llego a formar parte de ustedes de la RIED.

Speaker 2
[00:07:24] La primera entrevista que nos hizo la, la doctora Pilar cuando ella hizo esa pregunta, yo en realidad dije dentro de mí, porque ya me me está diciendo eso, si yo en realidad no, no me veo como líder.

Speaker 2
[00:07:43] Ya después, en la segunda entrevista empiezo a hacer costas. Llegó, pasó el tiempo, llegamos y no vemos como sucede allá a Perú.

Speaker 2
[00:08:00] Aprendimos muchísimas cosas que fueron muy impactantes para mí. Ya de regreso. Empiezo a ver que ya las cosas son diferentes. Lo mismos compañeros, me empiezan ya a ver.

Speaker 2
[00:08:15] Como un tanto. Y yo, yo en realidad digo pero Dios sí es lo que está pasando. Y ahí vienen invitaciones, así como para acompañar a los directivos a dar cursillos y cosas así. Y me hace la invitación. Aún digo nada. Yo no puedo. Yo, yo no tengo esa capacidad. Y le planteo esto a Pilar, que es la encargada de de seguir dándonos seguimiento como Docente Fellow y le digo óyeme, me está pasando esto, pero yo no me considero como así una líder. Entonces Pilar me dice yo creo que si, [Participant TH] y empieza a explicarme ciertas situaciones de vivencia de ella, como empezó su liderazgo y digo yo. Oye, pero realmente es similar. Lo que tú me estás contando con lo que está pasando conmigo? Y así ya inicia. Creo que ese fue el primer momento donde realmente me doy cuenta que a través de ustedes, de la RIED. Si pienso, digo óyeme. Pero

es verdad lo que me hace entender la doctora Pilar y creo que ya debo de ir asumiendo lo que está frente de mi.

Speaker 2
[00:09:52] Volví nuevamente, perdón, pues tengo una pregunta hasta antes de la RIED y todo eso. Te invitaron a presentar, fue después? Me gustaría pensar, me gustaría saber qué fue ese primer momento donde te invitaron y aceptaste.

Speaker 2
[00:10:11] En efecto, hasta sin si no te considerabas líder, no, antes no me consideraba, no me consideraba líder, simplemente apoyaba en porque como siempre eso me llamaba la atención de cooperar en los en los talleres de formación que nos daban. Yo no me podía quedar como sentada, como los demás escuchando, sino que había algo dentro de mí que tenía que parar y aportar, pero hasta hasta ahí no me doy cuenta.

Speaker 2
[00:10:45] Ok, no, no y bueno, yo creo personalmente que uno puede ser líder sin saberlo, no? Entonces puedes, puedes decirme ese primer momento cuando decidiste apoyar o como dijiste colaborar? ¿Cuándo fue ese momento? En qué año fue, qué fue la experiencia? Quién te invitó y qué es lo que hiciste? Como hace primera instancia que dijiste de decir sí a la oportunidad de ser líder, sin saberlo, sin saberlo.

Speaker 2
[00:11:17] Eso fue en el 2008. Trabajaba con una docente que que trabajaba de cerca en el Ministerio de la Educación, trabajábamos en privado y yo trabajaba con ella. Pero ya en plan de vespertina y nocturna, ella funcionaba como líder del ministerio, formando a otros docente en todo eso. Entonces ella, viendo en mí como lo que veía ella me invitaba a acompañarle. Maestra, vamos, aquello. Y así, sin yo saberlo, iba como cooperando sin darme cuenta ni nada de eso. Entonces siempre lo hacía, pero no dije con el fin de verme como una líder le nada por el estilo, porque ni yo mismo me estaba dando cuenta que sin saberlo ya estaba influyendo en otros docentes.

Speaker 1
[00:12:19] Otra pregunta entonces sobre esa experiencia, esa invitación que recibiste de tu colega, la mujer del Ministerio, la trabajadora del ministerio, por qué aceptaste la invitación de acompañarla por decir? Porque me imagino que estaba fuera de tu contrato o bueno, corrígeme si no, pero me imagino que no era parte de tu trabajo, de tu cargo.

Speaker 2
[00:12:41] No, no era parte entonces y sí, pero terminada la pregunta. Disculpe.

Speaker
[00:12:48] No, no. Entonces, por qué? Entonces por qué? Por qué meterte en eso sí era una responsabilidad, demás.

Speaker 2
[00:12:57] Bueno, éramos amigas y ella me pedía apoyo.

Speaker 2
[00:13:02] Tú puedes ayudarme con esto? Yo no quiero ir sola. Y como éramos amigas, yo Ok, Yo voy contigo. Pero yo lo que quiero es ayudarte y que no te sienta tan, tan abrumada con tanto trabajo. Y eso era. Ese era la línea por la cual acepté hacerlo. Pero no recibía ninguna remuneración ni nada, sino que esto me ayudó a ir como desarrollando las prácticas en ciencia y todo eso porque ella era la encargada de lo que es el área de ciencia acción de regional. Y eso creo que esa fue la motivación de yo como impulsar la ciencia y decidirme a estudiar, porque al principio yo lo que era, era maestra de educación básica de niño o específicamente de seis a diez años. Eso era lo que yo enseñaba, le enseñaba como a alfabetizarse, aprender a leer y todo eso.

Speaker 1
[00:14:07] Y cuándo empezaste entonces a enseñar en el nivel secundario superior? Con niños mayores?

Speaker 2
[00:14:14] Bueno. Con niños mayores. Ya empiezo a enseñar ya eso como del 2009 aproximadamente.

Speaker 1
[00:14:25] Ok, muy bien. Bueno, déjame ver mis otras preguntas.

Speaker 1
[00:14:37] Cuando tu amiga te invitó a acompañarla.

Speaker 1
[00:14:41] Exactamente qué fue lo que hicieron? Fue observación de otros docentes, fue docentes en servicio previo al servicio? Exactamente en que le acompañaste y por cuánto tiempo?

Speaker 2
[00:14:53] Sí, eran docentes en servicio. La labor de ella era como darle un seguimiento a esos docentes y proveerle de recursos, estrategias para que ellos siguieran como desarrollándose en ciencia. Porque esa, esa era su su labor en el ministerio.

Speaker 1
[00:15:13] Y qué fue tu rol específicamente? Nada más observar. O tenías una responsabilidad específica?

Speaker 2
[00:15:23] No? Y no solamente observar, sino que sin darme cuenta el ya yo también estaba dando curso y de osea, dándole información a los doce, explicándole cómo, cómo hacer las cosas. También he osea sin darme cuenta. Esto lo, lo, lo aprendí, le hacía mucha pregunta, lo

ponía a pensar y yo sin darme cuenta estaba induciendo a que crearan pequeñas hipótesis de lo que yo pensaban que creía que podía acontecer cuando desarrollándo los pequeños experimentos.

Speaker 2
[00:16:04] Entonces trabajaba directamente con con, con los docentes. Sí, exacto. Fui ayudando a mi amiga. Claro. Cuánto tiempo dedicaste o cuánto tiempo dedicabas a eso durante ese tiempo?

Speaker 1
[00:16:21] Perdió un poco. Ay, perdón. Mi pregunta era cuánto tiempo dedicaste a acompañar a tu amiga en este tipo de trabajo? [Connection lost, question repeated].

Speaker 2
[00:16:30] Bueno, en este en ese tiempo yo simplemente nada más trabajar trabajaba para, para el privado, bien, entonces, al tener la tarde libre y todo ese tiempo, yo hasta me iba con ella para su casa a preparar el material y muchísimas cosas que íbamos a hacer. Yo prácticamente era como su hija y tal. Ella me dice Dime mi hija, cómo está mi hija? Ya hoy ella no está. Ya en el servicio, porque llegó su pensión, pero dejó yo creo que ese legado en mi persona entonces fue darme cuenta.

Speaker 2
[00:17:14] Ella fue como una, una mentora. No sé si decirlo lo llamaría así para ti. No? Exacto. Cuántos años hiciste? Eso fue nada más un año. Cuánto tiempo pasaste haciendo eso con ella?

Speaker 1
[00:17:31] Pasé como aproximadamente tres años. Fue bastante tiempo. Perdón por seguir haciendo preguntas, pero realmente me.

Speaker 1
[00:17:43] Lo que a mí me interesa en esta entrevista es de saber qué le impulsa a alguien a hacer estas cosas? Me mencionaste que. Pues obviamente ella era tu amiga. Querías apoyarla a ella personalmente. Encontraste valor en lo que estabas haciendo. Cuando ella te hizo la invitación fue algo que ya habías pensado desde hace un tiempo que querías hacer algo, fue algo así como instantáneo decir a una oportunidad? Pues por qué no? Cómo fue?

Speaker 2
[00:18:14] Sí. Cuando ella me hace la invitación, yo no lo veía como una ayuda, sino que me gustaba estar con ella y aprender. Gozaba como de su presencia y yo lo que quería era estar con ella y aprender lo que ella hacía. Pero en realidad es que no lo hice nunca pensando en que iba a aprender mucho sobre todo esto. Ya después que iba viéndola a ella, me fui como motivando, interesando más, buscando libro o estudiando. Fue como un auto aprendizaje y obtuve, claro, con apoyo de mi esposo, que en ese tiempo era muy jovencito y en todos los libros que veía de ciencia él me lo compraba.

Speaker 1

[00:18:59] Así se lo dije, que era yo decirle la verdad a ver. Y ahí dejé de escucharte. Está bien. No dije nada. Pero me escuchas ahora? Me escuchas ahora? Ahora Suites? Lo siento. A ver. [Connection lost.]

Speaker 1
[00:19:20] Al final de la oportunidad. Es decir, que después de los tres años que me mencionaste, pues cómo te sentías al final de eso? Si ella ya dejaba de hacer ese trabajo. Pues.

Speaker 1
[00:19:32] Cómo te sentías al final de esa experiencia?

Speaker 2
[00:19:37] Bueno, ahí yo me sentía como uno, se van de amiga y ahora que yo voy a hacer.

Speaker 2
[00:19:44] Entonces ahí es que viene la oportunidad. Que el docente de ciencias se pensiona y mi directora. No sé cómo lo investigó. No sé cómo se dió cuenta, o bien dijo o Jaime, el maestro de ciencia, ya no va a estar en esa plaza. No queda ahí. Yo lo que daba era, como te dije, clase para el nivel primes, el tiempo de yo, subete de escalafón en Súbete a ese nivel. Te dije que me puse toda mi rosa. Yo lo pensé una semana porque yo le dije que yo no estoy acostumbrada a darle clase a ese nivel. Lo mío es es un niño de primaria.

Speaker 2
[00:20:37] Entonces ella me dice [Participant TH], yo creo en ti y creo que tú puedes hacer una excelente labor ahí arriba. Y entonces yo le dije venga a mí, porque es una nard.

Speaker 2
[00:20:59] Eso ya regrese. Bueno, como te dije, yo trabajaba de. [Connection lost.]

Speaker 2
[00:21:09] He aquí en [país] a la enseñanza dirigida por religiosas. Ellos la perciben como que es la mejor enseñanza. Entonces, cuando la hermana Idania, asi le decimos me propone eso, yo mira, me puse nerviosa, yo no comía chocolate, no pensaba, porque yo le dije a ella deme una semana para yo, para yo pensarlo. Luego le doy una respuesta. Ya después que pasó la semana se acercó al darle la respuesta y le dije Mire hermana, si usted cree que usted ve algo en mí, así que yo pueda asumir eso. Fue más arriba que a mí me gustan los retos y si usted cree que yo puedo.

Speaker 1
[00:24:14] Ahí estás. Prefieres que te llame por WhatsApp? Lo podemos hacer igual como desees. [Connection lost. Transferred to WhatsApp.]

Speaker 1
[00:24:25] A ver, no te estoy escuchando, estás en.

Speaker 1
[00:24:30] Ok, creo que ya, ya se arregló. No te preocupes.

Speaker 1
[00:24:34] Bueno, me estabas diciendo de la hermana que te invitó a pensar en trabajar con niños mayores?

Speaker 2
[00:24:41] No, si trabaja con dismo mayor. Entonces ya para finalizar en Ordal Tantum le dije Bueno, si usted cree que yo puedo hacerlo, pues vamos para arriba, vamos a hacerlo. Y acepté el reto.

Speaker 2
[00:24:56] Y eso fue en 2008, aproximadamente 2009 aproximadamente.

Speaker 1
[00:25:02] Aunque y para para poder para poder avanzar a esas Hansa edad, tuviste que hacer una certificación, porque yo sé que tienes una maestría en Química. No es así?

Speaker 2
[00:25:12] Sí, sí, tuve que empezar a hacer. Mientras tanto, me mantuve haciendo muchos cursos de ciencia y cosas así, porque todavía no teníamos lo que era ni el diplomado, ni nada de ciencia, ni nada de eso, sino que me mantuve haciendo diferentes talleres, curso y conocer diferentes universidades. Pero no era algo que me daba como como la licencia para realmente impartir ciencia.

Speaker 2
[00:25:45] Tuve entonces que empezar a estudiar y pasar todo ese proceso hasta tener la certificación que me avale enseñar ciencia.

Speaker 1
[00:26:05] Pues entonces mi pregunta es, pues pensando en esa primera experiencia con, con tu amiga del ministerio, cómo sientes que esa primera experiencia te impactó en toda, toda tu carrera como líder llegando hasta ahora? Es decir, me gustaría saber. Que me cuentes esa historia que me cuentas, esa historia de tu desarrollo como, como líder de STEM.

Speaker 2
[00:26:30] Okay, pues eh.

Speaker 2
[00:26:33] Te vengo a decir que entonces ya mi amiga no está en el ministerio. Necesitan ese apoyo y aquí desde mi distrito escolar. Yo siempre he sido buena, como haciendo letras bonitas cosas así. Entonces oyeme, necesitamos tu ayuda, [Participant TH], para talleres que iban a ejercer con los docentes del sector público.

Speaker 2
[00:27:03] Ahí estaba [Participant TH] ayudando y liderando. Entonces así yo creo que que empieza eso, pero aún yo no me doy cuenta de que soy realmente líder. Entendiste? Yo vengo a

caer en cuenta que soy líder en la segunda reunión con la doctora Pilar, que entonces igual que digo Oh, pero sí, es verdad, todo lo que he venido haciendo me ha abierto el campo para para el desarrollo.

Speaker 2
[00:27:37] Y eso fue lo que, lo que sucedió, pero fue en ese momento que realmente me di cuenta de que si era una líder sin saberlo.

Speaker 1
[00:27:50] Y quien te invitó a trabajar en el sector, a trabajar con docentes, en el sector público, o si es que alguien te invitó o no sé. Y por qué sentiste esa motivación de apoyar a docentes fuera de tu escuela?

Speaker 2
[00:28:06] No sé, como que eso estaba en mí. El siempre ayudar y compartir lo que sé, siempre lo he hecho desde pequeñita. Aún en el preescolar dice mi maestra de preescolar que yo dejaba de hacer lo mío para ir a como ayudar a mis compañeritos de al lado y ella siempre hace esa anécdota. Ya estoy un poco mayor, pero siempre hace esa anécdota creo que anda bien o algo.

Speaker 1
[00:28:36] Sí, de dónde viene eso?

Speaker 1
[00:28:39] Dentro de ti sientes que es sólo una tendencia natural o hay algo que está hasta abajo de eso?

Speaker 2
[00:28:48] Creo que esto lo aprendí de mis padres porque me dijo mis padres vienen como de.

Speaker 2
[00:28:57] Viene de un lugar bien, bien, pobrecito del campo. Y yo recuerdo que todas las personas que pasaban por allá por la casa, en el campo, mi papá y mi mamá siempre venga comer sin conocerse. Venga, pase.

Speaker 2
[00:29:13] Y como fui viendo eso de mi padre y fue lo que evidente pequeñita que ya lo dicen, que uno aprende lo que uno uno ve. Creo que, que ese ejemplo que vi en mis padres fue lo que me motiva a ser lo que soy. Lo que aprendí de ellos.

Speaker 1
[00:29:34] Y pues una pregunta más que me mencionaste, pues que cuando aceptaste la invitación de tu amiga, obviamente tuvo un enfoque en ciencias.

Speaker 1

[00:29:46] Después de eso, en tus instancias de apoyar a los demás era solamente en ciencias, en otra o en otras materias aún, como era en todo, que yo entrenaba haciendo de la lengua española y enseñaba historia.

Speaker 2
[00:30:04] Por qué? Porque en el nivel primario, aquí en [país]enseña. Como en esa 4 materias básicas te enseña lengua española, te enseñan sociales, enseñan matemática y te enseñan ciencia. Entonces ellos prácticamente sin saberlo. Cuando necesitaban ayuda, de hecho ayudaría aquello estaba [Participant TH]...

Speaker 1
[00:31:38] Bueno, a que me decías es que pues apoyabas en todos los niveles, porque en básica enseñan ciencia, matemáticas, español y ciencias sociales, supongo no es sangre, entonces es ayudémonos todo eso.

Speaker 1
[00:31:56] Hasta en este momento me pregunto si te consideras o docente líder en general o te identificas como disculparse ante el líder, no te escucho. Así era. [Disconnected].

Speaker 1
[00:33:39] Ok, entonces si mi pregunta para ti era si te consideras como líder, docente líder en general o te consideras como docente líder en ciencias específicamente, o crees que hay una diferencia y crees que hay una diferencia?

Speaker 2
[00:34:01] Hay una diferencia palpable. Por qué? Para saber poco de todo, pero dentro de todo hay algo como eso, cual te inclinas más. Y yo creo que ese algo es la ciencia.

Speaker 1
[00:34:15] Y por qué para ti? Porque es así? Me pregunto.

Speaker 2
[00:34:21] Bueno, porque para mí es sencillo enseñar ciencia es como mi vivencia diaria.

Speaker 2
[00:34:30] Yo te puedo enseñar el o sea hasta de una paginita que me la deje caer y ya con eso estoy enseñando gravedad a mis alumnos. Osea, es... Me gusta más la ciencia porque creo que es más práctica, más dimensional. Por eso creo que me enamoré de las ciencias.

Speaker 1
[00:34:55] Y me puedes decir de la primera experiencia que tuviste a después de tu interacción con tu amiga?

Speaker 1
[00:35:04] Una vez que te volviste maestra de ciencias, cuándo fue tu primera experiencia como líder de ciencias para otros docentes?

Speaker 2
[00:35:16] Bueno, ya así, así, así como en sentido general, yo liderando. Fue después de todo es impacto con la red que regreso de Peru. Ya no me ven como chalas simple maestras y no una maestra wow, internacional. Creo que ahí es que quieren abrirse como el camino y ya. Y, ya te dije, me reuní con, con el director regional producto de la carta que le enviaste. Y ya por ahí creo que se me abren los caminos y empiezo ya a trabajar directamente como con la regional, a impactar a los maestros de diferentes partes del país. Con los differente distrito. Te expliqué en una conversación anterior que aquí [country of origina] está inmensa, o sea dirigida por el Ministerio de Educación.

Speaker 2
[00:36:36] Ese ministerio a gran escala tiene diferencias regionales y esas regionales entonces tienen a su cargo diferentes distritos educativos. Entonces a través de mis regionales de las parte del este podemos e impactar a todos los docentes de los 11 distritos que forman esa regional.

Speaker 1
[00:37:03] Y bueno, yo ya. Obviamente hemos creado como las páginas que explican un poco sobre lo que lo que lograste durante esa actividad, pero nada más para tener un ejemplo para tenerlo como en mi transcripto.

Speaker 1
[00:37:16] Me puedes describir un poco cómo surgió la idea de la Universidad del Este de esas actividades que se llevaron a cabo hace un año, ya casi casi un año? Así que me pregunto. Pues puedes. De dónde? De dónde vino la idea? Y exactamente qué hiciste?

Speaker 2
[00:37:33] Bueno. De dónde vino la idea? Y cómo te dije anteriormente, al ser docente de ciencia…

Speaker 2
[00:37:45] Diferentes actividades. Me lo tomaba como docente de ciencia que soy por parte de mi regional entonces la encargada para ese entonces la la licenciada Tori Parra. Era la encargada ya el área de ciencia y siempre me veía como comentando que yo tengo una docente, esta docente hace esto, esta docente hace aquello, y lleva el comentario allá, a la regional.

Speaker 2
[00:38:26] Sin darme cuenta llego como te expliqué a la Universidad Central del [redacted] y busque y. Recibo una invitación para participar en el diplomado. Y ya conozco a la encargada del área de ciencia a nivel regional.

Speaker 2
[00:38:47] Entonces la encargada del nivel de ciencia le dice de mi.

Speaker 2

[00:38:53] jefa inmediata, oye, conocí a una chica, es así, así, así. Y le pregunta cuál es su nombre? [Participant TH]. Pero es la chica de la cual yo te venía hablando. El tú nunca me hacías caso. Entonces la encargada me dice, yo necesito que tú vengas porque tenemos que tener una reunión con el regional. Entonces ahí es que te pido que por favor, si me puedes conseguir unas carta o algo para yo ir con, con una base o algo que me reciba y wow.

Speaker 2
[00:39:34] Entonces ya después de ahí ya tú sabes lo que aconteció. Hoy estamos colaborando y quizás por la pandemia no lo podemos hacer ya de forma.

Speaker 2
[00:39:49] presencial. Pero sí me mantengo dando diferentes talleres a nivel virtual y todo eso.

Speaker 1
[00:40:05] Creo que si me puedes explicar un poquito más sobre exactamente qué pasó durante tu visita a la Universidad del [redacted] y también a lo que pasó, o exactamente qué fueron las actividades durante los talleres o en el taller que hiciste que surgió?

Speaker 1
[00:40:22] Si este diplomado duró aproximadamente 6 meses porque son diplomado que hicimos y el tema en general era cambio climático.

Speaker 2
[00:40:35] Entonces ahí se abordaron diferentes temas e invitamos a diferentes profesionales del área. Empezamos a contribuir y mi función era ejecutarlo

Speaker 2
[00:40:52] A los docentes que iban a participar en él, en el diplomado adjunto de la licenciada, o sea la encargada de la regional. Yo le ayuda en el reclutamiento ya a nivel de cada uno de los distritos educativos para al que sepa, en eso estaba más bien como en la logística al punto de ella.

Speaker 2
[00:41:14] Y eso está vinculado con la Universidad del Este o con los talleres. O es lo mismo? Perdón.

Speaker 2
[00:41:20] Es lo mismo. Con el apoyo de la Universidad del [redacted], porque la universidad era la que iba a dar la acreditación como universidad apoyando al Ministerio de Educación.

Speaker 2
[00:41:34] Y como docente fellow, me agregué al equipo.

Speaker 1
[00:41:41] Y pues me pregunto. Pues ahora pues has tenido estas experiencias y pues también me parece que te reconoces de ti misma como docente líder en ciencias. Pues cómo te hace sentir? Cómo te sientes ahora de ti misma como líder docente de ciencias?

Speaker 2
[00:42:03] Pues como te digo, no ha cambiado nada, porque yo me siento que soy la misma sangre.

Speaker 2
[00:42:12] Ya no tengo ni un miedo mayor. Nada de eso de mis compañeros me lo expresan. Me dicen óyeme, es que yo, estando tú en tu lugar, yo no le hablaría nada, de hecho. Que eso, eso no es nada.

Speaker 2
[00:42:28] Si la vida me ha presentado esto, me ha permitido participar es para que yo siga multiplicando.

Speaker 2
[00:42:37] No es nada de yo sentirme ni mucho más grande. No, no, ese no es el fin. El fin es nosotros compartir el conocimiento que adquirimos con ustedes.

Speaker 2
[00:42:49] Yo creo que eso es lo que ha hecho esa.

Speaker 2
[00:42:54] Se ha sensibilizado de que realmente los docentes, sí, se sigan, creo que eso es lo que me ha facilitado el convocarlo a ello con facilidad y todo eso.

Speaker 1
[00:43:11] Pues eso también me lleva a otra pregunta que es qué impacto crees que has tenido como líder de ciencia?

Speaker 2
[00:43:21] Bueno, yo creo que un impacto fue el decir, Sí, sí.

Speaker 1
[00:43:27] Cómo crees que has impactado en la profesión o en el sistema educativo?

Speaker 2
[00:43:34] Bueno, como te explicaba, porque en los docentes pensaban que el hacer ciencia específicamente en STEM necesitaban tener un equipo sofisticado.

Speaker 2
[00:43:50] Quizá en los kits del laboratorio específicos, y a medida que hemos pasado y hemos interactuado, se han dado cuenta de que de qué no. Era si se lo que tenían una visión muy diferente a lo que realmente se puede estar haciendo. Se puede estar produciendo y, y pedir algo a nuestros alumnos que con cosas sencillas pueden hacer grandes maravillas. Y yo creo que es que haciendo el mayor impacto de que los docentes puedan ellos aprender y no solamente

aprender, sino que puedan transmitir a nuestros chicos esa manera de hacer ciencia de manera divertida.

Speaker 2
[00:44:41] Yo creo que eso es lo ha dado un gran impacto.

Speaker 2
[00:44:46] Específicamente en esta parte este de hecho, a través de la línea focal lo que se busca es que no se queden simplemente en la parte este ni ni en la parte de la capital donde está [colleague], sino que a través de esta interacción de nosotros podamos seguir transmitiendo a otras partes del país lo que nosotros, nuestra comunidad hemos, hemos hecho y hemos impactado acá.

Speaker 2
[00:45:18] desde ese trabajo de la RIED que ustedes han hecho con nosotros en darnos esa oportunidad.

Speaker 1
[00:45:26] Y bueno, eso también me lleva pues una de mis últimas preguntas que es pues.

Speaker 1
[00:45:32] Qué son los siguientes pasos para ti de qué crees que eres capaz? Hacia el futuro?

Speaker 2
[00:45:40] Bueno, yo, creo que soy capaz.

Speaker 2
[00:45:43] Sí, así analizándolo, de asumir un proyecto, de seguir como induciendo a otros docentes para que ya se como yo, también ellos puedan darse cuenta de que en realidad son libres y que pueden transformar, pueden transformar.

Speaker 1
[00:46:13] Y respecto a eso. Crees que los demás también pueden ser líderes docentes?

Speaker 1
[00:46:20] Líderes? Si es así, qué es lo que necesiten para sentirse capaces de ser líderes?

Speaker 2
[00:46:29] Bueno, de hecho creo que proporcionar oportunidades como esa.

Speaker 2
[00:46:39] Esa oportunidad que tuve yo también ellos puedan tenerla y que haya como personas que sí crean en ello y que sí le apoyan en quizás ideas que la veamos. Oyeme, no pueda, pero creo que sí es solamente lo que necesitamos.

Speaker 2

[00:47:02] Es como motivación y esa persona que realmente crean bien en nosotros y que nos apoyen. A veces ni sé que es lo económico pedirselo como que realmente querría en los proyectos y las visión que tenemos. Porque te dije que el [país] en su campo un poco difícil para tú avanzar.

Speaker 2
[00:47:30] En qué sentido que, tienes que ser un poco político. Pues estaré en el medio, aunque tú no sepas nada. Pero estando político llegas quizás a los grandes.

Speaker 2
[00:47:44] Estatus estatus, no sí me entiendes, bien, pero hoy creo que quiero expresarte.

Speaker 1
[00:47:52] No, no, si, si lo entiendo. Bueno, si, si, si, aun tienes un poco de tiempo.

Speaker 1
[00:47:59] Si, tengo toda la tarde.

Speaker 1
[00:48:03] Pues una pregunta que tengo es que mencionaste a [collegue]. Me gustaría saber pues como te ha impactado tomar este viaje, tener este desarrollo en los últimos años junto con [colleague], con O o con [colleague 2], o con los del equipo de proyecto o con [institution]. Realmente has sido parte de un equipo. Me pregunto que impacto eso ha tenido en tu cambio o tu desarrollo personal.

Speaker 2
[00:48:35] Si. Te voy a decir la verdad! Para mí, cómo ha desarrollado esto? Yo creo que hay una persona clave.

Speaker 2
[00:48:46] Y es la encargada de evaluación, GMO. Yo creo que la vea que ella cuando salimos y premiado a nivel nacional y nos enviaron a Colombia.

Speaker 2
[00:49:04] Ella estuvo como muy pendiente a lo que yo hacía, como lideraba incluso un momento en que ella me decía [Participant TH], recogeme los docentes, reunirlos para cada momento en el salón.

Speaker 2
[00:49:21] Entonces cuando teníamos actividades allá en [país], ella, la más auxiliada de mí. Quiero a todos los docentes a tal hora. Y yo me las ingeniaba y le decía a todos éramos un grupo de 19. El docente. Yo llamé La doctora Gena dijo que a tal hora tenemos que estar. Entonces no podemos fallar porque nos están evaluando con eso. Entonces creo que a ella le impactó mucho el desarrollo que tuve durante ese tiempo que estuvimos en [país] y ya cuando ustedes le hacen la invitación al Inafocam, de la RIED. Mira [participant TH], el primer nombre que me llegó fue el de [colleague]. Y que la RIED extiendiera la invitación de una vez me acordé de ti y por eso te

estoy convocando a que si puedes participar en este proyecto para nosotros, como en [institution], sería un honor el tenerte como yo le expliqué en conversaciones anteriores. Yo le dije a la encargada, a Ginia, pero es que ya no puedo participar en este proyecto porque la física no es mi especialización.

Speaker 2
[00:50:40] Lo mío es química y tú me estás invitando a participar en un proyecto de física. No puedo participar en eso y se lo expresé como te lo estoy expresando. Y entonces ella me dijo yo creo en ti.

Speaker 2
[00:50:58] Yo quiero que seas tú, y yo sé que tú vas a hacer un excelente trabajo. Entonces, ya me dice eso he hecho. De acuerdo, pues. Créeme, yo asumo el reto. Pues manos a la obra.

Speaker 2
[00:51:18] Eso fue lo que pasó.

Speaker 1
[00:51:20] Pues una pregunta más. Es verdad que me siguen saliendo preguntas que pues has recibido mucho apoyo de otras. Es lo que me parece. Te han reconocido y eso está genial. Quisiera que todos tuvieran, tuvieran eso. Me puedes decir de algún momento que has tenido un obstáculo durante tu tiempo como docente líder y que, pues, tal vez has superado o tal vez no has superado. Pero me puedes decir en algún momento que has tenido un obstáculo?

Speaker 2
[00:51:52] Sí, y sí, tuve uno, uno, uno, uno principal. Y fue.

Speaker 2
[00:52:01] El director del distrito que había anteriormente. Osea yo entendí que no recibí el apoyo de él para trabajar de manera hacia mi comunidad.

Speaker 2
[00:52:16] Lo regional entonces regional me llama y en vez de yo hacer un trabajo local a mi comunidad, entonces regional lo hace como más grande y en vez de yo impactar de manera local. Entonces impactamos de manera regional.

Speaker 2
[00:52:38] Ok, entonces yo me sentí muy mal, dije, pero wow! Aunque el no cree en mí, si hay otros que quizás no me conocen, se han atrevido a hacerlo, entonces por qué no? Por qué no? Y eso de verdad como que me bajó un poco el autoestima. Después, conversando con Pilar me dice no [participant TH], que eres solo que no te sientas ni un te vaya a herido. En cuanto a ese liderazgo que yo se caliente no se la forma en que de esta manera a nivel regional, aunque descuella sienta que tú no los apoyaron. No es que tú no nos has apoyado, sino que ellos no han creído en ti.

Speaker 2

[00:53:33] Tener entonces eso sí me dió duro.

Speaker 1
[00:53:44] Estoy revisando mi lista de preguntas, pero creo que me has respondido a casi todo.

Speaker 1
[00:53:54] Qué hay de ti o de tu liderazgo que te hace efectiva o te hace exitosa en tu liderazgo?

Speaker 2
[00:54:10] Yo creo, Rebecca, que es el respeto.

Speaker 1
[00:54:16] En qué sentido?

Speaker 2
Yo respeto a todos mis docentes.

Speaker 2
[00:54:20] Cada vez que me dirijo a ellos se ve un trabajo que puede ser bello, o sea, puede ayudar. Bueno, en mejorar. Lo hago con mucha delicadeza, nunca haciendolos sentir que lo que han hecho es malo.

Speaker 2
[00:54:37] Sino que con esa forma de comunicación me ha ayudado mucho a perfilarme como un una gran [inaudiable]

Speaker 2
[00:54:49] dentro de ellos. Ya voy. No voy a hacer este [inaudible].

Speaker 2
[00:55:00] Solucionaste [inaudible[

Speaker 2
[00:55:09] Si solo son simples sugerencias que te doy, pero esta en que tomarla es tu decisión. Creo en ti, sé que vas a tomar la mejor decisión posible, entonces creo que esa forma de y creer en ellos.

Speaker 2
[00:55:25] Aunque le ha impactado mucho porque es lo que he visto en mi vida, recibe algo muy valiente que igualmente si yo he recibido a esto. Entonces qué? Por qué no puedo creer en el otro.

Speaker 1
[00:55:41] Pues pensando en tu futuro en cinco o diez años, tal vez hasta el más allá. Qué impacto te gustaría tener en los docentes de ciencia de STEM en su país o en la región como al largo plazo?

Speaker 2
[00:55:59] Sí, me gustaría como poder llegar aquellos, al estado, que veces lo veo como tan difícil de llegar porque creo que sí puedo llegar a esos lugares. Mi voz puede ser escuchada y quizás las cosas puedan mejorar en diferentes lugares inhóspitos de nuestro país donde no llega absolutamente. Yo creo que te conté que también hago trabajo social. Es una red de docentes motivado igual que yo que sentimos esa necesidad, de que también hacemos mucho trabajo social y ayudamos también a esos docentes que quizás no tienen el apoyo directo del ministerio y cosas así. Creo que eso me hace sentir especial, no?

Speaker 1
[00:56:57] Pues claro. Me sorprende mucho porque, bueno tienes. Tienes hijos?

Speaker 1
[00:57:01] De qué edad?

Speaker 2
[00:57:04] Sí, sí. Tengo una niña de 11 y otro de 16, pero ellos son autosuficientes.

Speaker 2
[00:57:15] Si tengo que durar una semana más a la calle. Lo unico que hacer es que tengo que dejarle es suficiente comida en el refrigerador jaja y un teléfono celular.

Speaker 2
[00:57:29] También he recibido mucho apoyo de mi esposo. El es también un alto ejecutivo del Ministerio de Educación.

Speaker 2
[00:57:42] También me apoya también en todo lo que haya que hacer, porque también en esa misión de que los docentes tengan un impacto positivo.

Speaker 2
[00:57:59] Él es director de escuelas. Dirige como seis o cinco escuelas del ministerio. Y también con él, eso ha sido genial, porque los laboratorios, hemos hecho esos experimentos en las escuelas de él.

Speaker 1
[00:58:16] Es un beneficio? No, no, pues eso es lo mejor.

Speaker 1
[00:58:25] Tengo. Tengo una relación muy parecida con mi esposo, con con su trabajo, con con con el software de los smartphones.

Speaker 1
[00:58:33] Y aunque él no es físico y pues yo sé más física que él, él siempre me ha apoyado específicamente desde 2010 y me encanta poder presentar con él.

Speaker 1
[00:58:45] Me encanta poder ser, que trabajemos, que colaborar, colaboremos como profesionales porque es otro, es otro lado de y de una relación personal que muchas personas nunca tienen.

Speaker 1
[00:59:10] Ok, pues yo creo que no tengo, no tengo más preguntas porque me has explicado tan bien y muy a detalle tu historia.

Speaker 1
[00:59:19] Supongo que lo último que tengo como pregunta respecto a este contenido de estar entre esta entrevista es pues si hay algo más que me quieres decir acerca de y de por qué? Por qué aceptas ser líder docente, el líder de ciencias?

Speaker 1
[00:59:37] Por qué crees en ti misma como docente líder de ciencias? No sé si hay algo más que quieras agregar que yo debería de saber de. Y de ti, y de tu, tu, tu desarrollo. Porque es muy importante para mi saber sobre tu experiencia y luego también vamos a estar entrevistando a los demás Fellows para ver si hay algo en común para poder apoyar mejor a otros que tal vez aún no son docentes líderes pero que lo podrían ser.

Speaker 2
[01:00:06] Sí. Yo creo que lo que me ha ayudado es como ese.

Speaker 2
[01:00:11] Ese inquietud de mí, de querer como seguir avanzando, seguir adelante. Yo como que no me puedo quedar estar en un lugar. Sí, yo creo que qué es lo que que me ha impulsado. Y otra cosa es que a pesar de sentir miedo, asumo los retos. Yo sé que el miedo se me va a quitar en el camino se reconoce el que siempre siente miedo como a lo desconocido.

Speaker 1
[01:00:41] Y dónde aprendiste eso? De dónde aprendiste eso? Porque eso es algo, pues me tomó años aprender. Caminar hacia el miedo.

Speaker 2
[01:00:48] Yo no sé de dónde lo aprendí, pero soy como muy, muy dada a lanzarme a las cosas.

Speaker 2
[01:01:00] Y digo bueno, si funcionó, funcionó. Y si no, me quedé con la experiencia. Pero no me gusta como quedarme con esa inquietud.

Speaker 2
[01:01:11] Si yo no lo hubiese hecho, qué habrá pasado? No, creo que es algo muy avanzado en cuanto a eso, y creo que ha dado resultado.

Speaker 1
[01:01:22] Si uno no hace nada, no cambia nada. Es cierto? Yo creo que también hay algo que dicen según qué dicen en Google.

[01:01:31] Que la falta de satisfacción es lo que promueve el bueno. Que hay que estar atentos a ese sentimiento.

Speaker 2
[01:01:40] Y me preguntan como tu puedes dar por tantas cosas? Porque mira, hasta los chicos de la escuela nocturna, se meten a la 1, a las 2, para preguntarme, como hiciste de los experimentos y los resultados. Aveces mi esposo me dice pero ponte un horario. Pero le digo óyeme, que no lo puedo dejar así. Es una cosa mia. Es como si yo no le contesto, como que les estoy faltando el respeto. Y que como que esa inquietud de ellos de aprender.

[01:02:25] Pues eso. Eso me deja con otra duda de que si crees que ser docente líder en ciencias es compatible también con la responsabilidad de estar enseñando de tiempo completo.

[01:02:39] Bueno, mira, se hace difícil, pero no imposible. Por eso, por eso es que te digo que tengo. Tengo muchas, muchas expectativas. Bueno, el cada vez que hay cambio de gobierno, hay otro de líderes que ya llevaban una visión de mi trabajo. Y yo creo que ahora se abren el abanico mucho más, porque eran personas que no eran, sino que veían el trabajo desde el punto de vista. Pero ahora le ha tocado estar en los algos importantes.

[01:03:22] No sé, creo.

[01:03:26] Que que van a haber muchas oportunidades con este cambio gente que este desde mucho tiempo ha visto el trabajo.

Speaker 1
Y tienes alguna solicitud en particular para esa gente?

Speaker 2
[01:03:41] Bueno, en particular te pedí esas cartas. El director distrital me dijo que me tiene pendiente que desde que salga de unas cuantas reuniones que tiene ya anteriores, estoy yo en su agenda, porque el quiere conocer más del trabajo y más de lo que estoy haciendo para saber de qué forma él puede apoyarme.

[01:04:13] Incluso me dijo que que vaya pensando el salir de las aulas. Para entonces encomendarme la función del formar a otros docentes. Eso es lo que que ha hablado así. Cuando me vio el me dijo pero eso lo vamos a concretizar cuando yo te invite a la reunión que vamos a tener.

[01:04:36] Cuando yo salga de otras responsabilidades que tengo delante.

Speaker 1
[01:04:42] Entiendo. Y te gustaría eso? Te gustaría tener una responsabilidad así de formadora?

Speaker 2
[01:04:49] Yo creo que sí. Porque yo, lo que quiero es como ver un cambio, un cambio en los docentes, creo que asumiré el reto con mucha responsabilidad y con mucho [inaudible].

Speaker 1
[01:05:04] Muy bien. Bueno, hay algo más que quieres agregar?

Speaker 2
[01:05:11] Bueno, yo creo que no. Yo creo que te cansé de tanto hablar.

Speaker 1
[01:05:22] Esta muy bien porque no se si te lo comenté, pero amm. Pues creo que sabes.

[01:05:27] Estoy trabajando en mi doctorado y en en enseñanza de la ciencia desde entonces. Bueno, no es enseñanza, sino lo que se llama instrucción en las ciencias en sí, que estoy estudiando el liderazgo más que más que lo que pasa en el aula.

[01:05:41] Y entonces, es decir, el trabajo de la RIED porque es parte de nuestro, de nuestro plan tener como investigación. Para poder decir que después que tenemos lecciones aprendidas esperamos de los docentes, de los equipos de proyecto, pero para mi personalmente me sirve mucho.

[01:06:00] Entonces te agradezco de manera muy personal por decirme tu historia, porque a mi me permite avanzar con con mi con mi tesis.

Speaker 2
Y yo planteé que se me quedaba agradecerte, pues al e que yo así como pensando en cómo ayudar hacia los docentes he elaborado un manual de prácticas de laboratorio, el cual Pilar me está dando seguimiento a eso.

[01:06:31] Me dice tienes que publicar esto. Vamos a hacerle los arreglos del hogar porque eso tiene que publicar se yo, es que yo nunca he publicado nada en general, que bueno, pero esta va a ser la primera vez que lo vamos a hacer y tu verás amiga, que te vas a quedar increíble. Entonces también quiero decirte que Pilar me está ayudando mucho en esto.

Speaker 1
[01:06:54] Pues felicidades con eso. Yo creo que pues me alegra que tengamos a Pilar en nuestro equipo porque ella sí es muy motivadora y ella sabe como superar los los los obstáculos por seguro.

[01:07:10] Es muy importante tener a alguien así en la vida. Algunas veces cuando yo me siento un poco desmotivada me voy preguntando pues quién es mi mentor? Porque necesito que alguien me aliente un poco y tal, me queme aquí y me ayude. Que medio de dirigirme no? Porque algunas veces para mí, al menos yo creo que lo que más me asusta es cuando siento esa inquietud así como tú y no sé qué hacer. Eso es, eso es lo peor, no?

[01:07:37] Al menos si puedo ver una posibilidad, aunque tal vez no sea muy probable, es mejor que ni saber, cierto?

Speaker 2
[01:07:48] No te digo algo, lo mejor que me ha pasado en la vida es conocerlo a usted.

Speaker 1
[01:07:55] Eso sí, muchas gracias. Pero tú no? No hay otras cosas, no hay otras cosas en la vida que son más importantes por seguro.

[01:08:05] Pero, pero aprecio que pues que te hayas podido aprovecharte de esta comunidad, no?

Appendix F: Cara Interview Transcript

Speaker 1 (00:00:00):

All right. Wonderful. Okay. So, um, why don't you just kind of give me an update on what you've done over the past, you know, past few months. Cause I know you've been so busy and I know that you, you know, the last time that I think we really interacted with through the [redacted](Caribbean community of practice) stuff. Um, but tell me what's been going on in just the past couple of months before we get started. So I know.

Speaker 2 (00:00:25):

Okay. So what I wanted to tell you, like I said, we would talk a little bit after that is, so right now I, I kind of feel it like when it comes to like what we have been doing, like this part of it, I feeling right now, like I, I kind of stuck because right now you can system right now, here is like, that is like where we it's, like we went on pause. So like just before, um, COVID that's like March, March of last year, the 14, everything was going so great. We had already, um, we conducted workshop with administrators. It was the second cycle we were going to begin and we had already done the workshops, um, with the administrators and we were ready to move on to teachers. Uh, we went so far as to, uh, change our activity plans and everything to include STREAM, um, outcomes, which was really, really going well.

Speaker 2 (00:01:30):

And then all of this came and everything just came to a standstill. So that is where we at as for that. Um, apart from that where we, I continued with the [inaudible], so there is where I continued with the STEM part of it and what I did after we finished last semester, I continued, um, with some of the students, some of them were like messaging me personally. And I was, so I was kind of talking to them, um, some on the, on the main group chat and then some of them were messaging me like personally and asking me if it was okay for them to do so. So I was talking to some of them on that level, like personally, like if they were going to do like, they were going to try an assignment or a project and they wanted like, uh, like just a feedback as to how they were doing it and where they were on track and things like that. So that is what, like, in this couple of months after we completed last semester, there's where I held on to those students there. So I have been in touch with some of, some of them.

Speaker 1 (00:02:51):

How do you, I guess I'm curious to know how you feel about those interactions. Like, do you feel like the efforts have been worthwhile? Do you

Speaker 2 (00:03:00):

Feel like the teachers get it or

Speaker 2 (00:03:03):

It has been really, really worthwhile when we see the changes that even for my personal teaching and at my school itself, uh, when I see when we see the changes and all that, first of all, in our children and then how our teachers came alive and I speak in about the teachers and my school is

like, we could, like, we could sit down and we could plan for STEM activities all afternoon after school. And, you know, we would, we would just sit down there and the time will go by and we, and we would not believe the time had gone. And they, they became so alive. It's like, you know, it's like this engagement. And instead it just brought a whole new life to everything we were doing. And every way, even children, especially we knew we had reached a certain point when our children with access, when are we doing the next experiment?

Speaker 2 (00:03:59):

And when they were using all those terms and those words, you know, um, we, we knew, we knew we had done something really, really great. And when we had this and I always talk back about the day it had, this was going on all over, all over the internet when they were trying, they were saying that the grab gravity with the broom, and when they came to school that morning, they went and they put down their lunch bags and they were looking for the broom. So they wanted to show us, they wanted to see if we could do the same thing. And we spent almost, uh, we did not even start school that day. They stop at school and all of them trying to make this brooms stand up. And then we went straight into talking to them about, you know, why the broom can stand up.

Speaker 2 (00:04:54):

And it really had nothing to do with anything that was happening on that particular day, but it all had to do with gravity. And then we went on to start talking about the moon and why is it where if we were to go to the moon, we will not, we will be just floating around with, they really loved. And then this little girl said that she just wish she can be an astronaut and she could go to the moon. And there, we started the talk also. So many things happen on that particular day. There, we started to talk also about the importance of goods and not being afraid to be what you want to be and to do what you want to do, especially when it came to things that related to science. And we, we, we really made her feel, um, that, that she could have done that. And she can work towards probably one day being the first girl from [country] to go to the moon. And she was so excited. It was as though she was already feeling that and all those things, they have to say that it does matter.

Speaker 2 (00:06:07):

I think it is so important. What I have also been doing is over the past months, what I, what to they are to Islamic base, um, schools. And we're not, not really close, close to me, but I work with the people. What they have done is when those schools were, was being established, they had asked me to help them have them like with guidelines as to how they can begin an early childhood center. And I started with them from then, and they kept in touch with me and I continued to like to give them, um, give them assistance and to do like workshops for them. And then I introduced them to STEM and I asked them like, have you ever taught about offers? I had asked them if they ever heard about STEM. And one, one of the schools that I did when I had the meeting with the teachers, one of the teachers said, yes, she thought about STEM.

Speaker 2 (00:07:10):

I said, so, you know, STEM is well into our curriculum right now. We, we refer it to refer to it as stream. And it, it is re it is something that the ministry is as well into to also, and once you want

to have your level of education on par with ministry, then you should be also thinking about how you're going to introduce STEM or stream into your curriculum. And I did the same thing for the two scores on two separate occasions. And those teachers, they went ahead and they began to do research. And I keep in touch with those teachers also, and we do the same thing. Like they will message me and they will ask me like, what I think about this and are we on the right track? And so I am also working with those two schools and those teachers there.

Speaker 2 (00:08:08):

So I have introduced those two schools now to STEM and they, they really enjoy it. They said it has made a difference. The DHL ran also. And they even said like couple of the teachers, they have children of their own. And they say they even do those things with their own children. So it, it is really, really, really great. I, Hmm. I don't know how it would have been minus the experience of the, this coupler. This lasted, let's say like about two years or a little bit less. I can't even begin to say how I think my experience would have been before this. So

Speaker 1 (00:08:56):

I'm so glad to hear that. I'm so glad it's worth it to you and to your colleagues. So that's what I actually want to talk about in this meeting today is where kind of things started. So I actually would like us to think back to the very first time that you feel that you engaged in leadership as a STEM teacher. Um, so if you recall last year, we asked you some questions about, do you think about yourself as a STEM teacher leader? And what does that look like? And are you doing those things? What I'd actually like to focus on today is the reasons why you do what you do as a STEM teacher leader. But first I want to give you a couple, I'm going to give you a definition that I'm using, just so that we are talking about the same thing. So what I'm interested in asking you about is what I call professional strategic leadership and STEM.

Speaker 1 (00:09:47):

And so what I mean by that is it's focused on improving STEM teacher education. So I'm right, right now, during your interview, I'm interested in what you're doing for other teachers and for systems, everything you've talked about, um, more so than focusing on like, what is happening in the classroom. I love hearing about that stuff, but most of my questions will be about your work with teachers and with the systems that support STEM teachers. And then, um, like I said, professional, strategic leadership. Um, and so what I mean by that is, um, I, the kinds of things that you're doing when you step beyond the scope of like your traditional contract work, like whatever you, your job description is, it sounds like you're doing things that are above and beyond in addition to, and you're really stepping outside of boundaries and that's the kind of leadership I'm really interested in.

Speaker 1 (00:10:37):

So I'm going to have a series of questions just like last time. And I will try to try my best to listen quietly and not interrupt you. Um, and I, um, so I would like you to think back to the moment or the period in your life, when you first felt that you had the opportunity to be a STEM teacher leader, again, beyond your classroom, beyond your own, beyond your own school, um, beyond the scope of your official job description. So I'd like to know what was that opportunity or that moment or that period. Um, and tell me that story. So what was going on with you? What was

the context, how did you feel and why did you say yes. And why did you decide to become a STEM teacher leader?

Speaker 2

I think that happened for me because I, when I know, so when I was asked to represent, uh, early childhood and [country], and to be able at the seminar and Peru, I really did not know much about STEM. We, I used to hear about STEM in the primary school and the secondary school, but I never thought much about it because to me it,

Speaker 2 (00:11:54):

Nobody spoke about it at my level at early childhood. Uh, so what, when it really happened for me is when I went to Peru, when I went to Peru, I, even though I hadn't, I really did not know about STEM. I have to say it was like, uh, it was like the total package for me. So I had no pre-notion of what STEM was. So I went there and I knew it was, is when I went there. I realized that what I really went there for was to become more aware and to learn about STEM. When I started to realize while I was there and I started to attend the workshops and I listened to the lectures. And then when we met in the big conference room and then [colleague 1] and, um, [colleague 2], and they will do the experiments and stuff, then I started, I said, okay, so this is STEM.

Speaker 2 (00:12:56):

It has a lot to do with science. It has a lot to do with engineering and technology, uh, concepts. I never taught about early childhood. In fact, in my teaching early childhood, I thought about maths and language and story time and building blocks and all those things I did not take. I did not even think for once we could have done STEM at the early childhood. And when I started to attend, when I went to visit the schools and I saw what those children were doing, I said to myself, I am going to go back home. And my children, they are going to be doing the same thing. There's no two ways about it. I am going to go back home and the same experience these children I have in here, my children, they are going to get the same experience. So at that point in time, all like every time I made a new, every time I had a new experience or I visited somewhere else, all I could think about is when I return, when I reach home, when I go back to school and I keep thinking about all the things I have to tell my teachers, and I did not know what their thoughts would be off or anything like that, but all I could see in my mind was their smile.

Speaker 2 (00:14:22):

I could just see them. Like I could just envision, I actually saw the change in my school. And I said, that is what I going to do. And I just couldn't wait to come back home. But it happened to me. It happened for me when I went to Peru. That was, um, even though I had no experience with STEM and not much, except here in the STEM domain, everything happened for me there. I got to know about STEM. I got to see STEM in practice. I got to see the materials that can be used and everything else. So when I came back home and I had to talk to my teachers about STEM, I did not have to, I did not have to guess about what I was going to tell them.

Speaker 2 (00:15:11):

There was no worry for me about material, because I could have shown them, hope, everything that we have around us, we are going to be using. And every activity that we can, we did before and we going to do in the future, I wanted to show them how we could incorporate STEM in it. So I have to say for me, it was Piru. It was that trip to that seminar there that I was so grateful and thankful now I sure, sure, sure. I can say that because it made a difference in for me, for my school, for my teachers, for my children. And when I could have come back home and in just a short space of time, when I could have, see, when I could have seen what I, what was done for my children, it was not just a smile as I saw on my teacher's face, but it was those experiences that we gave our children. So I have to say it had to be there. And I, I, I just cannot see me minus B room anymore.

Speaker 1 (00:16:24):

I ask you now a little bit about, so, um, because you're a school administrator as well as being a teacher, I think, um, you know, you naturally have this group of this community of teachers that you can also impact. Can you tell me about the first time that you stepped beyond your school to start working with teachers who maybe were not directly under your supervision and why, when did that happen? What was going on and why were you inclined to do that?

Speaker 2 (00:16:54):

So, so first of all, so when we, when we, when we came back, we engage in, um, in, in planning and carrying out workshops for our government or our teachers, then our teachers in early childhood of administrators and our teachers. So we knew we had to do that. We, we were called upon to, to, because we had all these, these experiences and we had actually gone to [inaudible]. So we, we had, we were sharing back for our teachers. Uh, so that was the teachers or in a, in a government side of it. But when, as I, as I got to experience more, more about STEM, learn more about STEM. And as I saw what it did, I knew I, I, because I was working with schools beside, uh, like our ministry school and our ministry teachers, I said, but I have to introduce this to these others, if it is that I am helping these schools.

Speaker 2 (00:17:59):

And they look to me for guidance and systems and helping them to not remain stagnant, but to be able to move forward. Then I had to share this with, with, with them also, and I did not do it right away, but as I engaged, like from time to time, they would call me to do, like, I will do workshop with their teachers. And even though I had the chance when I, when I came back and experienced them, even though I had a chance to do workshops with them, I did not talk to them about STEM right away. I found I had to be, I had to know, like I had to do it with my, within my school. Really know what this was all about. And know if I'm going to introduce this to teach us who did not have my experience. I had to know exactly what I was gonna to say to them and how I was going to help them to include this and to let them know how important STEM was and what it did for children's learning.

Speaker 2 (00:19:08):

So it took me a little, a little while until I eventually, which I did. I think it was coming to the end, even though our schools are closed for COVID face-to-face I still do. I did workshops with those two schools, with those teachers, uh, virtually we also, um, communicated via WhatsApp

and I shared, but I was fortunate enough to share with them about STEM face to face. So like when we will allowed to meet in small groups, that was one of the first meeting I had with teachers after COVID closed our schools. And they were, they, they were there and they were asking me questions about the curriculum and about how I would, what they were most interested in was online. But I had to remember, I too was just like them. I was no better than them. I too was now learning about online.

Speaker 2 (00:20:17):

So I, first of all, I had to share with them that, that I was no expert in online. I was probably, if I don't know, I probably was not even as good as they were online, but I shared with them, I shared experiences like how we move from one to the other and where we work then. And then when we started to talk about curriculum, that is when I started to talk to them about stamps. Well, what, we know what we refer to here as STREAM. And I, I asked them, you know, if they heard about stream and well, first I said STEM, and then I said, but here we, we are, we are saying stream. And I explained to them what, why we say, we are saying stream and not just STEM, as I explained to them. And then I, I said, you know, this has it ha this has benefit vetted our children and has changed how we do what we do, you know?

Speaker 2 (00:21:21):

And I, I, it would be nice if you all could at least think about it. And right away, they started, they started to asked me about STEM, what it was about, um, what, what, what, what it meant. And I, I, I was explaining to them and I was talking to them about the science and the technology and the engineering and, uh, the reading and the maths and things like that. And I just went ahead and then I just started to show them. I just said that to show them how a simple activity that they could do could have so much of stream in it. And then they were saying to me, but what did that is so true because when we do our activities, all of these things happen. I said, so, so it was the same for me. I said, you know, I was fortunate to go to Peru.

Speaker 2 (00:22:16):

And when we were doing, and when we were listening to these lectures or we saw activities being done, I kept telling myself that one thing, but we do all of these. We do all of these in our activities, but we never, we really did not know they were referred to now as STEM or stream. And now you can actually, um, pull out those outcomes and you can make your activity plan so much more meaningful, and you can actually know your children will be doing all of these things. And you will know, because here it is now, you know, exactly like I could look at an activity plan and right away I could, I could identify all of the components that their data stream. And that was one of the most important things we had to do when we changed our activities to include the stream components.

Speaker 2 (00:23:12):

So that, that was one part of our activity plans that the teachers and the administrators will have in a little bit difficulty with, especially the technology part, even after recent, we, we continuously have to go back and explain what technology is. You know, that technology is not just about the, the computer, the laptop, the tablet, or those electrical devices. And, and I really loved, I realized that out of whole stream, I really, really love explaining technology to the

teachers because when we had our teachers workshop also, um, that the, the presenter, the husband asked me whenever, wherever we would go, the horse relaxed me to explain technology. Could you explain technology? What, what is meant by technology? And I just, um, I just started to do so out of the wall stre I was there constantly explaining technology. And I would say to them, well, you know, technology is anything that you can do. And I, I tried to make it as simple as it could be and not let it feel as though it is so overwhelming for them. So I would say, you know, technology is so simple, right? It is anything that you can do to help you to accomplish a task, to do your job.

Speaker 1 (00:24:41):

Sorry to interrupt. May I ask you, so you've talked about two different training opportunities, so right after you came back, and I know this was, I think in October and November, that's when you did the ministry trainings, which included also private school teachers, I'm curious to know, was that a requirement or an expectation placed by your ministry, or like who came up with the idea to do those workshops?

Speaker 2 (00:25:04):

Uh, it wa it was not, it was not really a requirement. I think what happened is they were, they, they had, they had, they were interested in STEM because they wanted to introduce STEM into early childhood. One of the reasons why we were chosen to go to Peru for that seminar and I, what happened is because we had gone and we got that experience and they were not there. We had firsthand experience. I think that was the main reason why we were chosen to, to assist with these workshops. And it's only when we really started those workshops. And we started the work with the curriculum team at the ministry. Then that was another time that I realized how much I have learned about STEM. And I never realized that, you know, I never taught. I said, but I can't believe this is me talking about STEM.

Speaker 2 (00:26:11):

And I can't believe this is me sitting with the people way up in curriculum. And I hear ya, and I am talking to them about STEM and I am telling them, okay, so this is what we need to do. And B this is how, what might work best. And these are topics we can do. And I just couldn't believe that. But then also as we continue, those workshops is that, that is a time also that I gained a lotta experience. I realized from when I would do further research and even on the spot, like someone might ask a question and I would realize that I would have to answer, and my answer had to relate to STEM or stream. And it's Dan too, that I realized as I continued along that line, my knowledge grew, my experience grew. And I just realized that this is something I just really want to know more about and not just know more about, but I really, really want to practice this.

Speaker 2 (00:27:16):

I really want to practice them. In fact, at one point in time, I was sitting with the teachers at my school. And again, we were talking STEM stream all the time. And I was saying to them, you know, I have this, I just have this strong feeling about the STEM activities and STEM teaching that, you know, I feel like I could just do that. I feel I could just go around the schools and I could just, uh, you know, I show them how to incorporate STEM stream into their curriculum and, and, and help teachers. I said at that time, that is how I was feeling. I feel I could just move

straight into STEM, full blown STEM. I just want to be a STEM teacher because being a STEM teacher, I was not going to miss out anything because I was still going to do all the nice activities. What I would have benefited from is I would have gotten the opportunity to do all the mini experience experiments that I wanted to do, and just did not have the time to do it in school.

Speaker 4 (00:28:25):

So that

Speaker 2 (00:28:26):

Was a, that was a really strong tool that I had and a feeling that I had. And I still do. I still feel as though that if I got that chance, I would like to, to really get into STEM and really grow as a STEM teacher stream teacher. And I know what a ministry is, is really serious about STEM because we have activity plans. They have been changed. It probably is at a pause right now because of COVID. But I know as soon as a God, when we read to interface, the pace is, is like, is like right now, there's a, there's a pause button and it's pause, but I know as soon as we, that's probably one of the first thing or first button, they're going to press again and we're going to continue again. So I see, I see that being, I don't see any stop date because we were right there and just roll and out stream right across the early childhood centers in [country].

Speaker 4 (00:29:35):

I would be, yeah. Let

Speaker 2 (00:29:37):

Me ask you now. So when you did these workshops again, you did public school teachers and

Speaker 1 (00:29:42):

Also non public school teachers. Um, so you've mentioned Ben that you started branching off into, you know, beyond the ministry schools. Um, you waited a little while before you started responding to those requests. So tell me about how did that happen and when did you feel like you were ready to start reaching out to those schools?

Speaker 2 (00:30:03):

I felt like I was ready when I, when I felt that I was ready. If you understand what I mean, even though I feel, I felt as though I had a fair amount of knowledge and where my experience was growing, my experience was growing through teacher workshops, but my experience was growing more so to what I would do at my school, because what I would do, uh, like this, this supervisor, when they, when they come to school and they would see, they would see our environment and they would see the things we do and they would notice, and they would say, but we have made a huge thing. And I remember one day the director of ECC, she passed by my school and she stopped. So happened. One of the things, even when I was in Piru that I saw, and I said, I don't know how I going to get it, but I knew I going to get it.

Speaker 2 (00:31:06):

And I know my school is going to have, it was the light table. And I worked and I worked along with parents and we got a light table. So happen here, come COVID. We just got a little chance to play with it. But when we got it, I think it was two days after the, there, the director of ECC passed by. And she, whenever she she's in our area, she never passes our school. And she stopped by. And I was so happy to show her that. And I, if I think I was happy that my school got a light table, I did not even imagine her expression. She was so happy. And she was so proud and she took pictures and she made me send activities. The children were doing and everything. And I think I am running away from your question.

Speaker 2 (00:32:05):

I did this the same way with me when I started talking to anyone about STEM, I just go on and on, but it's just that we do so many things. And it is all now about STEM, but we have not forgotten what we did before. But coming back to the teachers, I fed it, w I, it happened what, like while I was there and meeting with them and talking to them, I just knew it was the time it was not planned. I just, um, re and I re really in a really simply simple way, I just asked them, have you heard about STEM? And I got that feedback. And then I just started to talk to them about STEM. They became very interested. I, but I made sure to let them know that. So you are a private school, but you also want to keep up with what the ministry is doing at that level when it put in the curriculum.

Speaker 2 (00:33:10):

So I S so one of the things I said to them, I said, right now, everything is at a pause. I said, we have gone so far as to actually change our activity plans, to include stream components and to be able to identify the stream outcomes. I says, so I take, if it is that you all want to make sure that you are always on par with what is happening. One of the things I think you should do is you should do some research about STEM stream. And so I said to them, I say, well, when you are doing your research, you would see STEM, you will see steam use stream. So then don't get too worried that they are all the same thing is just the different letters and darker. And I told them what they, what they meant. I said, and we, uh, we started to refer to STEM as stream at early childhood level, because we did not want anyone to feel.

Speaker 2 (00:34:17):

Especially teachers, teachers have a tendency to kinda sometime they, they kinda misunderstand things a little bit and they tend to think in their own minds. Okay. So, so like, if you, if you, if you said this to them, that the minus something else from it. So, so one of the reason why we went into the stream is two important things we did not want to take away from ECC was the creativity and the importance of reading and research. And I explained that to them. I said, so that is why we have the art and the creative, the creative, the ads. I said. So that is simply what those mean. And that is why we included it because creativity, the arts in early childhood and the foundation for reading is very important at the early childhood level. And we want that to be there. So it will never be forgotten that this has it's important at the early childhood level.

Speaker 2 (00:35:25):

So I started to talk to them, and that was one, one of the school, one of the teachers at one of the school. And when I spoke to them about it, then I knew it was time that I could, I could mention

this to the other school and other teachers and I am. And that is why when I met with them again, then I mentioned it to them. So then I realized that, uh, it was not too different talking to those teachers who I would assess from time to time. It was not different talking to them about how I would talk to them. The teachers at my school, it felt very comfortable. I felt I was, I felt I was capable enough to do justice. I did not want them to feel confused. And I did not want them to feel it was something new I was talking to them about.

Speaker 2 (00:36:26):

So those were some of the important things I wanted to make sure that I will not do to them. Uh, especially I did not mention too much about like going too much. I just, um, talked to them a little bit about it because what I want them to do, I want them to kind of get a little bit of the experience, similar to what I had. I, I, I did not want them to go into this with like too much, uh, uh, uh, uh, information from me, but I wanted them to go and do their own research and then let them come back and tell me what they thought about it and how they understood it. And then I could probably talk to them, let's say they were, they were, they were not clear on anything. Then I could probably explain it a little bit more or reassure them what their thoughts are about what the research was that they were on the right track. So that is how I took it on. And that part of it,
Speaker 1 (00:37:33):

No more about your, your motives. Um, and I say this because I'm anticipating, it sounds like you're investing a lot of time in these, you know, in these people, right. Who are not directly under your, who are not under your supervision at all. Right. And I don't, um, I'm guessing you're not receiving any additional, like compensation as a consultant. So I'm curious to know what is it in you or around you that makes you feel I either obliged or, or, or feeling that charity in some sense, in order to give of yourself to others in this particular way, what, why are you so motivated to get other teachers,

Speaker 2 (00:38:10):

Um, on board with us? You know, it is a first time that I know that you're telling me this is that I never even thought about that. I never thought about being compensated. In fact, I have been helping assisting the teachers in, in, in these two schools, especially there's a third one, but not as often as these, I never ever thought about getting something back. I always think about how much I want to give to them that I want them. I think the most important thing for me is I feel like I want them to experience what I am experiencing. And that is, that is compensation enough. And I feel as I feel that is what I want. That's the only, other than that, I don't see myself like thinking about compensation any other way. I just want you, I wanted you to see, first of all, I want to, I want you to see how your teaching and learning can change. I want you to see, I want you to see most importantly, I want you to see the benefit to the children. I want you to see how you could change the lives of children and how they could look at learning.

Speaker 1 (00:39:33):

I'm going to push you a little bit more and ask you even why that, why do you think that, that, that you desire that for other people? And I mean, it may or may not have to do with teaching or a science specifically, but I'm just, I'm really curious. What is it deep inside of you? Do you know where that comes from?

Speaker 2 (00:39:51):

My mama. She, she did not, she did not have a formal education, but for some reason she always kept telling me, she said like, she would tell me, she say, you know, you have to take your education, you know, have to take your education. And for some reason she will always tell me, you know, I know you're going to be a teacher. You have to be a teacher. And I don't know, it was something like, as I grew that group. And no matter what I did, I still kept thinking about teaching. And even though I was, I did train in for other types of jobs. And at the time when I was asked to do a two year full time course for early childhood teacher, I had no finish training as a, in the bank for the bank. And I said, but I have to go back two years to school.

Speaker 2 (00:41:05):

And then so they said, but you're not two years. We'll just go by and you always wanted to do this as, especially at the younger. So just go ahead and do it. And, you know, I had the support of family and I just went ahead and I did it. And I kept, you know, how words, especially if that is what I think that is what made everything for me and made me have from just how words and keep telling me that. I think that from, from Dan, that passion that was there. And I think that is why I do what I do. And I want to continue doing what I do. And because that is what I want to do. I want to, I feel, I feel if I feel there's no better thing or no better job in this world than to be teaching children, especially to be teaching children at that early age, I think there is where we can make so much difference that we don't even know.

Speaker 2 (00:42:20):

And I feel because I know that I feel, I want others who are in our teaching, younger children. I want them to know that too. And I want them to know that they can make a huge difference and they can have a huge impact on the, on the outcome of the children that they interact with. And they can either make them, or they can break them and they can get them to love learning, or they can get them to never want to see school. I, I, and when I talk to them, I always say, you know, when I talked to them, they said they don't even have to ask how I feel about what I do. And, and that, that's why I do it. I do it because I think I just, I just, I just love teaching. I love sharing, sharing experiences, and I love sharing knowledge.

Speaker 2 (00:43:24):

Like if I, if I learn something or I see something today, I just want to, whoever it is I know is going to benefit. I just want to let you know, I want to let you know that this is what I saw. This is what I read. This is what I did. And I think that you, it can help you, or I think you can use it to help someone. And I think that is a main reason why I do, why I do what I do. And I, and I really love what I do. I don't think there is anything else that I would do than what I am doing right now.

Speaker 1 (00:43:55):

Great. Has there been anybody else I'm particularly thinking of the time from, um, you know, post Peru, when you started doing the workshops with the ministry and then also this outreach to these additional schools, have you received any encouragement or discouragement from anyone around you? Be it family or friends or colleagues?

Speaker 2 (00:44:18):

I can't say I received any discouragement at all, because I would be so excited about doing these stream activities that when I did not get a chance to do it at school, I will do at home. I have a little nephew and I will just do it with him. When I go to do these things with him or the adults is around there and they will have so much fun just as whole when we, I would do it at school. So I will do experiments. I just love doing things with him and I, and I introduced him to all his experiments. So, so he, he also is part of it. And my family also, like, I will, I will show them things and I will talk to them about STEM. And I will talk to them about how it, how it has changed what we do in school.

Speaker 2 (00:45:10):

So even they are aware of what we do in and how different things are now. And like when I have to get materials, everybody know, I always look in for something and then know exactly why I looking for it. And the nicest thing about it is how they would want to help me. They will want to make sure that what I need I get, and it doesn't matter where, or how far they have to go sometime too, to get it. I don't mean distance, but the things they might have to do to have me to get what I need to do, what I have to do that is really amazing as Mike, my colleagues, the teachers in my school, they, they are, they are very similar. They are very open they're, um, they're always willing to listen. They can do, we can talk about STEM for hours.

Speaker 2 (00:46:03):

Yeah. So, so I have to say that, uh, even if there were slight amount of discouragement, for some reason, we, it was never noticed because the ups was so much, I can't even recall like any discouragement of anything. One of the things too, we were able, even before the ministry had gone ahead and audit all the other teachers in, in [country] with doing STEM, we were already doing STEM. So the teachers in my school, by the time they had to engage in, in STEM workshop, stream workshops, they already had a lotta, um, ideas. They had some experience because we were doing it. When the changes come, came to the activity plans, we were one year ahead because we had already included stream outcomes in our activity plans. So quite ahead. So we were way ahead, we'll be where we are ahead in how we formatted our activities, how we would look to see how we, every activity we would do, we would look to see how we could incorporate some kind of stream in it. If it were not all older, the components, at least the ones that were meaningful. So I say, yeah, I cannot say there were like any discouragement, either way. That's great. And when the ministry, um, when a ministry, when we went ahead and we, uh, have, uh, to plan the workshops and to conduct the workshops, that was a lot of encouragement. It said, it said to me that we had done something worthwhile because we were sharing it to all the teachers in our country.

Speaker 1 (00:47:56):

That's fabulous. So let me ask you that. So you, we started out by my asking, you kind of like what you've done. You gave me a very detailed overview, and then I kind of, we stepped back and thought about the why, why, why did you do that? Now? I'm curious to know for you looking forward, and you've already told me what you desire, right? What you desire would be to like, be that kind of like STEM teacher who could directly train and support teachers at multiple schools. And I've also heard you talk about how you're hoping that that pause button will get

released or whatever from the ministry. And that they'll move forward with the, the new lesson plans. Um, I mean, fast forward, 10 years from now, like, what do you think that you can do for, for your school, for your, um, I think, I guess thinking beyond your school, actually thinking, you know, what do you think you can do for your country or even for the, for the region? What do you feel that you're capable of doing in terms of improving STEM teacher education through your work with teachers and teacher system?

Speaker 2 (00:48:56):

I feel what I can do, what I can see myself doing in a couple of years from now, I feel I could see myself really, really getting teachers involved in in-stream coming on board with STEM. I F I feel that is what I want to do. I want to send since the ministry is well ahead. And we could, we could see that as far as, uh, when they, when you, we added that to their, uh, their courses that, that told us a lot also that taught us that there was no stepping backward, but there's only going forward. So that taught us that we are going to go more into STEM stream referred to here. And I think that is where I would like to see myself. I would like to see myself really helping teachers to understand what stream is all about. It may not come.

Speaker 2 (00:50:01):

I will not say it came. And for me, it was not difficult because I have to say [inaudible] experience probably why it was not difficult, too difficult for me, because actually being present and what the practice and the actual activities and seeing everything on hand had to make it easier for me. So I know for, to just go and set a teacher or ask the teacher, how do you feel about STEM or stream will not be as easy at it as it is, as it is for me, or was for me, I know there will have to be a lotta encouragement. You will have to let them know it is not something new. You are not going to be doing something new. And it's something that could be done. A huge question for our teachers, always here is about materials. And that's a one thing I always say to them, especially when we were doing the workshops, I always said to them, then don't ever let materials be honest too, because everything that you see around, you could be used as a STEM, as a STEM material, as a material in a STEM activity.

Speaker 2 (00:51:20):

And I think that is, that is those two things kind of go together and gauge and teach us and STEM can get an ha get an mTOR, know more about STEM or a stream. And actually the two has to go hand in hand, because if you go to tell them about STEM and stream, they would take that information, but they would start ask the question. The first thing, the first question might they might access, but where are we going to get the materials to do this? So those are two things from my experience with the workshops that we did, those are the two things I see going hand to hand. So you let them know about stream, but you talk to them also about materials and let them see that nothing is impossible at all. And I think that's, that's where I would like to see myself. I would like to see myself engaging more with teachers and stream and talking to them a lot more about materials that can be used, how easily they are available is no, who you don't have to go into a site, a store that sells equipment for science and buy. No. So I think, I think that if that should happen for me, I think that will be huge. Yeah. So I'd like to see myself

Speaker 1 (00:52:44):

Fabulous. Um, okay. Just a couple of more things. I'm looking at the long list of questions, but you've answered many of them throughout your, your, you know, explaining to me, um, your story. Right. Um, I know, I remember actually from the first interview, um, where we asked you a little bit more about leadership in general, but I would like you to kind of give me a quick summary. Um, so you, you shared with me about really like your STEM identity development, like thinking about yourself as a STEM person, but I'd like you to think beyond, to think before that even, and I'd like you to tell me, when do you feel you really first became a teacher leader? Not necessarily a teacher leader, but what was your first experience with leadership that has helped you to get where you are today with STEM teacher leadership? Does that make sense?

Speaker 2 (00:53:36):

Yeah, I think when I came back home and the first, the first teachers I spoke to about the experience I had and STEM, what STEM really was about and what I really went to Peru, for was the teachers at my school. And when I was able to talk to them about that experience and when I was able to have them to understand what Treme was all about, I think when I was able to share information for them. And when I, when I saw them returning information and comment with activities and were able to identify stream and activities and carry out stream activities. And, and when they were able to take an experiment and when we would, we would talk after and I would, we would be giving each other feedback. And when I realized how much they understood stream STEM, I realized, I think I, I, I think I am on my way.

Speaker 2 (00:54:52):

I think I am well on my way to being a good teacher leader when I could have done that. Because when we do our normal curriculum, we are all trained to do the same curriculum. But when we, when I came back and we added STEM and stream to the, what we were doing, and I think we manage pretty okay. I think, and when I would get feedback like from supervisors and when they would come and see our environment, and they will hear about the things we are doing, and they would mention our school name when we will be having workshops and things like that. And they will talk about the things we were doing. And when I realized that there was no outside input, there was nobody else that came to our school and gave us information about STEM or about how to do activities or about what experiments to do and how to make it, um, effective for children at specially, for children at our level.

Speaker 2 (00:56:03):

And when they would talk about our school and the things we were doing, then I knew we had to be doing something right. And I remember when we now started in our school and parents will come back and they would be telling us, their children were talking about all these experiments and they went back home and they had to go, they, they were getting all these material and they were, the children were right on track and they were doing nobody's experiments and they were telling them everything. And then even the parents, the common ones is what experience, the experiments you are doing today, you know, and, and they would be finding out, I realized that I had done something, maybe not, uh, reaching out at that point in time with all the teachers at that time. But I think when I, when I reached the teachers at my school and when I was able to deliver it to our children, I realized that is when I felt that I was doing something and it was working and it related to the street.

Speaker 1 (00:57:14):

Um, have you, do you feel that you've, I know you've said you really haven't received any discouragement from anybody, but have you encountered any obstacles that you haven't already shared with me in terms of supporting STEM teacher leaders?

Speaker 2 (00:57:29):

Uh, I don't think we had enough. We went into it as much to realize, uh, whether they were going to be any obstacles because when we started and we conducted our workshops with the teachers and everything, they all took it really well. That's why I would have to go back to that one day. One of the, one of their, one of their question always was material. So for me not, I don't think for me, I, I can take anything. I can, I can pick up a pencil and I can show them how it could be technology or how we can talk about a fence to learn there, be so much STEM in it. Uh, so for me, material is everywhere that can be used. I think if there was going to be, or in future, maybe the question always may arise will be material. And we will have to continue to talk to teachers about materials and how easily they could have materials available to them to meet up would be the only drawback. Because when you talk about materials and you talk a specialist like STEM, you teach some teachers just automatically feel you have to go to the store. So to me, that that could, um, maybe what have been an obstacle for STEM, but I don't see it anymore because I think we talk so much, even when we were doing our workshops, when we use materials in our activities, there were materials that we could get everywhere. It was easily available. So not many obstacles. And I think

Speaker 1 (00:59:22):

This is my last question. Um, what do you think has made you specifically an effective STEM teacher leader?

Speaker 2 (00:59:34):

I, what has made me and effective teacher, I think I would just have to be that I just fell in love with STEM. I, that that would have to be it. I think even if I had gone to Peru and I saw everything and I was engaged in activities and I listened to the lectures and I did all I had to do. And if I did not relate to STEM and if I did not like what I was hearing about STEM, I don't think I would have been an effective teacher. I think I just, even though, uh, even though we in early childhood, I had always loved science. I had always loved science. I remember when I was at the university and one of my assignment was to make a, I made a volcano and I made a volcano and it w it could erupt on everything.

Speaker 2 (01:00:37):

And I had it, I had it on, on a piece of cardboard and I, I was, I had already presented and I was taking, it was time to go home. And so I was taking it back to the car and the lecturer passed by and she said, how come you look like it is, it was made with real work in the mud. So I said, well, you know, miss it is volcano mud. I did go to the volcano and I got real on what, and I made a volcano and she was walking out, she stopped. And she said, that really is working a lot. And I said, yes. And instead of just walking by and seeing that she stopped and she touched it and she looked at it, so it made a whole difference for her too. So I just really, really enjoy

STEM and learning about STEM and what STEM does for teaching and learning. I think that is what makes, make me a effective, an effective STEM teacher and how

Speaker 1 (01:01:39):

You also attribute that to your leadership abilities or, um, so that you feel that that makes you an effective teacher of student of children. Um, uh, is there anything else that makes you an effective teacher of other teachers or an effective influencer on the ministry? For example,

Speaker 2 (01:01:56):

I think, I think it has to be, uh, it has to be being a leader, but being a leader in a really, really humble way, being able to talk to teachers and make them feel, talk to anyone and make them feel, or even the children in my school, being able to talk to them and make them feel that they can do anything and nothing is impossible. And I think, I think that is what, like, like even the teachers at my school will tell me, they say, you know, miss, you just know how to talk to people. You just know how to talk to parents. You just know how to talk to the children. And they say, you can get so many things done. So I think for me, it is just that it is just the way I would choose to talk to people, to others.

Speaker 2 (01:02:45):

I don't ever let them feel that I know all of this. And I am coming to tell you because you don't know anything at all. I don't, that is a one thing. I don't make anybody feel. I feel that whatever I can do, you probably could, you can do it and you can probably do it so much better than me when you, when you get to know about it. And I think probably that is what mix just makes me who I am and what my teachers will tell me to, you know? Uh, and, and those are like some of the comments that I would hear and what they would say to me that, you know, you just have this way of the way you would talk to us. You don't make us feel as though we cannot do this. Or, you know, we are less than anything, anybody.

Speaker 2 (01:03:33):

Yeah. So I think it may be, is just that I think it has to do, especially if you, how you feel about something, because how you feel about something when you talk to someone about it, they're going to know. And if I come to you and I going to just tell you, well, you know, I, I, uh, this is STEM and, you know, you can, you can do STEM and you can teach children and you can, uh, engage them in STEM and things like that. And if they don't see what I feel about STEM, that will make a huge difference. So I think it is all about how, how you feel personally, because if I don't like STEM and I go to talk to you about it, you're going to know. But if I, if I love STEM, like what I really do, and I took on to talk about it, you will know, because I've been talking, I would just go on and on and on.

Speaker 2 (01:04:31):

And as the same thing we do at school, and we will just sit down and we will talk and talk and we will choose so many different things and we will come up with activities and, you know, and we've been, see STEM here, and we will see STEM there and, and everything. We can see STEM. I think it's just that you really have to really want to do it and love it and want to know more about it. So since I've been introduced to STEM and I've been to Peru, one of the things

that I have never stopped doing is research. I, I continue to do research. I continue to look, look at activities for, for the younger level children. I continue, continue to look at how, uh, how you could, how you could, um, get teachers to meet, to see how they can learn STEM, but a in a SIM in an easy way, not make it difficult for them.

Speaker 2 (01:05:29):

And I think that is what I want. I feel like I want to make sure that teachers know STEM is not difficult. I think that is the most important thing I want to make them know, because if I can get them to realize that STEM is not difficult and they can do it, then that is what they will transfer to their children. And I want them to feel about STEM the way I feel about STEM, because if they don't, no matter how much they get to know about STEM, but if they don't feel about it the way you supposed to feel about it, then, then you can't get it. You can get it go in. Because I was surprised at how quickly I was able to introduce stream to my children and my school. And we just went with it and everything was about stream and it added so much value and meaning to the experience we give to our children. And I want that for other children. I want other children, no matter where they are or where they're going to come from, they must benefit from this kind of learning experience.

Speaker 1 (01:06:39):

Great. I think you've answered all of my questions. Um, so thank you so much. Um, really, I, I only ended up asking you, I think, five or six that are probably 15 different questions, just cause you answered all the other ones without prompting, et cetera. Um, that's, that's fabulous. And I'm so inspired hearing your story and, and um, I mean, I agree with you. I think joy is just contagious and I, I, um, you know, it's, sometimes there's, I'm not sure if there's a deeper explanation than, than, than that. Right. But, um, yeah,

Speaker 2 (01:07:15):

Rebecca, I am, I am just, I am just so happy for the experience. I just found God, I don't know how I was chosen. I was chosen. I, I, I can't, I can't even think how it would have been, like if I was not introduced to this, I can't think, and I think if I wasn't chosen to go to payroll and I did not have that, uh, valuable experience and whoever had gone and they came back and that said they would have done what I did with the ministry. And let's say, um, I was on the other side, I was one of the teacher who had to attend those training sessions. I think stream what, I mean the same way for me, it was just, um, it would adjust that back, that love that I had for science, it would adjust no, bring it back or back to me.

Speaker 2 (01:08:18):

And I would've, I would have gotten the chance to not really do all those things. And I, I w I would have gotten to know how I can do it, and I would have gone, I would have went ahead and do the same thing I do is now I, I, from I wanna hear about it. I would start doing research. I would start looking at for experiments. I would have went before a ministry would say it to do it in school. I probably would have been doing it in my school that I think where I, where, where I was receiving training by somebody who went or going and coming back, it, I think it would have been the same for me.

Speaker 1 (01:09:00):

Yeah. Well, I'm, I'm, I'm glad to hear that. And I certainly, um, I certainly anticipate the Bessie impact you're having on others. So, um, that's, that's really fabulous. So thank you so much. Um, I, I'm imagining it's time for you to eat lunch nap a little bit late, so I don't want to keep you much longer, but thank you so much. And I'll just, just to share with you as well. So, you know, obviously we're collecting this information for our project, but it's also become the center of my, my doctoral dissertation for my PhD. And so your story is especially precious to me because it's, um, it's becoming a focus of my personal work and what I hope to carry on even beyond [inaudible], because I tend, this is last year and I don't expect it's going to get additional funding from the, from the U S government.

Speaker 1 (01:09:49):

Just, I mean, things are difficult right now, everywhere around international development is it's, it's something that's really tough. Um, right now, just in general, but I guess what I'm saying is I want my life work to continue focusing on people, um, working with people like you, right? Because I really believe just like, I think you see potential in people, you see potential in students, you see potential in other teachers and you want to foster that you want to support that big, that, you know, um, you want to nurture it. And, and, you know, I, I really hope that that what my goal is, is to help other people see stories like yours and understand it's worth it's worth, you know, building relationships. Because like you say, you know, sometimes doing things with humility and just talking to people and getting to know people and finding out what they're interested in and seeing if they're receptive to you, like that's, I think a really critical part of leadership that's often overlooked entirely. And so even being at the OAS, I really struggled because the kind of politics and the kind of way that I see people try to make change happen through politics does not correspond very well with the kind of change that I see teachers make. It's very different teachers are often very effective on a very human level. And so that's what, anyway, it's very inspiring for me to hear your story. So I think we're done much. And I think, I think it's time for you to go eat. Yes.

Speaker 2 (01:11:16):

Thank you so much, Rebecca. And it is always so nice to talk to you. And then I get to talk so much about STEM. It is always nice to talk to you. I just wanted to let, to tell you that there's something is that I really enjoy doing. And I started, I have, I like, I like writing children's stories. So as our, uh, when I was at university, one of my assignments was to rewrite a children's story. And I, I rewrote the letter red hand. It w it was the first one I did. So in [country], we grow rice where we used to grow rice a lot. It is not growing so much, but everybody still knew about it. So I rewrote the little red hand and I, I to include the, instead of her growing wheat, she grew rice and instead, and she made pillow.

Speaker 2 (01:12:14):

So I reword that story. And I just wanted to share that with you. And yesterday, one of the teachers read, uh, the children's activity yesterday was to make pillow. That was their activity, and it still happened. I had that story and she read it. And for the first time I heard it had been red. And I couldn't believe that I, I, I rewrote that and it, so I am looking at that. I don't know how to take it further. I know if I, I knew if I knew how I knew, I could probably read

somewhere because of our children, just as our children enjoyed it. I know other children, and it would be loca

Speaker 1 (01:12:57):

It's about what you've done. Right. As you've, you've made it, um, indigenous is not the right word, but, um, but you've, you've incorporated, right? Cultural relevance, pretty powerful. I would love, um, if it's something that, um, you know, I don't know if the national association for the education of young children would put it on a pump on a post or something like that, but if you would be interested in having me share it with them and see if they'd like to publish it, like, you know, put it on, put it online on, um, if you're interested.

Speaker 2 (01:13:27):

Well, that would, that would be nice. And so I just wanted to share it with you because when I, because when I heard it yesterday and then the teacher who read it, she said, she said, miss you ever taught you, you realize what you did, because when as part of active topics, what we have to talk about wetlands and everything, and in here, it does include in that story. I had, I talked about wetland and all of these things I said, but no, I can tell how much meaning that really have, because so many things, no, we can see that as in that. Yeah. So that is something I was, so I really like a lot is just that I don't know where to take it from there.

Speaker 1 (01:14:07):

Yeah. Well, I mean, yeah, if you would share it with me, then I'd be happy to find out if there's something I would copy you on any communications with the national association, see if they would be interested in publishing it. Cause they did a little, they did a small story about, um, uh, uh, carbon abide from Dominican Republic. Let know Sophia Salguero, I'm sorry, Sophia from, from Costa Rica. Um, so maybe they'd like a blog from you because I know that they would love to internationalize. Um, some of the things that they're doing. So that's something to think about. I, I don't know if there are other, um, other places to publish that would be good like that.

Speaker 2 (01:14:45):

If it's a book that I had written, I had done the book all by myself. Well, I had done it. Like, it's a, it's a really large, it's a large book that I did, but I actually have to do the book like a complete book. So, so if I like wanted to send it for you to see how I would do that.

Speaker 1 (01:15:01):

Oh, uh, well, do you have it digitally? Do you have it in PDF? Okay.

Speaker 2 (01:15:07):

No, at that time, no, we didn't. I just had to make this a hard copy of this book because we have,

Speaker 1 (01:15:14):

Yeah. Oh my goodness. Um, what I'm trying to think in the short term and the short term, are you able just to take photographs?

Speaker 2 (01:15:24):

He said, yes, I can take. Yeah, because it's not many pages, so yeah, I can't do that. I can, I can take pictures on, at least show you what it looks like, and you can have a read and you can tell me what you think.

Speaker 1 (01:15:36):

So there's also, there's also an association. So I don't know. I guess what I'm saying is by, by, by carrying it forward, I don't know. I mean, if you're looking for, uh, uh, it sounds like it hasn't been self-published or do you have an actual publisher?

Speaker 2 (01:15:48):

No, I have not even spoken. You are a first person apart for my lecture and the students who heard it, uh, the lecture, I was really happy about it when she heard it apart from you and the tea, the teachers at my school, nobody really knew I did that.

Speaker 1 (01:16:06):

You know, pillar, she, she has a friend who's recently published some children's books. So maybe there's actually a publisher who would pick it up and like print it for real, like for, for libraries and things like that, too. Um, if you can, if you don't mind just sending me photographs, then I can share it with Kayla and see if she has an ideas. You know, the other thing, um, you know, if you want it to be, if it was like publishable within an article, there's also the national associate national science teaching association, and they have an early childhood education focus journal. And you could write a story about this and how you not only have you rewritten, you've rewritten a classic story now to be relevant for th for [country], right. Also incorporated stream and teachers were incorporating it and they're doing cooking. Like there's a beautiful stat

Speaker 2 (01:16:56):

And that, and that's, and that is how it happened yesterday. And we were able to select, even, even now, even though, uh, we are online, we still show our children. Like we talked to them about like the stream, like all the science and technology they will be doing. So whenever we have an activity and we could point out those things to them. So that is how we went ahead. So we did not, we did not put that pause. We don't have to ride the activities, but we still, we don't want our children to forget all the things we were doing. So we let them see that.

Speaker 1 (01:17:33):

Let me some photographs. And if you would also, um, you, you had mentioned, you know, you're working with other schools and you're doing workshops. Like, let me know about those things. If you don't mind, like if you happen to have any screen captures or, you know, agendas, I love to know just so that we can feature it and, you know, share it with the community too. So send me,

Speaker 2 (01:17:51):

So I would, because I never thought about it at all and I would go, and I will have these meetings, these workshops, I never did. I never

Speaker 1 (01:18:00):

It be a note. Tell me like, yeah, cool. Did you work with what happened? I mean, if you want to it's, it's just, I think humility, humility is a good thing, but it doesn't necessarily mean being invisible, right? Yeah.

Speaker 2 (01:18:13):

Because like what they would do, like they will call me and they will ask me if I can do so. And so, and I, I, I would, they would give me time to like make time and I've addressed often I will, I will go do, and I will do it for them. And then they will keep in touch with me. And the same way, like the teachers from the UV, I can, some of them, they would message me and those teachers will do the same. In fact, like when we did those huge workshops with our [country] and where after those workshops, and I would get messages from somebody to these teachers that I don't even know who attended the workshop and they would be messaging me on and we would talk so that it really has, it has, it has done, it has gone really like when it, in, in that way. Yeah. So I would talk to [inaudible] teachers, like who is so far away from me, like from different communities and I will talk to them. Yeah.

Speaker 1 (01:19:16):

Great. Yes. Yeah. So let me know. All right. I'll let you go now.

Speaker 2 (01:19:21):

Okay, Rebecca, thank you so much. Have a great rest of the day. Bye bye.

Appendix G: Amanda Interview Transcript

Speaker1: [00:00:00] Principiará. Ok, perfecto. Bueno, pues entonces lo que vamos a hacer es lo siguiente si te acuerdas, hasta hace tal vez más de un año y medio, creo que Pilar te entrevistó. No es así? Ok, entonces pues esta entrevista tiene como dos propósitos. El primer propósito es para mi es muy personal porque tú sabes, creo yo estoy estudiando mi doctorado, estoy ya en mi tesis y me interesa muchísimo este como estas historias de desarrollo profesional, de desarrollo de líderes docentes y entonces estoy buscando como similitudes entre las experiencias, a pesar de que los contextos a través de toda la región son muy muy diferentes. Pero estoy si estoy viendo como hacen en tubes, entonces para mí es muy interesante y pues no se ha escrito mucho de esto, de una perspectiva más humana, no? Entonces eso, eso es para mí. Y en segundo lugar, nos interesa mucho saber, pues como la Real ha sido parte de esa historia. Entonces, en este momento no estoy pidiendo una evaluación de tu experiencia con la red, aunque me encantaría tenerla por seguro con tema de mis preguntas. Hoy se van a enfocar más en esas semillas de tu liderazgo que pudo haber empezado hace mucho A.C.

Speaker1: [00:01:25] antes de la RIED y todo eso. Entonces no quiero que te limites a esta experiencia con la real ok? En y pues nada más unas definiciones. Yo tengo mucho interés en tu trabajo como docente líder, específicamente en cómo has apoyado a la profesión docente, entonces obviamente ha sido líder dentro de tu aula y también dentro de tu escuela. Pero me interesa mucho esas actividades que has llevado a cabo que impactan a cómo el sistema más grande, pues obviamente puede incluir lo que has estado haciendo con con. con el programa de televisión puede incluirse ha dado talleres, el curso que has hecho y otras cosas que has hecho en tu vida que realmente impactan a mayores cantidades de otros profesionales sin ventanas. Es perfecto. Ok, muy bien. Entonces me gustaría saber para empezar, cuándo crees que fue o no? Más bien me gustaría que me explicaras el primer momento que te diste cuenta. No, prefiero saber el mejor, el primer momento en que fuiste líder docente que ahora reconoces.

Speaker2: [00:02:43] Bueno, el primer momento en que me reconocí como líder docente fue muy pequeña realmente en la iglesia, en la comunidad de mi iglesia, se tenía la necesidad de que a los niños se les educara basado a los principios bíblicos. Todo el mundo se focaliza en los adultos. Todo el mundo se focalizada en lo que eran los jóvenes. Pero los niños estaban en la iglesia muy inquietos, locos por salir. Y entonces yo dije Hay que hacer algo con estos niños. Y ahí dije Pero yo puedo, yo puedo cantarle, aunque no sé cantar. Me decía a mí misma Puedo entretenerlo y a la vez irlo formando. Recuerdo que ese domingo le pedí el permiso a mi pastor y a mi pastora de sacar los niños al área del patio y ellos me dijeron que si yo podía dominar a esa manada, entonces es usted me permitía todos los domingos y entonces a partir de ahí tomé todos los niños que habían asistido a la iglesia de diferentes edades y duré seis años haciendo eso.

Speaker1: [00:03:55] Y eso cuando fue.

Speaker2: [00:03:57] Eso fue. Yo tenía 15 años, 14 años de edad,

Speaker1: [00:04:02] Porque mucho antes de ser maestra,

Speaker2: [00:04:04] Mucho antes de ser maestra, la gente decía de mi vocación por el servicio de educar. Pero yo realmente no lo veía como un gran impacto hasta ese día. Hasta ese día que vi a todos los niños reunidos escuchándome. Y ahí dije Dios mío, yo puedo ganarme un dinerito extra para pagar la universidad dándole clases a los niños. Y ahí abrió una sala de tarea.

Speaker1: [00:04:34] Fantástico! Y pues te escuché decir pues yo sí puedo. Qué te hizo pensar que tú sí podías, especialmente a esa edad?

Speaker2: [00:04:43] Realmente yo me había manejado en diferentes áreas del campo laboral, especialmente áreas técnicas y áreas de trabajos que no son profesionales. En mi casa nos enseñaron a trabajar desde pequeños y vendíamos fruta en un con mi abuela en un mercadito que ella tenía en su casa y yo decía yo soy buena para los negocios porque la gente impacta, o sea, yo hago conexión con la gente. Vendíamos ropa, también llegamos a vender gasolina, carbón. No sé si el concepto carbón aquí en leñas y muchos, muchos negocios para sustentar la familia. Yo colaboraba y yo veía el nivel de conectividad que hacía con la gente. Yo decía voy a estudiar algo que tenga que ver con ventas pequeña. Yo decía esto, pero al llegar a la iglesia dije no debo, voy a dejar la venta, voy a dejar el proceso de mercado y me voy a dedicar a dar salas de tarea para pagar mi carrera, que era ingeniería civil en este momento. Yo soñaba con ser ingeniera civil. Sí, pero era muy costosa. Entonces, a partir de ahí comencé a dar sala de tarea con ese entusiasmo y ese carisma, porque entendía que sí podía y que los niños que permanecían ahí conmigo.

Speaker1: [00:06:10] Y me pregunto qué había del contexto de la Iglesia que te hizo pensar que era el momento. Pues te escucho decir algunas cosas que ves, esa necesidad entre los niños de que necesitaban una manera de enfocarse, tal vez un poco mejor. Y también esto de que había oportunidad de ganar un poco de dinero también. Entonces me pregunto si había algo más en ese contexto, si es que había personas que te apoyaban o que tal vez también te desmotivar para hacerlo como como era ese contexto.

Speaker2: [00:06:41] El contexto de la Iglesia es muy rico en motivación, porque generalmente todo el mundo quiere trabajar y estar al servicio. Y cuando vi a los niños inquietos porque no era su ambiente, no estaban el tema focalizado para ellos. Entonces me acerqué a mi abuela. Fue la primera persona que me le acerqué y le dijo Mamá, cuando yo era pequeña usted me llevaba a la iglesia, a otra iglesia y a ellos le daban, nos daban clases de otros niveles. A estos niños no le interesa esta clase, hay que darle clases para ellos. Y ella me dijo Pues hazlo tú, tú puedes. Y entonces les dije que me daba vergüenza porque yo no tenía este nivel de confianza con los pastores, con el equipo líder y había líderes específicos para hacer el trabajo y yo sentía como que era como pasarle por encima a las personas que ya eran líderes en la iglesia. Y mi abuela me dijo si hay otros que tienen el rol y no lo ejercen y tú tienes el interés. Gestualmente recuerdo eso. Si tú tienes el interés, hazlo, que no importa quién sea el líder, lo importante es que lo hagan. El trabajo debe hacerse. Y usó una frase cristiana que dijo que el trabajo era mucha, mucho trabajo, pero pocos eran los trabajadores. Entonces que me era reto y así lo hice.

Speaker1: [00:08:09] Bueno, muchas gracias por compartirme todo eso. Ahora me gustaría que pensaras en una situación un poco distinta cuando dirías que fue la primera vez que diste cuenta de que eras líder docente en STEM específicamente.

Speaker2: [00:08:26] Guau! Cuando me di cuenta específicamente que era líder docente en STEM, cuando nos mandaron a hacer los objetivos en dinámica que nos impulsaron a pensar en grande, a soñar y éramos las 5 sentada en la mesa, dijimos el reto está. Pero estamos hablando de un proyecto para cinco años, que vamos a decir cómo lo vamos a hacer entonces. Sofi dijo que no pensáramos que éramos más estudiantes, sino que visualizamos lo que ya éramos y comenzamos entonces a bromear y a decir bueno, pues ya somos líderes STEM, yo soy Carmen del Pilar. Entonces cada una se asignó un cargo representando las a ustedes. Otra dijo Yo estoy en Alyson y nos pusimos en la imagen de ustedes. Y entonces, a partir de ese día sentimos la responsabilidad de cumplir la meta, de promover. Estèn y dijimos No, esto no se puede quedar aquí. Debemos llevar a nuestras aulas, a nuestras escuelas. Esto que acabamos de aprender porque el reto está en la mesa y depende de nosotras poderlo poner a funcionar. Ellos ya nos dieron cómo hacerlo. Ahora nos toca a nosotras focalizar y hacerlo explotar. Y entonces llegué muy, muy emocionada a mi al pie del avión y llegué a la universidad. Recuerdo que prácticamente amanecí en la universidad porque mi vuelo era de madrugada y amanecí entre el aeropuerto y el parqueo de la universidad y cuando ya llegó la hora de dar clase, me cambié la blusa que tenía del viaje y llegué a las aulas saludando a mis estudiantes universitarios y en vez de iniciar dando la clase, inicié contando la experiencia y ellos muy motivados me dijeron En la hora de almuerzo nos juntamos para que nos cuentes más. Y ahí comencé a impactar de lo que es STEM. Recuerdo que que cuatro estudiantes me decían Profe, yo quiero saber más de este foto. Cuatro de estos estudiantes. Ahora en la capacitación que vimos en el curso de capacitación virtual que vimos el equipo Fuerza estuvieron

Speaker1: [00:11:01] Fantásticos, así que se cerró el círculo y así es. Pues una pregunta, igual como me dijiste, un poco del contexto de la situación en la iglesia y por qué decidiste responder? Responder a ese bichito de de inquietud por decir que tenías cuando estabas en Perú y en esa experiencia con dinámica, pues dices que te dieron el cómo hacerlo. Me pregunto si me pudieras explicar un poco más sobre ese contexto, qué te hizo sentir así de tan motivada de querer compartir, que te empezó a sentir que pues que tenías esa responsabilidad así como dices.

Speaker2: [00:11:41] Una parte de lo que me impulsó fue ver a mi comunidad, yo hice un cuadro comparativo mental. Vi lo que estaban haciendo en Perú a través del seminario y las visitas que hicimos a las diferentes estancias, a las escuelas. Y yo dije son niños de la misma edad. La diferencia es el país. Son maestras igual que nosotros. La diferencia es la metodología. Entonces, si ya nos dieron las herramientas que son espen enseñarle a los niños a través de proyectos en ciencia, tecnología y matemática, entonces yo tengo todas las herramientas, tengo los niños, que son los que están siempre interesados en aprender y yo estoy motivada en enseñar, estén y ya tengo cómo enseñar este cómo incluir la ciencia, la tecnología, la matemáticas, hasta el arte en mi aula y mi país lo trabaja por proyecto, pues simple es poner manos a la obra. Y entonces en el colegio que trabajaba en ese momento le presenté el proyecto. Les conté cómo hacerlo y luego, en la tarde, cuando llegué a la escuela pública La Juanas al pie, topÃ, que es ahora donde estoy de manera constante. Le presenté a mi directora también, lo que lo que aprendimos y lo que nos mostraron. Y entonces me dijo la directora Es un reto, es un gran sueño, lo lograremos en un barrio como este. Y yo le dije bueno, yo no pensé viajar y ya acabo de llegar de Perú. Y a partir de ahí seguimos dándole forma.

Speaker1: [00:13:25] Fantástico. Entonces recibiste apoyo de tus ser de administrador? No, eso sí es algo muy importante. Pues me pregunta también sobre el contexto de la invitación que recibiste del Ministerio a participar en esa experiencia en Perú. Me pregunto cómo cómo surgió esa oportunidad para ti y por qué decidiste aceptarla?

Speaker2: [00:13:54] Ese, ese sí fue una gran sorpresa realmente, porque se hizo una convocatoria a todas las docentes del país de diferentes niveles para que fueran a participar y fueran parte de lo que eran las buenas prácticas y las clases por televisión. Yo escuché el proceso, pero no, no sentí el nivel de motivación porque estaba envuelta en muchos compromisos y en eso acababa de pasar de un proceso de salud. Entonces, después del casting y la convocatoria y mi líder distrital, Carmen Cruz, que es la técnico del distrito, me llama y me presenta el proyecto. Ya todo el mundo participo, ya hicieron la selección y ella me presenta el proyecto y me dice de es a una entrevista y te van a entrevistar directamente en una oficina. Conoce lo que ellos están presentando y no estás obligada. Me lo dijo así textualmente No estás obligada a aceptar. Tú conoces tu cuadro clínico de salud. Acabas de pasar de una operación y me lo resaltó mucho porque ella estaba preocupada por mi salud, pero me gustaría que lo conozcas. Y le dije Sí, dígale a su superior que voy a ir a la entrevista. Debo agregar que cuando dije sí que iba a ir a la entrevista, yo tenía aquí en mi casa, estaba asesorando una tesis y alguien muy cercano que estaba justo en ese momento, Jairo Caba, un estudiante que estaba ayudándole a asesorar una tesis. Me dijo Usted sabe su potencial y usted sabe quién es.

Speaker2: [00:15:40] Digo sí, pero es apresen, dar buenas prácticas. Yo ahora mismo mi salud y comencé a poner la barrera del por qué no? Y él a presentarme en las barreras del por qué si. Trató de convencerme y dejó las frases en la mesa de que yo puedo mi potencial, que él cree en mí y que yo soy superior a cualquier cosa de lo que me puedan presentar a un poco preocupada. Fui donde mis padres y les presenté el proyecto porque dependía también mi hijo, a quien se lo dejo mi familia y mami me dijo Mi mamá es mi madrastra realmente, me dijo. Tú llegarás a donde tú quieras llegar. Y tú llegarás lejos, porque hemos visto tu motivación y tu interés por educar y a todo lo que tú. Hasta ahora recuerdo esa frase todo lo que tú has decidido emprender lo has hecho con amor y vocación. Esto no va a ser la diferencia. Te apoyamos. Papi no estaba. Papi estaba en la iglesia y me dijo Te apoyamos Guillermo y yo, mi papá, te apoyamos y no tienes ni que decírselo, porque ya yo hablé por él y dije bueno, pues voy a la entrevista. Era sábado y fui entonces a la entrevista sin saber exactamente ni qué me iban a decir, ni qué iba a hacer, ni nada. Y aquí estoy. Acepté el reto.

Speaker1: [00:17:08] Fantástico. Pues una pregunta diría es que pues con todas esas experiencias que se te han presentado a esto de la iglesia, la oportunidad dirá pero y lo de dinámica? Y pues ahora de esta experiencia con. con la televisión sientes que en tu carrera esto ha sido planificado? Estabas pensando escaparte así usando estos pasos o fue más como algo que fluyó? Cómo fue?

Speaker2: [00:17:34] Realmente siento que fue algo que fluyó totalmente. No esperaba una escala tan trascendente y de manera tan drástica, podría decir rápida. Recuerdo que en la ANEF, en el 2017, en una reunión con el señor rector y el equipo docente del nivel inicial, él nos preguntaba cómo nos proyectamos en esa fecha. Él acababa de devenir de un proceso de crecimiento para la universidad y quería ver nuestra visión y a mí me preguntó que cómo yo me

veía aquello proyectaba como como docente, como ser humano. Y recuerdo que le dije que a que hasta donde yo quería llegar a nivel de educación, porque él tenía muchos deseos de que nosotros como docentes creyéramos para poder impartirles clases a los estudiantes. Y yo le dije que si el máximo escalón para yo crecer era ser ministra de Educación. Yo iba a ser ministra de Educación y me dijo tú piensas en grande. Es que el límite lo pone uno. Yo no tengo límites para la educación y a veces me dicen que no sé decir que no para las capacitaciones, pero todo lo que yo pueda adquirir en conocimientos para brindarse a otras personas y poder ayudarlos a que ellos crezcan. Yo quiero hacerlo todo lo que me sirva para ayudar a otras personas, a otras personas, a que crezcan y se desarrollen como yo lo hice. Yo quiero hacerlo porque hoy yo lo que soy fue gracias a una oportunidad de gente que creyó en mí y que decidió que yo lanzara mis conocimientos al mundo.

Speaker2: [00:19:24] Yo inicié mi carrera como ingeniera civil, como cualquier estudiante de una familia, pero por situaciones múltiples tuve que dejarlo e irme a un mercado a trabajar con mis padres y allí encontré la oportunidad de un ingeniero que estábamos vendiendo comida. Él llegó tras una frutas y no encontraba la fruta y entonces le ofrecimos comida para que le llevara a su esposa y por el manejo de mercado que teníamos. Él dijo pero ustedes no son del nivel de de estar trabajando en esta área. Ustedes tienen otro nivel profesional y ahí mami le dijo esa muchacha es estudiante de ingeniería civil. Y le contó mi historia y me dijo Pero tú puedes seguir estudiando. Y yo le dije Yo no tengo los recursos económicos para pagar la universidad y la universidad requiere de mucho costo para estudiar ingeniería civil. Y me dijo Yo no tengo los recursos para pagarte la ingeniería civil, pero tengo el empuje para llevarte a otra universidad a que estudies educación y de ahí puedas pagar tus estudios. Y ahí dije otra vez como que mi mente se focalizo a mi iglesia y dije otra vez la misma frase que yo utilicé utilizar la educación como trampolín para pagar mis estudios ingeniería civil. Y dije si acepto, acepto la oportunidad de que me lleve. Y me dijo Es una universidad privada, pero yo te voy a conseguir media beca.

Speaker2: [00:21:00] Y yo le dije Sí, perfecto, vamos a ir a ver, a ver si puedo pagar la media beca. Y nos fuimos. Y cuando llegué yo amanecí ese día orando. Yo no dormí porque era media beca, a ver si me la daban el sueño de seguir estudiando para seguir creciendo. Y amanecí orando. Y cuando llegué a la universidad, el rector llegó y me vio y le preguntó al Señor que qué era lo que yo quería. Y él, el ingeniero, le dijo Ella quiere estudiar. Y entonces él dijo El rector dijo Cándido de Jesús se llamaba el rector en ese momento, y me dijo Dilo tú con tu boca, qué tu quieres hacer? Y yo lo miré a los ojos y le dije Yo quiero ser profesional para ayudar a otros a emprender como yo lo acabo de hacer, lo estoy y lo quiero hacer. Y me puso la mano en el hombro y me dijo Dios está contigo. Aquí damos media beca. Para que los estudiantes tengan la oportunidad de crecer y desarrollarse. Pero yo siento la gracia de Dios sobre ti y te voy a dar una beca completa. La diferencia es que vas a pagar la reinscripción y la inscripción para que tengas el compromiso de seguir estudiando. Y yo. Relief Salí llorando muy emocionada hasta el día de hoy.

Speaker1: [00:22:24] Ah, no, pues qué bendición! Y aún te mantienes en contacto con esas personas?

Speaker2: [00:22:30] Realmente con el señor Candido no, porque cuando cambian de rectores ellos se van trasladando, pero en el ingeniero por unos años antes de la pandemia, si el que me invitó a la universidad, si tuvimos contacto, pero luego perdimos el contacto por la pandemia.

Speaker1: [00:22:50] Y hace cuánto tiempo fue eso? No sé cuántos años llevas

Speaker2: [00:22:55] De la universidad de ese proceso. Recuerdo exactamente que fue en enero del 2005.

Speaker1: [00:23:02] Ok, sí, muy bien. Entonces, cuántos años llevas enseñando clases con estudiantes? Y cuántos años llevas enseñando en la universidad?

Speaker2: [00:23:13] En la universidad? Fue desde el 2007 mi coordinadora de carrera. Primero me comenzó a utilizar, como digo, utilizar el término tal vez no es el correcto, pero a mostrarme el campo universitario como monitora pero monitora monitora como un currículum oculto. O sea, nadie no era oficial. Ella me ponía a explicar algunos conceptos, a explicar algunas cosas que yo manejaba y ahí me fui desarrollando en el área de docente y luego en el 2010 ella ya entonces me fue dando asignaturas para con ella ahí en el aula y yo entonces daba la asignatura bajo el nombre de ella. Y luego entonces ya oficialmente ella me llevó a lo que es en el Departamento de Recursos Humanos. En el 2010 ya yo estaba graduada oficialmente, ya me había graduado de licenciatura en el 2008 y dos años después me llevó a Recursos Humanos para para que fuera docente ya de manera oficial en la universidad, en la universidad.

Speaker1: [00:24:29] Cuando empezaste, empezaste a enseñar en aulas como de preescolar. En 2008, justo después de año,

Speaker2: [00:24:38] Jueguen en Jaén en aulas de preescolar. Yo inicié en el 2005, 9 de septiembre de 2005. Ya yo tenía mi primer hijo, JG, y ya yo tenía conocimiento de lo que eran las clases que tenían que recibir los niños de 5 años, porque tenía una sala de tarea y yo quería que JG tuviera una educación de calidad dentro de lo que era mi sector y fui y busqué uno de los mejores colegios que tenía la comunidad Centro Educacional, mi casita y lo inscribí el primer año 2004. Para el grado pre primario, y cuando llegué me hizo una entrevista el ayudante asistente de la directora MG, me hizo una entrevista y me hizo llenar un formulario de datos donde yo llené que decía estudiante de Educación Inicial y me hizo la oferta de ser maestra en el colegio. Y yo le dije pero yo no tengo experiencia. Yo recién en enero me acabo de inscribir y me dijo el director Fredy Vélez, su esposa ME, AR y yo MG, le hemos estado observando durante todo este año. Que JG ha estado cursando con nosotros y hemos visto su calidad humana y hemos visto su perfil como madre y su interés por la educación de su hijo y como maestra de nivel inicial, aunque usted acaba de iniciar. Creo que usted tiene el potencial para dar clases en preprimaria y yo en serio? Y qué debo hacer? Traiga su currículo y yo nunca he hecho un currículo.

Speaker1: [00:26:26] Wow! Pues una pregunta, me has dicho de tantas personas que te han apoyado en algunos casos de la nada, algunas veces con personas con quien llevabas una relación fuerte? Me pregunto si alguien ha puesto obstáculos en tu camino o si alguien ha intencionalmente intentado desmotivar en tu camino como líder docente.

Speaker2: [00:26:47] Si sí ha recibido dentro de los familiares m dicen, por ejemplo vas a dejar a tu hijo solo, cuando en esa ocasión José Guillermo era muy pequeño. Mi hijo mayor era muy pequeño y yo nunca me había despegado de él para irme un día entero a estudiar a la universidad. Tenía que salir a las 5 de la mañana y regresaba a las 6 7 de la noche y cuando llegaba llegaba con un malestar muy fuerte de cabeza, porque el traslado era muchas. Era una hora y media de camino y me decían tú estás sacrificando lo más importante tu familia. Por algo que fácilmente ni lo logres. Porque es es una beca, pero como quieras. Estás trabajando muy duro para pagar la reinscripción, pasaje y libros. Y yo le dije quiero seguir intentándolo. Y entonces mis padres, al ver mi necesidad, se quedaban con mi hijo. Y me lo cuidaban los sábados hasta que el papá del niño llegaba del trabajo y entonces el papá del niño lo recogía y yo hacía todos los quehaceres del hogar para poder después que los quehaceres y las responsabilidades como esposa. Yo cumplía entonces ahí hacía las tareas para no descuidar mi vida familiar y mi vida matrimonial. Pero para no descuidar el trabajo. Entonces estudiaba en las madrugadas y hacía fichas y carteles grandes para pegarlos en las paredes del mercado donde yo trabajaba. Y ahí entonces leía la clase que debía aprenderme o memorizar o o desarrollaré el sábado siguiente.

Speaker1: [00:28:32] Yo entiendo un tema, son muchos

Speaker2: [00:28:34] Conceptos, pero si soy muy fuerte. Entonces la gente veía ese, ese proceso de que era mucho trabajo y me decía es demasiado suelta eso. Tú te estás sacrificando mucho, vas a parar en loca. O sea, esas frases que no te permiten dentro de lo posible seguir, pero a la vez son el empujón para continuar. Aparecieron.

Speaker1: [00:29:00] Y por qué crees que crees estar? No sé si se llama como constitución tan fuerte como para realmente creer que si puedes, a pesar de las dificultades que te hace. Qué es lo que internamente o externamente te motiva a pesar de esas personas?

Speaker2: [00:29:19] Mi historia es bastante emotiva porque qué me motiva a seguir adelante? Qué me motiva a creer que sí puedo? Mi padrastro murió hace muchos años, pero antes él era estudiante Ingeniería Civil y creo que él fue el pilar para hacerme entender el nivel de potencial que yo tenía. Y éramos seis hijos de él. Solo eran cuatro y dos de mi papá. Pero vivíamos todos en su casa y él era estudiante de ingeniería civil, de estudiante de ingeniería civil. Pero él era técnico en electricidad, un master en electricidad. Él era el mejor, no porque era mi padrastro, pero sí recuerdo que todo el mundo lo buscaba para que hiciera trabajos muy fuertes en lugares ni a empresas muy caras. Y la gente le decía deja la ingeniería civil porque tú, tú tienes un marco sostenible con la electricidad. Y él decía no, yo voy a ser ingeniero porque yo necesito un título para enseñarle a mis hijos que hay que ser profesional y. Y él llegaba muy fuerte el día entero, cansado del trabajo y se sentaba a estudiar, entonces después que cenaba, agarraba los cuadernos y se sentaba a hacer las tareas y nos decía junto a mi abuela materna ustedes tienen.

Speaker2: [00:30:45] Éramos pequeñas, pero los recuerdo. Ustedes tienen que estudiar, porque el que nada sabe, nada vale. Y yo le puedo dar comodidades y lujos porque mi empleo, mi profesión, me lo permite. Pero cuando yo falte, quién se lo va a dar? Ustedes hoy son mis hijos, pero mañana van a tener sus propios hijos. Cómo le van a enseñar a que sean profesionales si ustedes no lo son? Y ese empuje de que necesitábamos ser profesionales se quedó grabado en mí,

sumado a que yo manejaba muy pocas matemáticas en este tiempo y cada vez que yo le pedía ayuda, él me decía Tú puedes, papi, yo no sé hacer las matemáticas. Yo le decía él me decía tú puedes. Las matemáticas entran por las manos y si no lo haces nunca lo vas a lograr. Tienes primero que hacerlo, pero antes de hacerlo tienes que creértelo. Yo le decía Dame, pero yo creo que puedo creer, no es suficiente, hay que ejecutar esa creencia y a partir de ahí siempre me prometí seguir adelante.

Speaker1: [00:31:57] Pero considerando todo esto, este desarrollo personal que has tenido, me pregunto Me gustaría preguntarte ahora sobre cómo sientes que en los últimos años como maestra has podido impactar a otros docentes? Y te quiero hacer esta pregunta específicamente usando la perspectiva de Stam, tu trabajo que has hecho en tu liderazgo docente en Stamm con otros docentes? Bueno, no sé si me explico bien, pero supongo que lo que lo que me pregunto es qué impacto crees que has tenido en otros docentes, específicamente en el campo de todo el trabajo docente en STEM? Si me entiendes 100

Speaker2: [00:32:39] Por ciento que ha impactado positivamente en el campo, estén en mí otros compañeros docentes a tal nivel que hasta en el curso de liderazgo que acabamos de hacer promoviendo estén no solo participaron colegas del nivel inicial, no solo participaron gente de la comunidad, sino también participaron mis superiores. Yo tuve técnicos participando del curso. Estèn porque al oír que eres Tain, a través de mis conocimientos se motivaron tanto que se inscribieron técnicos distritales para conocer qué fue lo que CA aprendió en Perú y una de ellas que permaneció fue mio, Sotheby's Jiménez, que es técnico distrital de los AR y permaneció y terminó el curso. Y cada vez que nos encontramos en algún evento ella dice todo lo que aprendió. Pero no obstante a eso compañeras de trabajo dicen que mi vida cambió después de haber ido a Perú y conocer estèn y yo misma entiendo que mi visión cambió. Mi metodología de mostrarle a los niños es otra. Ya sé que no debo solo enseñar lo genérico que me muestra el currículo, sino que los niños pueden iniciar desde muy pequeños a conocer cosas que antes era un cuco. Un cuco es un miedo. En [país] y demostrarle que ellos sí pueden y comenzar a investigar. Desde esta perspectiva ha cambiado mi vida de una manera muy, muy general, porque hasta mi hijo en casa comienzo a trabajar. Hay momentos que estamos haciendo algo tan simple como cocinar y entonces comienzo a trabajar las medidas y les digo qué vamos a hacer? Galletas, pero yo necesito que tú me hagas estas mediciones, porque cómo vamos a saber qué cantidad de galletas vamos a hacer? I Y comienzas entonces conscientemente, porque antes lo hacíamos inconsciente, pero ahora consciente y a través de un objetivo claro y todo sin querer comienzo.

Speaker2: [00:35:11] Pero aquí puedo aplicar este Déjame ver. I. Días atrás hubo mucha lluvia y él me decía Mami, yo quiero bañarme en la lluvia. Y yo le decía Pero por qué tú crees que llueve? Y comencé a cuestionarle. Y por qué quieres bañarte en la lluvia si tenemos agua en la llave? Es que el agua de la lluvia es diferente. Y nos bañamos los dos en la lluvia mientras nos bañábamos en la lluvia. Yo le preguntaba y qué? Tú le ves de diferente? Y me dijo este es más dulce, es más fina. Y comenzó a ver las características del agua. Y me dijo Mami, yo tomé este poco de agua en este vaso y mira este poco de agua. No son iguales ni si son iguales, son agua. Y me dicen obsérvala bien. Esta se ve más limpia. Y comencé a decirle. Podemos seguir investigando a ver si de verdad el agua lluvia es más limpia que el agua de la llave. Y me dice Mami, mira los polvos que se ven en el agua de la llave. En esta agua no se ve que tiene polvo.

Vamos a seguir observando y esa es de impacto. Ese interés, ese cambio que he recibido, lo estoy transmitiendo consciente, porque antes lo hacías en este nivel de conciencia.

Speaker1: [00:36:24] Muy bien. Y entonces qué nivel de impacto crees que puedes tener en otros docentes? Mirando estoy como que estoy preguntando sobre tus planes para el futuro, qué impacto quieres tener en la profesión docente en general? Y también me pregunto si hay parte de eso que tiene que ver con Sermo, si lo ves como más integrado.

Speaker2: [00:36:43] Quiero seguir impactando porque realmente quiero que la gente conozca todo lo que yo aprendí y lo que sigo aprendiendo. Quiero que la gente vea y digo las gentes, no solo a los estudiantes que tenemos estén en las manos, pero que nunca lo habíamos usado de esta manera, que podemos educar desde nuestros hogares a nuestros hijos en estèn y podemos seguir investigando. Quiero que hiciera mi punto de vista es que no se quede en mi nada más. Que no se quede en los que yo le enseño que quiero que sea. Propagado a nivel mundial, de manera tal que no existan más niños que no manejen matemática, que no existan más niños que les tengan miedo a la ciencia. La tecnología es una herramienta que está en los niños, los maneja muy bien, pero que lo manejen bajo un enfoque claro de que no hay tabú, que todos podemos conocer matemáticas, todos podemos conocer ingeniería, todos podemos manejarla al nivel de que no sea lo básico para pasar una asignatura, sino para aplicarlo a la vida. Porque tenemos genios en nuestros hogares, tenemos genios en nuestras casas, pero no los estamos impulsando. Y si mami, papi. En los hogares logran entender eso y yo como maestra también lo logro entender. Entonces tenemos ingenieros, tendremos doctores en ciencia, doctores en matemáticas, en física sin miedo. Tendremos más profesionales en esta áreas específicas que en otras áreas, porque se van a esas áreas, porque les tienen miedo. Y ese despertar es que sueño que todos estemos trabajando, estén que no tenga Carmen Abad que ir a un mecánico a desarmar el. No está mal ir a un mecánico, pero que tenga los conocimientos básicos de cómo se desarma y se arma una herramienta porque le tengo miedo, no tomo una llave porque le tengo miedo, no tengo un destornillador para conocer en electricidad y poder decir que el positivo va en este lado y el negativo en esto. Son conocimientos que están en nuestros hogares, pero no nos arriesgamos a conocer y ese es el nivel de impacto que quiero que todo el mundo conozca.

Speaker1: [00:39:14] Y queréis algún plan concreto para el futuro? Para seguir haciendo? Hace impacto?

Speaker2: [00:39:21] Plan específico de decir no tengo, porque realmente todo conmigo se ha dado una cosa tras la otra. Pero he visto que a través de los cursos que hemos dado con fuerza, el equipo fuerza, esas chicas maravillosas que Dios ha permitido y ustedes, como la Harriet Pelosi y la OEA, no han permitido conocer. Hemos visto que esos cursos han impactado y ahora por la pandemia lo estamos actuando de manera virtual. Pero entiendo que esto va a pasar y podemos hacerlo de manera presencial. Para que? Siga llegando, pero a la vez crear multiplicadores de esos conocimientos, no solo dar cursos para que la gente aprenda, sino dar capacitaciones para que la gente multiplique esto y llevarlo a un nivel. De conocimiento que todo el que asista, si tiene el interés y la motivación, entonces lo multiplique y ya no seré cármen, ya no será el equipo Fuerza, Leila, Sofía, Milagritos, Lucy, no seremos solo nosotras cinco, sino serán esas noventa personas que asistieron a nuestro taller multiplicando en sus lugares, en sus comunidades y estas

a su vez en otra y seremos una colonia. Multiplicadores de conocimiento estèn. Ese es mi proyecto fantástico.

Speaker1: [00:40:49] Bueno, pues yo creo que me han respondido a todas las preguntas. Había otras, pero ya las respondiste como respuesta, así que creo que ya he llegado al final, con la excepción de preguntarte si es que hay algo más que yo debería de saber. O más bien que. Más bien, si yo fuera a tomar mi tesis, escribir mi tesis, que se fuera a publicar. Si yo fuera a agregar conocimiento al mundo académico o al mundo profesional sobre el por qué volverse ese docente, qué hacer para recibir esa motivación para hacer ese cambio en la vida? Qué más debería de saber que no me has dicho?

Speaker2: [00:41:34] Sería que el que decida ser docente, que entienda que en sus manos está el reto, desde que decidió ser docente ya el reto está en él, pero que después de asumir el reto, entonces entienda que la magia está en sí y la magia es creer en creer en mí, creer en ti, que has decidido ser docente. Si logras creer que puedes lograr ser docente e impactar a otros, entonces podrás hacer cualquier cosa sin. Y después de creer en ti como una magia, entonces. Hacerlo con amor y con compromiso, porque es la única manera de romper las barreras de los obstáculos que te llegan por la familia, por los colegas. Porque mucha gente te va a decir no lo sabes hacer, no lo estás haciendo bien. Es una irresponsabilidad hacerlo de esta manera. Pero en el error y la práctica es posible que exista una irresponsabilidad, es posible que no lo sepas hacer. Pero en el error y la práctica es que vas a lograr entender. Qué puedes hacer para lograr el cambio y conseguirlo y qué no. Y puedes decir pero estás experimentando, sí, pero la vida es una experiencia. Nadie escribe un libro y dijo Haz la vida así. Entonces hay que lanzarse y luchar por sus sueños.

Speaker1: [00:43:11] Muy bien. Bueno, muchísimas gracias, realmente ha sido un placer escuchar tu historia y tu como has de saber quién es ese? Ese es el drón por las palabras. Por eso me imagino que también te escogieron para esto de la televisión, porque afluyen muy bien, de manera muy bonita. Tus palabras me. Bueno, muchísimas gracias.

Speaker2: [00:43:37] Muchas gracias a usted. Estoy de verdad muy emocionada porque cuando me hablan de televisión hay cosas que no se ve enteras en la televisión y las cámaras ponen a uno nervioso y una entrevista. Escuché tantas veces esta entrevista en la televisión y ya hay una entrevista, aunque es con Rebeca, pero wow, cámara, televisión y realmente es. Muy interesante poder hablarle a la gente de quién es uno, cómo somos y cómo hemos crecido, porque se ve muy lindo. Carmen trabajar en la televisión con ese maquillaje, esa sonrisa. Pero la historia de cómo Carmen logró llegar al lugar donde estaba no llegó de la nada. Dios estuvo en el proceso, pero también hubo un sacrificio humano. Hubieron gentes, comunidades que te ayudaron a impulsarte del lado positivo, del lado negativo, pero fueron la catapulta para seguir escalando el éxito. Entonces es bueno que el otro conozca eso, porque muchas veces siente que no es posible alcanzarlo, porque hay muchas críticas, porque no hay los recursos. Pero cuando tú logras escuchar la historia de otras personas dicen Ah, pero si ella pudo, yo también puedo.

Speaker1: [00:44:54] Si no, estoy completamente completamente de acuerdo. Yo creo que la diferencia entre un docente de aula, que es el buen docente de ahora y luego el docente líder, es eso que tú dices que yo creo que es la perspectiva, no de. Hay una cosa decir, pues yo soy

maestra de literalmente máster, no literalmente soy maestra de esta temática o de ese trabajo, pero es otra cosa. Es decir, yo puedo hacer esto y también puedo hacer esto, que tal vez no estoy haciendo, que tal vez desconozco, pero yo sí puedo y eso cambia por completo. La vida de personas no hace

Speaker2: [00:45:33] Más que agradecida Rebeca por la invitación. Desde aquella vez 2019 que nos dieron la oportunidad de conocer, estèn y abrir los ojos desde otra manera, desde otra perspectiva y darle una mirada diferente a lo que es la educación y querer. Inyectar en cada uno de lo que asistimos. El enfoque de esta manera. Gracias por impactar nuestras vidas para que nosotras impacten la vida de los demás. Porque estoy muy agradecida.

Speaker1: [00:46:04] Muchas gracias. Para mi ha sido un honor completo ser parte de todo este proceso, porque yo tampoco sabía que iba a salir de ello por este medio. Y estoy hablando de la red en general porque yo llegué, había un. Bueno, ya la red tenía como más de 10 años, como 13 años. Cuando llegué solamente quedaba una persona. Natalia no sé si te acuerdas.

Speaker2: [00:46:26] Sí, claro, claro.

Speaker1: [00:46:28] Ella fue la consol que se quedó y ella no era la encargada del grupo. Entonces no sé, hubo como una situación muy tóxica. Muchas personas se fueron y fue una desorganización total y solamente Natalia se quedó con el compromiso de mantener la vida de Arrien. Y luego cuando yo llegué, entonces yo tenía a Natalia para aconsejarme y todo eso. Pero aparte de eso, yo llegué con experiencia como maestra, con mi experiencia en la física y en la ciencia, y yo estaba completamente rodeada por personas con educación en económicas, políticas, relaciones internacionales y yo tampoco usaba español en mi vida diaria en esos días, porque ya había sido maestro de escuela de escuelas públicas. Tenía mi esposo que es mexicano, pero ya casi no hablamos mucho español en la casa. Entonces yo llegué súper asustada, no, pero se me presentó la oportunidad y luego me preguntaron pues que quieres hacer con esto? Qué tipo de comunidad quieres formar? Y luego me dejaron básicamente a solas con Natalia, planificando y pensando en qué vamos a invertir, en quién vamos a invertir y cómo vamos a manejar esto. Entonces yo tengo. Bueno, entonces yo tengo mucha empatía por todo lo que dices, porque yo siento que. Tomar unos pasos hacia lo que nos asusta es lo que nos hace exitosos. No hacer, pues ha sido una lección difícil de aprender algunas veces está bien. Bueno, muchas gracias CA, espero que tengas un día muy lindo y sigamos en contacto, ok?

Speaker2: [00:48:09] Gracias. Feliz de compartir contigo, Rebeca.

Speaker1: [00:48:12] Muchas gracias. Hasta luego.

Speaker2: [00:48:14] Hasta luego. Gracias.

Appendix H: Jesica Interview Transcript

Speaker1: [00:00:02] Ok, perfecto. Bueno, pues para contextualizar un poco. Creo que fue hace más de un año y medio que creo que fue el pilar que te entrevistó, no? Si decimos bueno, ella te hizo unas preguntas sobre tus percepciones, sobre qué es el liderazgo docente, cosas así. La entrevista que quiero hacer hoy es un poco más amplia, en el sentido de que me interesa mucho saber las raíces de tu liderazgo docente. Y cuando yo me refiero al liderazgo docente profesional, me refiero no realmente a lo que haces en el aula, aunque sé como que los cuentos como liderazgo. Lo que sí me interesa más que nada es tu liderazgo, pues de otros docentes, particularmente fuera de tu trabajo, de tu trabajo diario. Es decir, que lo que has hecho con el equipo fuerza a cualquier cosa que hagas que sea como fuera del contrato que tienes con con tu escuela. Y aunque yo sé que, pues desde la perspectiva de primera infancia, tal vez no siempre se distingue específicamente el liderazgo en la enseñanza de STEM. En eso sí me estoy enfocando. Entonces sí, sí. Hay algo más general que quieres agregar a la entrevista. No hay ningún problema con eso, pero específicamente me interesa tu liderazgo en el área de estar. Ok, muy bien. Ok, pues mi primera pregunta entonces esto no debería de durar más de 45 50 minutos aproximadamente? Y te voy a hacer varias preguntas. Puedes responder como quieras? Am Tengo toda una lista de preguntas, pero muchas veces pasa que responderás algunas preguntas naturalmente, así que algunas veces me tomará unos minutos para ver dónde estamos y que nos falta. Ok. Y por último, el propósito de esto es No, no, en este momento estamos buscando como una evaluación de teacher, aunque puedes compartir lo que quieras. Lo que realmente sí me interesa saber es más como tu carrera, más tu crecimiento, pues desde quién sabes pudo haber sido desde tu niñez hasta ahora, así que no tienes que limitarte a dar tus experiencias en los últimos dos años. Tú qué me escuchas?

Speaker2: [00:02:32] Es que si seco todo de cuerpo, quita, pero parece que ya no sé, voy a voy a quitar la cámara, que si tengo mejor señal.

Speaker1: [00:02:45] Perfecto. Muy bien. Ok, pues entonces voy a empezar. Mi primera pregunta es que me gustaría que pensaras en un momento o un periodo en tu vida cuando por primera vez tuviste la oportunidad de ser docente líder en STEM. Y como mencioné, como fuera de tu, de tu trabajo diario, fuera de tu descripción de trabajo, si me entiendes, entonces ese primer momento o esa primera oportunidad para ser docente líder en.

Speaker2: [00:03:18] No sé. Bueno, porque yo quisiera quisiera iniciar contestando o como contextualizado un poquito en que yo personalmente eh. Digamos que nunca me consideré una líder. Sí, y a la a la fecha aún me cuesta porque digamos que no, no he sobresalido, como en muchos aspectos que uno considera que normalmente debe tener un líder. Si hoy en día, digamos con la formación y el recorrido que se ha tenido en el momento, pues yo puedo decir ah, bueno, sí, sí, soy una líder, pero también soy una líder como más pasiva. No sé si sea la palabra y una líder que necesita continuar en ese camino de buscar cómo las formas de de fortalecerse. Porque digamos que me ha costado, me ha costado mucho y digamos que remitirme a un momento especial de liderazgo y sobre todo en este. Y es como es difícil, pero tal vez cuando cuando estaba en mi proceso de universidad, pues sí, tuve docentes que si bien no se denominaba estem, si lo llevaban a uno por el caminito de que la la educación hay que darle pues un huaico, el tema de investigación, el tema de ir más allá y no quedarse sencillamente con lo que le dicen a uno.

Speaker2: [00:04:56] Si de pronto ese es el esos pudieron ser mis primeros inicios. Luego. Luego lo. Digámoslo supe que era importante cuando empieza uno a laburar como tal, pero se estrella uno porque de repente llega a unas instituciones en las que se debe hacer esto. De esta manera y no de otra. Entonces si lo bloquean a uno poquitico, sobre todo, digamos aquí en – pasa mucho con las instituciones privadas que ya tienen, como todos los estamentos, su forma de trabajar. Entonces todo se hace como sistematizado, como que todos debemos marchar de la misma forma. Entonces hay como que como decimos coloquialmente, cortan alas y uno olvida eso un poco. Ya cuando pasa uno al sector público, la cosa cambia un poco a pesar, o sea, así, si hay con mayor autonomía hoy en día la hay mucho más en definir cada quien sus estrategias y lo que lo que sea. Pero aún así, pues se bloquea uno como el de pronto con colegas y que pronto no lo permiten. Cómo avanzar en ciertas cosas o en que lo que uno está haciendo como que no es, como que no está bien, que sólo está bien lo que ha venido funcionando por años.

Speaker1: [00:06:17] Entonces sí es que ten. Bueno, si estoy interpretando Tarbes lo que está diciendo, tal vez no estoy en lo correcto, pero me suena un poco que como que dudas un poco en considerarte como líder, porque es un poco difícil ser reconocida como líder en el contexto en que estás. Estoy en lo correcto o no?

Speaker2: [00:06:38] Y si no, digamos que sí me cuesta reconocerme como líder y me cuesta que los demás lo reconozcan. Pero digamos que eso. O sea, que los demás lo acepten o no, o lo reconozcan. Digamos que a mí me tiene sin cuidado, pero si tengo, digamos, con una frustración, porque especialmente con con mis colegas del mismo jardín, por ejemplo Hellas, yo no logré animarlas a ese discurso. Sí, y digamos lo único desde antes. De pronto yo llegaba con alguna idea y no de si es ahora como lo tajante, no? Y como yo debía acogerme como a la mayoría, entonces sencillamente esa idea se quedaba por ahí. Sí, pero pues ya hay. Digamos que solo lo superé y no sé si es también la palabra, pero digamos que hoy se me fue la que iba a decir como parcialmente, porque digamos, me desligue del trabajo en equipo con ellas en algunas cosas ya se lo tuve que tomar la decisión y decirles bueno, si ustedes no van a hacer esto como yo lo estoy sugeri sugiriendo o si no lo podemos hacer, pues yo, yo lo voy a hacer por mi parte, sí. Obviamente eso no fue tan bien tomado y digamos que sí. Una excusa que yo yo utilicé también para poderlo hacer. Es que yo estaba en un trabajo con la OEA. Sí, y yo debía darle respuesta a ciertas cosas. Y si no lo hago, pues entonces cómo fue por ese lado? Lo hice, pero aún así yo tengo una frustración porque yo quisiera que las cinco trabajáramos como en armonía frente a ciertas cosas y no está. No, no se ha podido dar.

Speaker1: [00:08:38] No eres la primera en compartir esa frustración. No sé si eso es un alivio, pero es algo compartido por todo el mundo, honestamente. Alguna gente tiene un poco más de suerte trabajando con colegas particulares, pero no es tan en común esa experiencia, lastimosamente. Entonces úsese una palabra que usas. Usaste dos palabras que me interesan o dijiste que superaste al menos parcialmente o que te das ligaste? Me pregunto, pues, en qué momento fue y qué te hizo decidir hacer eso?

Speaker2: [00:09:16] Bueno, pues el el momento fue cuando digamos en lanzándolo un poquito con lo que me paso en el proceso de formación en la universidad, donde me me indicaron algunas cosas en las prácticas, digamos que lo podía llevar a cabo, pero cuando vi la realidad,

cuando ya me gradué y empecé a trabajar, pues era otra cosa, pero siempre en mi estaba como esa, con esas ganas de hacer algo diferente, porque no intentar algo algo más o por que no hacer las cosas de otra manera? Por qué no dejar esto? Que los comentarios que dicen no es que aquí lo hemos hecho siempre así y no hay otra forma? Yo decía no, pero podríamos hacer tal vez algo, no sé. Y entonces en el momento que. Y pues ahí si debo decirlo, cuando uno se empieza a formar o empieza a escuchar de otras historias cuando eh, digamos que no puedo dejar de lado lo que he vivido durante estos dos años. Pues como que vuelven a aparecer las ganas de decir pues yo no estaba tan mal. O sea, estas estos deseos que yo tengo, estas ideas que yo tenía, no están tan locas, ni están tan salidas de los cabellos ni ni están tan mal y sí pueden dar buenos resultados.

Speaker2: [00:10:34] Entonces en ese momento digo yo no, yo debo tomar decisiones de o digamos, debo aprovechar esto que estoy teniendo y decir si lo voy a poder hacer o demostrar de alguna manera, que qué es estar dando buenos resultados y pues sí, digamos no, no encontré el apoyo con mis colegas directas, pues de alguna manera con, por ejemplo con el retorcí en donde él estaba muy a tono con lo que se está haciendo, estaba muy de acuerdo y he recibido como ese apoyo. Entonces, desde ese punto de vista, pues también teniendo ese aval pues, y uno lo hace, además que no está haciendo nada, digamos en contra tampoco de lo que la institución quiere o en contra de los derechos de la educación en más. Entonces de pronto eso fue lo que lo que me motivó, como haber tenido una esperanza por un tiempo luego que esa esperanza se apagara o se dejara de lado por otro tiempo y luego saber que pues que si sí se podía.

Speaker1: [00:11:44] En cuánto tiempo llevas enseñando?

Speaker2: [00:11:48] Y voy para 10 años

Speaker1: [00:11:50] Muy bien, y todos estos 10 años has estado en la misma escuela?

Speaker2: [00:11:55] No, no, yo he cambiado varias veces los últimos y ya voy para 6 en la misma.

Speaker1: [00:12:03] Ah, ok. Y esta como resistencia siempre la he sentido en cada institución o como sido.

Speaker2: [00:12:12] Pues digamos que en las primeras instituciones eran de carácter privado, así que. Personalmente, no. No había como mucha opción de elegir. Entonces se llega a uno, se acoge a lo que hay y se hace lo que se dice y entonces se maneja como en colectivo. Y de pronto, cómo digamos, estaba iniciando como tal la experiencia, así entonces uno acoge eso. Pero pues ya con el pasar del tiempo, pues uno se va volviendo más crítico. Sí, y la experiencia hace que también uno pueda establecer comparaciones o o mirar qué funciona y que no funciona, que se puede cambiar y y ya, digamos, donde más se sentido. Pero también es por él, por más tiempo que llevo en esa instituciÃn, porque eso también hacen las otras. Duré un año o dos años así ya ni esa, pues voy para seis años, entonces es donde más llego a tiempo y donde también, pues he tenido con más criterio para decidir ciertas acciones, para tomar decisiones y para ser más autónoma en ciertas cosas.

Speaker1: [00:13:32] Muy bien. Y dime un poquito sobre todo. Bueno, no sé si quiero usar la palabra liderazgo porque siento que de alguna manera eso como que trae sus propias cargas. Cuando fue más bien la primera vez que empezaste a interactuar e impactar a otros docentes fuera de tu escuela. Cuándo fue la primera vez que lo hiciste? Te acuerdas de eso?

Speaker2: [00:13:58] Hoy he. Pues la verdad, yo creo que la primera vez ha sido la experiencia, ahorita con la riete con Larry, no, no, pero la carne movido mucho fuera, fuera de la institución. No, no, realmente no!

Speaker1: [00:14:22] Y. Pero dime. Te refieres al curso que hiciste o algo anterior a eso? Has hecho muchas cosas a con la red entonces?

Speaker2: [00:14:31] Pero no fue una Hulot los inicios de la de la red? Los inicios desde el curso que se hizo a través de la plataforma y ya luego los seminarios y demás. Pero sí creo que antes no ha habido así mayor interacción con docentes de otro lado, no?

Speaker1: [00:14:52] Y pues un poquito más sobre tu colaboración con el equipo Fuerza, porque me imagino que esa colaboración ha sido muy distinta, la colaboración que has tenido o que tal vez has querido tener en tu propia escuela. Así que dime cómo ha sido esa relación? Cómo se ha evolucionado?

Speaker2: [00:15:12] Sí, claro. Bueno, pues en esa experiencia pues eh. Digamos que ya luego de todo, del curso del Seminario de maestros fue como la que tomó más fuerza. Y fue bonito porque fue encontrar otras colegas de otros países con problemáticas similares y también con peces comunes. Entonces todas con ganas de trabajar, todas con ganas de de generar pues esos cambios, todas con ganas de más. Pues sí, en términos generales de trabajar por un fin común. Entonces, pues la experiencia pues fue muy, muy buena. Y se da cuenta uno por un lado, que uno no está solo. Sí que hay más colegas con Etra, con las necesidades e intereses y por el otro que hay como ese apoyo, porque pues yo puedo contar lo que me pasa y la otra pues y a mí me está pasando algo similar, o yo puedo decirle te sumes de que tiene algo más de manejo, será que me puede como asesorar en esta parte? Porque si yo, por ejemplo, veo en ellas de pronto mucha más experiencia que la que yo tengo y yole yo se los manifesté a ellas desde un principio. Ustedes trabajan todas, trabajan en universidad, todas e en su maestría, todas han hecho una cosa u otra y yo me sentía abajo porque ellos diano, yo no tengo esto, yo tampoco me peleo con la universidad como tal, eh? Entonces nos los estudios de pronto son más avanzados. Entonces yo siempre les manifesté a ellas desde un comienzo. Yo siento que como que yo no hiciera parte de esto por por esas características. Entonces ellas digamos que sí, también fueron un apoyo muy importante y si no, el hecho que queste aquí es por que algo algo le vieron, algo, algo pasó. Entonces si es si es muy bueno tener una oportunidad de compartir con con colegas de otros países, pero que a pesar de las distancias, pues compartimos intereses y gustos y necesidades similares.

Speaker1: [00:17:34] Muy bien, gracias. Y pues dices que tus colegas de equipo fuerza dijeran pues alguien debió haber visto algo en ti o que algo pasó. Dime cómo pasó tu selección para ser parte de la refiere parte específicamente del teacher? A que fue la circunstancia? Y por qué dijiste que sí? Especialmente con tus dudas, no?

Speaker2: [00:17:58] Sí, pues bueno, eso fue. Fue loco por? Porque luego pues me enteré de un poco de cosas que uno queda ahí como plop! Pero pues a mí principalmente me llamó el rector o director de del colegio donde trabajo y me me comentó que me iban a llamar de la Secretaría de Educación y porque estaban interesados en buscar personal para un proyecto que si yo deseaba ir, que no era algo seguro, pero que si yo quería ir como la entrevista. Entonces yo le dije que bueno, pues yo debía viajar porque yo no estoy en Ciudad Capital si no estoy en un municipio cercano. Entonces ese día me asignaron como el permiso para ir y demás. Yo asistí y la verdad no había más gente, diría yo. Yo me imaginé que iba a ser una entrevista como grupal o algo así, pues finalmente me atendieron en el Ministerio de Educación. Y lo que me dijeron, pues ellas me hicieron muchas preguntas y más. Entonces pues a mi me pareció bonita la idea, pero pues algo que me dijeron era que que yo no iba a ser la única entrevistada, que igual que habían cumas docentes de otros como de otros municipios que iban a ser citadas y que después toman la decisión y si yo era la ya seleccionada me avisaba. En todo caso, que eso fue un viernes y el lunes ya me estaban llegando todólogos, los medios me llenaron el correo de mil, de mucha información. Entre eso venía como los Love de Perú. Entonces yo decía pero esto es ya se como, así que me voy a ir para Perú, eso es, ya era, no sé. Luego pues supe y yo sí llegué un poco perdida a Perú porque voy ya conversando y temas, pues muchas llevaban ya rato haciendo actividades y demás. Yo tuve que hacer como en una semana lo de los meses anteriores, hasta Pilar un día me escribió. Yo, por ejemplo, a Pilar no le reconocía ni la cara. Yo a Rebecca tampoco a nadie. Entonces me dijo Cómo vas con el póster? Y yo cuál póster? El póster que hay que enviar esta noche. Y yo ahí no lo estaba.

Speaker1: [00:20:35] Lo rectos y digo esta nominación. Pero sí, algunos llegaron súper tarde. La pobre de Milagritos creo que la pasó igual.

Speaker2: [00:20:43] Entonces yo decía que me hablan cual póster y que veeru y que haga esto, que entré a la plataforma y que escribí, que si todo toco muy rápido, entonces pues si yo cumplí y lo hice, sí, entonces pues bueno, yo dije bueno, pues me seleccionaron, pero pues yo, yo la verdad que con dudas de que hayan entrevistado a alguien así. O sea, siento que el proceso no fue tan responsable como que se hizo de último momento. Entonces eso a veces quita expectativas. O por ejemplo, a la que como que hoy mandemos a gestÃ, porque esta fue la única que llegó a la entrevista. O por qué Mercutio?

Speaker1: [00:21:27] Por qué crees que te seleccionaron? Tienes idea o aún tienes tus dudas?

Speaker2: [00:21:32] Pues yo creería y digamos ataño más la selección por parte de la institución más que del ministerio. Sí. Luego ya supe cuando, cuando regresé del viaje, el supe que ese digamos, como que esta invitación sí la habían socializado en el Consejo Académico del Colegio. Y como que ese día de todas las como de las candidatas que habían, digamos, optaron por mí y se esperaba o digamos lo que no piensas que otras instituciones hicieron lo mismo, sí, pero. Pero la verdad, pues yo lo que digo yo no vi a nadie más en la entrevista. No se si ninguna otra institución quiso enviar a alguien como representante, entonces ya y porque pensaron en mí, es de la institución que es como así tengo la lavista? Pues seguramente porque hay algo que sí y digamos me caracteriza y es que a mí me gusta estudiar. Sí, entonces a mí me gusta estar empapada, a mí no me da pereza leer, no me da pereza asistir a un curso, es digamos que eso me gusta y pues hay muchos colegas que eso no todo lo que hacen fuera del horario laboral pues no

les llama la atención. Y obviamente cuando uno asume un reto de estos, pues uno sabe que hay que dedicarle tiempo y si no, no, si no, eso no va a resultar. Entonces yo creo que fue más que todo por eso, porque, porque, porque tenía tal vez el tiempo, porque no tengo hijos, entonces hay muchos colegas con hijos y sobre todo pequeños, entonces eso también limita y es entendible. Entonces, de pronto, entre todas las opciones que hayan podido tener, pues seguro sacaron esas características y dijeron pues la hija,

Speaker1: [00:23:32] Realmente no te das suficiente crédito, quién sabe? Me dices que en general que el rector ha sido un apoyo para ti.

Speaker2: [00:23:42] Sí, sí, el ser humano en sí. Y bueno, y de alguna manera siento que también explicamos de alguna forma si confía como en mis capacidades. Sí.

Speaker1: [00:23:54] Y pues una pregunta crees tú en tus propias capacidades? Esta vez, esa es una pregunta, puede ampliar mi pregunta más bien, más bien cuando dijiste que sí a esta oportunidad de la Real, cuando llegaste a Perú. Pensabas que ibas a poder ser como exitosa en el programa, enfadosa.

Speaker2: [00:24:16] Y no de inicio, no, de inicio no, por qué? Porque lo mismo yo veía que todos se saludan, que se conocían, que ya habían tenido reuniones virtuales y demás y como que sabían estaban más ubicados que yo. Yo sí me sentí bastante como perdida, así como que no entendía bien el propósito de estar allá ya con él, con el pasar de los días, ja, ja. Y bueno, ya pude. Como comprender entonces inicialmente debo decir que no cuando conformamos el equipo fuerza. Ya le vi más forma y si, tal vez me dejé contagiar por él por el entusiasmo de las demás. En decir esto nos va a llevar lejos o con esto vamos a hacer muchas cosas. Entonces ya sé, debo decir que cuando ya hicimos el equipo como tal, le tome más, con más cariño y más entusiasmo por hacer algo.

Speaker1: [00:25:16] Dime, dime de ese momento que se conformó el equipo Fuerza. Creo que sé a qué te refieres, pero quiero que me digas mejor tú.

Speaker2: [00:25:25] Bueno, estábamos en dinámica, estábamos en dinámica y estábamos y bueno, allá hicimos muchas actividades, como de plantearnos metas, hacer compromisos, ir escribiéndolo en papelitos y un día una asignación fue escribir una carta, una carta de cómo nos veíamos en. Como que cinco años. Y entonces me acuerdo que ahí entre entre risas y demás. Entonces en la mesa que estábamos las cinco o sentadas en a carne, pues la que se le ocurrió el nombre. Entonces dije por qué no? Porque no somos equipo y pongámosle un nombre y bueno, entonces ya después ella armo el grupo de WhatsApp con equipo fuerza, no te acuerdas? Somos equipo o fuerza cuando escribimos la carta, eh? No recuerdo bien la indicación. Creo que la carta se escribía individual, pero como nosotras ya nos consideramos equipo, solicitamos a Jimena que si nos dejaba hace la carta en equipo de José. Entonces salimos ahí a la salita y empezamos a redactar entre todas las cartas y la hicimos como equipo. Entonces ahí fue cuando, cuando nació, pues comulgar la idea.

Speaker1: [00:26:44] Y qué dijo en la carta? En general?

Speaker2: [00:26:47] Es bueno la carta era algo de proyección. Entonces decía que qué habláramos como si ya hubieran pasado 5 años que estábamos haciendo en el momento y y si como que estábamos logrando entonces esa carta, eh? No la he vuelto a leer, pero se proyectó como que en cada una éramos docentes, líderes en nuestro centro de enseñanza que estábamos llevando a cabo dinámicas alrededor de STEM y que nuestras prácticas eran como un ejemplo y motivación para los demás docentes. Bueno, decía varias cosas, pero básicamente me acuerdo de eso hace mucho. No la leo.

Speaker1: [00:27:34] Creo que tengo una copia en algún lado. Alguien me la mandó hace tiempo. Hace?

Speaker2: [00:27:39] Sí.

Speaker1: [00:27:41] Y pues considerando lo que puedes recordar de esa carta, sientes que vas en ese camino o si lo ves aún muy lejano e.

Speaker2: [00:27:52] Creo que sí hemos. Bueno, personalmente creo que he avanzado en varias cosas. Por qué no más, cuando de hecho hace poco estuvimos hablando de eso en el equipo y mientras dijimos y lascas lo que escribimos, por qué se nos está empezando a cumplir cada cosa de la que escribimos? Entonces el hecho de poder haber hecho el curso y llamar a otros docentes, pues eso sí era como algo que de pronto lo vimos como un sueño, pero no lo creímos, que fue tan, tan posible y tan rápido. De pronto lo habíamos visualizado para más. Para más adelante. Y pues ahorita con el nuevo fondo de liderazgo, pues decimos bueno y vamos a continuar, entonces seguramente son muchas más cosas que se irán logrando y hasta más de lo que escribimos.

Speaker1: [00:28:50] Entonces, bueno, me gustaría regresar a A. en unos momentos acerca de tus pensamientos hacia el futuro, pero me gustaría ir regresando a tu pasado antes de ir por ese lado. Dame un segundo, por favor. Me preguntó. Considerando como tu carrera, los pasos que has tomado, como como líder, como alguien que impacta a otros docentes, me pregunto si desde hace mucho has tenido planes para esto o si ha sido algo más que ha fluido. Supongo que lo que quiero preguntar con esta pregunta es que me has dicho que hace dos años, dos años y me fui hace dos años o dos años y medio ya dos años aproximadamente. Seamos un poquito menos de dos años, pues hicieron como un plan muy concreto. Me pregunto si los pasos que has tomado. En este tiempo realmente se han sido como planificados, o si ha sido algo que simplemente ha fluido. No sé si me explico bien.

Speaker2: [00:29:58] Y bueno, cuando cuando hiciste la pregunta la primera vez me remitió a algo que si yo cuando empecé a trabajar y cuando empecé a ver tanto ejemplo de algo que yo no quería hacer, es siempre, siempre digamos me propuse, pero tal vez no había caminado para conseguirlo. Y era que yo no quería ser sencillamente docente de aula, si no con ello no es mérito la labor, porque sé que es lo más importante, pero cuando no tiene espejos en los que esos docentes, por ejemplo, que ya tienen más de 60 años y siguen en el aula y y bueno, seguramente hacen su su labor con él con mucho amor. Pero yo decía yo no quiero eso. Y hay algo que yo siempre he visualizado, ni es poder hacer algo más en fuera. No, no quedarme en el aula. Sí, o sea, por ejemplo, yo tengo ahorita. Pues digamos que me me complace mucho la idea de estar en aula y y a la vez estar haciendo otras cosas, pero. Pero por ejemplo, yo no me veo mencionando.

Tomé como docente de aula. A mí me gustaría ser directivo docente. Sí. Entonces más adelante una una coordinación o una dirección de una escuela. Eso siempre me me apasionaba mucho, siempre me ha gustado. Por ahora, claro que sí. Quiero seguir disfrutando del aula porque es donde más se aprende y y digamos que también es lo que me apasiona, así por ahora. Pero si calculo en unos años por ahí 10 ya a poder estar en la parte directiva de una de una institución y no seguir en aula. Entonces eso y pues digamos que tal vez en las ganas de de aceptar estas propuestas es es que uno va ganando experiencia, va adquiriendo otros aprendizajes, va conociendo cómo otros mundos que le pueden enriquecer ese ese proyecto de vida más adelante crecer.

Speaker1: [00:32:14] A? Me pregunto si pues específicamente en referencia al curso que que diste con el equipo Fuerza Strat para maestras y maestros en primera infancia, me pregunto si tu sientes que fuiste exitosa en ese, en ese trabajo y si esperabas o si pensabas que iba a ser exitosa o no con ese trabajo.

Speaker2: [00:32:48] Bueno, yo tal vez soy una de las que más miedos mostraba y hoy comienzo porque yo veía que era y yo decía es que tenemos mucho trabajo, son muchas cosas por hacer al tiempo y debemos organizarnos y yo soy muy cansona con el, con el tema de organizar. Si designemos tareas cada una se dedica una parte y nos reunimos y trabajamos así y tal vez hoy las lamas. Si yo no sé si cansona es el Tarsicio, porque mis compañeras me dicen la juiciosa,

Speaker1: [00:33:24] Pero

Speaker2: [00:33:27] Por el término que llevo aquí en [país] se usa mucho el término juiciosa, juicioso, es decir, y

Speaker1: [00:33:33] Tal vez. Es decir que como que estás muy, muy atenta a la organización. Si alguien no está bien organizado como que le ayuda a organizar.

Speaker2: [00:33:41] Y yo tiendo y entendí un poco que a mi liderazgo y como massage sunsi, como organizar. Entonces. Digamos que al principio yo era una de las más miedosas y yo a veces les decía no nos dejemos emocionar por burlon por lo que pasa en el momento, por que a veces decimos sí, sí, sí y resulta que no vemos todo el trabajo que hay detrás de ellos. Entonces ellas de alguna forma me reconocían de eso y decían sí, es verdad. Entonces pensémoslo mejor, hagámoslo de esta forma y demás. Entonces creo que dentro o dentro del grupo. Pues como que de alguna manera cada una tiene su rol, sí, y cada una tiene sus fortalezas, entonces está una que pronto tiene más capacidad de expresión oral. Está la que de pronto no se detiene. Hay ideas muy buenas, está la que ya tiene mucha experiencia y tiene mucho material para compartirse. Y entonces, pues como yo siempre me considero como que la que menos, pues de pronto ahí tuve la oportunidad de de no de sobresalir, pero sí digamos de dar de mí lo que estaba a mi alcance y dentro de ya digamos a nivel del curso. Pues sí, pues es de alguna manera van a decir a la de [país], la de [país] en lidero este juego

Speaker1: [00:35:13] O la de

Speaker2: [00:35:13] [País] nos indico como hacer la agenda? Sí, entonces de alguna manera seguramente voy a ser recordada por algo así sea pequeñito, pero pero sí, sí es sí, creo que sí es la palabra. Sí, tuvimos como éxito con el discurso

Speaker1: [00:35:35] Que me pregunto también por qué has decidido seguir adelante específicamente con, con, con este grupo, con este trabajo, aún con esas dudas? De cierta manera de que misma me pregunto si has sentido que es algo que has hecho por tu propia voluntad, tu propio deseo, o si más bien te has sentido como jalada por un grupo y no estoy aquí para juzgar. Es una pregunta muy honesta de cómo como llegado?

Speaker2: [00:36:08] Sí, claro, pues es que uno pone como en una balanza muchas cosas. Entonces yo pues realmente ha sido por por propia voluntad que he tomado la decisión de continuar o. O las decisiones que se han tomado, pues han sido muy muy voluntarias. Eh. Pero. Pero si es como. O sea, nace en parte por el interés. Digamos que tiene que ver con lo que yo tengo como sueño y es como no, no quedarme solamente en el aula si la labor. Y sea lo más bonito o así sea para lo que yo estudié. Pero digamos que como está dentro de mis anhelos, pues sí siento que pertenecer a estos grupos, a una comunidad como la que ya pertenezco, pues eso me ayuda a estar como a como a la vanguardia, no quedarme. Siento que si de pronto dejo de participar o debo de estar informandome en algo que me interesa, pues se va a quedar ahí. Entonces el sueño que tengo de pronto no lo voy a poder lograr. Entonces si ha sido, sí ha sido muy voluntario. Y además porque el trabajo, si bien implica esfuerzo, tiempo, si bien a veces se ve uno colga dísimo con todo lo que he hacer, pero es un trabajo, la final muy bonito y es su trabajo en el que uno le ve como la la recompensa de alguna manera, cuando cuando ve que se logra algo o cuando si la una, digamos, hablando del equipo, si una no pudo estar en la reunión, pero las demás sí.

Speaker2: [00:37:50] Entonces eso, eso motiva mucho y motivar pronto. Cuando yo estoy caída en lo que hago, cuando no quiero, como que hoy no me quiero reunir y. Y la otra dice no vengo corriendo del trabajo, pero ya hago el enlace y nos conectamos un rato. Entonces uno dice cómo le voy a quedar? Magik no conectemos un rato y trabajamos en algo que no tengamos. Entonces sí creo que ha sido voluntad y de alguna manera el apoyo que uno siente, y no solo digamos entre el equipo, sino por ejemplo con sumercé, con Pilar, con Alyson, pues uno también tiene mucho acompañamiento y ve que que las cosas pues van fluyendo y ya lo hace uno parte de su día a día.

Speaker1: [00:38:39] Has recibido motivación o desmotivación de tus colegas en la escuela, de tu rector, de tu familia?

Speaker2: [00:38:49] Bueno, pues motivación con apoyo. Apoyo sí, bueno, ahorita el apoyo más grande que tengo es el de mi esposo y pues porque cuando nos conocimos y ya yo ya estaba metida en esto, entonces él supo en que estaba yo y y supo que yo tenía mucho trabajo que hacer luego de la jornada laboral. Y pues él me ha acompañado el digamos, como que tiene la paciencia cuando estoy dos horas conectada. Por ejemplo, cuando estamos planeando el curso era casi todos los días de 6 a 8. Ahí sí, entonces se me esperaba o me ayudaba con o si nos compartíamos las tareas que si yo no podía hacer. Hay algo en mí que me ayuda, sí. Entonces ese, ese apoyo es indispensable, porque debo decir que que era soltera cuando acéptela. Estaba soltera cuando acepté este proyecto. Cuando te casas el año pasado, el año pasado,

Speaker1: [00:40:02] No sé si lo sabía.

Speaker2: [00:40:05] Y no, pues digamos que la relación no está formalizada bajo bajo ningún ritual. Pero si estamos conviviendo ya casi desde el año pasado. De hecho, una pandemia como que nos unió. Si es cuando acepté este proyecto, yo estaba soltera, pero a él lo conocí justo, justo después de venir de Perú. Aunque entonces ya después nos formalizamos. Entonces pues ya he recibido mucho apoyo de parte y ha sido fundamental. De hecho él me ayudo mucho con el video final que presentábamos y demás. Y de mi familia pues sí. Y de mi familia, pues ellos saben que yo estoy ahí, que tampoco, que no solo me dedico al colegio, sino que yo tengo un compromiso, digamos con la huelga. Entonces lo entienden así y de parte de la institución, pues de que más he recibido apoyo ha sido del rector. Él es el que me ha firmado las cartas, él es el que se ha enterado de de como va el proceso de manera general con él yo hablé que mis colegas docentes no querían estar en el curso, que si se podía hacer con los estudiantes maestros en formación.

Speaker2: [00:41:25] Me dijo que sí. Y bueno, él participó en uno de los encuentros que también me dejó muy satisfecha porque conoció más de cerca como de que se trataba. Me dijo que ha conversado con ustedes, que nos había hecho unas una sugerencia respecto a una palabra, que no manejamos hipótesis, sino que manejamos supuestos que era más cercano a los niños. A mí también me lo dijo, yo le hice bien y él está como muy como enterándose, como que todo el tiempo quiere, quiere saber, consulta, pregunta y pues eso es y es bueno. Digamos que por eso es por tener ese apoyo, es que yo he arrancado porque la verdad cuando uno si no, si no hay que darle las cosas, pues es como fuera, como complicado. Ok, muy bien, gracias y desánimo y desánimo. Pues ahí de mis quejas directas que ellas no, la verdad no. No lo he logrado y la verdad ya no les volvió a decir nada, ya ellas saben que yo hago mis planeaciones y basado en lo mismo, pero de manera ejecutaba diferente, por decirlo de alguna manera.

Speaker1: [00:42:34] Yo siempre decía que cuando era necesario yo estaba muy dispuesta a cerrar la puerta de mi zona y hacer lo que era necesario. Muy bien. A ver, déjame ver qué otras preguntas faltan. An. Pues simplemente, mirando hacia el futuro, qué te gustaría lograr como docente líder en STEM específicamente? Tienes algún deseo específico y qué te hace pensar que es algo viable?

Speaker2: [00:43:10] Bueno, el deseo, el deseo es poder. Puedes llevar a cabo las las prácticas este. Pues bien, si no uno no hacerla ni superficial ni por ahí a cometer errores garrafales que después sean muy difíciles de borrar o de corregir. E Ahorita mismo debo confesar que hasta yo estoy en proceso de adaptación porque estamos pues en el proceso de regreso a la alternancia era perdonar la presencialidad. Pero he aquí en [país] todo está muy loco, porque hoy dicen una cosa, mañana dicen otra y es pasado, mañana salen con otra, vuelven a lo primero que habían dicho. Entonces estamos como en constante adaptación, están yendo muy poquitos niños, así que eso también como que nos tiene pensando bueno, con. con los que tengo presencial puedo hacer ciertas cosas, pero con los que están en casa ya no voy a poder hacer lo mismo. Pero tampoco puedo recargar a los padres de familia, no puedo cargar a los niños. Entonces si ahorita digamos que sin perder lo que se ha ganado, pues hay como prácticas que nos están llevando a cabo porque pues por las circunstancias como que no, no ha sido posible, pero sí sueño con con poder

digamos, llevar prácticas cada vez más e más enfocadas al STEM y hacer y por ejemplo ver que esos niños que yo tuve este año en cinco años están haciendo cosas maravillosas, o en seis años o en 10 años y cuando se gradúe, entonces ese día es como mi sueño saber a ver que tiene diferente ese niño con el que yo digámosles y ciertas herramientas hoy que no se las di.

Speaker2: [00:45:00] O es que no la recibió de parte mía, sino de parte de o de un colega así? Como qué? Que no sé qué diferencias. No sé si sea la palabra así, porque no, no es el ánimo de comparar o es meditar, pero es decir, de que este niño se hace preguntas. Este niño está curioso por saber algo y este otro sólo hace lo que le indican. Sí, entonces, cómo? Como que mi sueño sí es poder ver a largo plazo que las prácticas que se hagan hoy en día y van a tener ese impacto más adelante y que yo lo voy a poder ver, no,

Speaker1: [00:45:36] Ojalá, ojalá. Y entonces me has me has dicho un poco sobre tus deseos para tu propio impacto en los estudiantes de tu aula. Tienes algunos deseos sobre tu impacto sobre las prácticas de otros docentes.

Speaker2: [00:45:59] Otros docentes que estén en la ría o de docentes de la institución

Speaker1: [00:46:03] Puede pueden ser docentes en los alrededores. Otros docentes como como los docentes que empacaste a través del curso, me pregunto si ver como cómo te ves en el futuro, como alguien que impacta a otros docentes o si eso tal vez no está en los planes para ti.

Speaker2: [00:46:25] Digamos que lo vería en la medida que yo vea que lo que hace un colega, independientemente que sea y yo lo pueda aplicar y puedo tomar ejemplo de ello, es decir, hay de que qué bonito eso que está haciendo y yo lo puedo hacer y no me había, no. De pronto a mí no se me había ocurrido y yo iba y mire, hicieron esto y si me lo puedo copiar, lo copio, lo adapto, sí, y lo puedo aplicar. Entonces, si de pronto sería, sería bonito. Es encontrar como de pronto en otros colegas esas ganas también y esas intenciones que tienen de hacer cosas de otra forma, que de pronto a uno se le pasa, porque pues hay gente más creativa que uno, como en ciertos aspectos. Entonces eso, eso me gustaría. O sea, eso sería muy bueno y quizás sueño también con poder trabajar más adelante con otros colegas que conozco, por ejemplo, inmediato. De pronto que lleguen otras profes que que quieran, digamos, hacer algo o que traigan ideas nuevas y que también yo me pueda acoger a eso y trabajar en equipo como un colega lo quiere, como un loco si lo quisiera.

Speaker1: [00:47:35] Muy bien, gracias a. Me pregunto si a través de todo este tiempo en tu carrera, si has tenido, si han cambiado tus pensamientos o tus perspectivas sobre el liderazgo docente y el impacto que crees que puedes tener en el sistema por el tiempo. Es decir, que me has dicho que como que no necesariamente tenías toda la confianza del mundo sobre pues sobre ser líder. Me pregunto si es sociedad. Has visto un cambio en ti misma, tus percepciones de ti misma y porque puedes hacer como docente ver.

Speaker2: [00:48:17] Sí, pues por un lado es ganar confianza de saber qué? Pues que todos en el fondo tenemos algo de líderes. Lo que pasa es que la pues digamos, las acciones son diferentes y hay líderes que llaman mucho más la atención que otros. Y yo soy de las que esos que no, que no llaman mucho la atención, pero pues de alguna manera tengo características que que si potencio

pues puedo sacarle provecho si, o por lo menos puedo hacer más con ellas. Y si el hecho de estar en este proceso y estar intentándolo por lo menos pues y eso ya de alguna manera me hace una una líder que debo seguir trabajando si debo, debo seguir tomando decisiones, debo seguir instruyendo, consultando, no quedarme con lo único que tiene uno alrededor, sino ir más allá y y a ver si más adelante, pues de pronto se pueden hacer cosas más, más grandes.

Speaker1: [00:49:22] Y si pudieras hacer algo grande que sería qué es lo que consideras grande?

Speaker2: [00:49:30] Bueno, a mi me gustaría mucho poder escribir un libro, aunque y me gustaría escribir un libro y cuando reúna como suficiente. No sé si sea basado en la experiencia propia, pero sí, y que sea un libro de cuentos que no solo cuente mi experiencia como tal, sino que deje algo más. Y eso me gustó mucho de un libro que leí de una profe de España y a mí ese libro me inspiraba mucho. Yo he comentado mucho de ese libro porque es una profe con ya años de experiencia en la que relata de alguna forma sus experiencias, pero va como tips para que uno los pueda acoger sin ser tan directa, sin ser, sin estar diciendo que se tienen que hacer las cosas así y no de otra forma. Pero si por ejemplo, eso de llegarle pronto a mucha gente, si así como yo adquirí el libro de alguien de España que algún día la escuché y escuché su libro, tuve la oportunidad de verla también y me gustó mucho y por eso lo hice. Y es un libro que impacta y es un libro suave. Leer es bonito, entonces a mi me gustaria por ejemplo hacer algo así y de alguna manera que yo pueda llegar a otros docentes de una manera amable, de una manera de decirles esto le pasa a todo el mundo y pero solo se puede resolver de algunas formas. Por ejemplo es eh, me gustaría llegar a ser directora de una escuela y eso siempre lo lo he tenido. Debo trabajar por ello, pinchar y por ejemplo continuar con el equipo me me emociona mucho, me llama mucho la atención y pues ojalá pueda seguir haciendo como cositas así de capacitaciones de de formación, que también se pueda ayudar a otros docentes.

Speaker1: [00:51:37] Abrazo. Bueno, pues yo creo que básicamente llegamos al final de mis preguntas. Me pregunto si hay algo que esperabas que yo preguntara o algo más que quieres decirme?

Speaker2: [00:51:50] Mmm no, no, que espero que que haya estado bien las respuestas o no bien, pero pues si, como acorde a lo que se necesite.

Speaker1: [00:52:00] Pues es todo. Todo son datos, no? No, mi rol no es de juzgar ni evaluar ni nada, es simplemente pues ver si ha habido mucho o mucha investigación sobre el rol de docente como líder, como agente de cambio en Estados Unidos. Bueno, digo que mucho más que muchos otros lados, pero no tenemos como sistemas coherentes para apoyar a docentes que quieran liderar o apoyar a docentes que tal vez no saben que tienen esas capacidades para liderar, para impactar a otros. Y terminamos como como me parece que me expresas, terminamos todos trabajando en islas. No lo tuve, tuve una platica. Puede dejar de grabar?

Appendix I: Miranda Interview Transcript

Speaker1: [00:00:00] Con? Muchas gracias y creo que te comenté en el WhatsApp que también está. Pues obviamente sirve para la Riedel para entender exactamente como estamos teniendo. Bueno, como esperamos tener un impacto en las trayectorias de los docentes, estamos, pero yo personalmente también estoy trabajando en mi doctorado y estudiando como es como van desarrollando los docentes. Entonces no quiero que pienses en esto como una evaluación de la red en particular. Obviamente estamos muy, muy abiertos, muy abiertas a dar retroalimentación, pero más que nada quiero enfocarme en en tu desarrollo que pudo haber pasado hace mucho tiempo y no necesariamente en el contexto de Barriera. Así que voy a hacerte varias preguntas. Me puedes responder de la manera que quieras y va a ser como algo fluido y en formato OK. Esta es muy, muy bonita y muy bien vestida, pero estamos aquí casuales. Ok, muy bien. Ok. Bueno, pues entonces, como mencioné, me gustaría que me digas un poco sobre todo tu desarrollo como líder docente, pero me gustaría que pensaras específicamente en lo desterré. Es decir, si me puedes decir del momento del periodo de tu vida, cuando realmente sientes que tomaste ese primer paso hacia ser líder docente en STEM O en ciencia o en matemáticas. Esos campos relacionados. O tal vez empezó con algo distinto, no sé.

Speaker2: [00:01:44] Si realmente hablamos de veces desde mi práctica, Alika.

Speaker1: [00:01:51] Sí, sí, pues lo que yo sé que tal vez las raíces de tu práctica como líder, como líder, tal vez empezó con cosas más generales u otra cosa que no fue stamp. Y si me quieres, si tienes algo que decirme sobre eso. Genial. Luego me gustaría escuchar de ese primer paso hacia el liderazgo docente en Stang, si me entiendes.

Speaker2: [00:02:15] Sí, imperfecto. Bien, tú sabes que generalmente a veces somos líderes, pero no lo identificamos como líder. Más sin embargo, otras personas que te observan y que ven tu trabajo y ven tu labor, se identifican y quieren seguir. Tú sabes que los líder, la persona líder es como un espejo de los demás. Yo te miro a ti. Yo quiero ser como tú. Yo digo yo quiero ser como tú. Entonces estoy beatificado, que tú eres un gran líder. Entonces esa parte realmente yo como persona, como profesional, no la identificaba más. Sin embargo, habían muchos ojos de muchos profesionales y de muchos superiores encima de mi trabajo y encima de mi persona. Y es ahí entonces cuando ya logro llegar a lo que es el Polo Chi y entonces el logro determinar y enfatizar y y de apropiarme que realmente soy un agente líder, que entonces es el que me identifico como un gran liderazgo. Entonces es ahí cuando empezamos a trabajar la metodología estén luego del seminario que tuvimos allá en el Perú, inmediatamente empezamos a implementar lo que era la metodología STEM en primera infancia y de una vez empezamos a trascender a otros maestros. Entonces empezaron a implementarlo y Empres empezó de una vez como a fluir. Entonces, cuando ya viene nuestra práctica, nuestro fondo de liderazgo, pues que hacemos nuestro plan, ahí coge más auge porque muchas personas ven el curso, se quieren inscribir y realmente ha dejado como una marca porque ya varias personas de aquí de mi comunidad local de [país]. Llámese directores de centro educativo, me han escrito que quieren expandir esa estrategia y que quieren implementarla dentro de eso, de sus centros educativos y de ello enhorabuena, pues el trabajo está fluyendo, o sea, se está notando que el liderazgo está trascendiendo y muchas docentes se han acercado a mí y tú eres la fuente. Dime cómo hacerlo,

como lo vamos a hacer. Quiero implementar esto, quiero hacer esto. Y realmente ha sido una experiencia muy bonita

Speaker1: [00:04:43] Y me alegra. Sientes entonces por cómo, por cómo lo describiste? Pues que tal vez no sabías que ya eras una líder o sientes que no te volviste el líder hasta pues esa experiencia con en Perú sientes que ya tenías como idén. Tal vez no lo sabías, tal vez no tenías esa identidad de líder, pero ya era el líder desde hace mucho. Esto. Perdón, se cortó un poco. Me escuchas? Voy a cerrar mi cámara. No sé si eso ayudaría. Ya, ya, a estas de congelarme o a ver, te preguntaba que si tu sientes que tal vez si eras líder desde hace tiempo hasta de esa experiencia de aprender de la metodología STEM y tal vez no lo sabías.

Speaker2: [00:05:41] Exacto, exacto. No me identificaba como una líder.

Speaker1: [00:05:45] Pues dime, entonces cuando crees reflexionando ahora que tu sabes que es un líder? En qué momento crees que te volviste el líder docente en general?

Speaker2: [00:05:57] Bueno, pues diría que desde mi principiode de experiencia laboral en el sector oficial, porque yo vengo de trabajar en los centros educativos privados, que a [país] lo llamamos colegios, que son instituciones privadas y ahí bueno, y desempeñamos nuestro rol en las aulas, entonces cuando ya pasamos al sector oficial, llámese Ministerio de Educación. Entonces ahí de una vez empezamos a trabajar para modelarlo. Prácticas educativas a otras docentes y asistían en toda una región, asistían diferentes maestros de diferentes instituciones a observar lo que era nuestra práctica educativa. Entonces considero que hace ya desde mis principios soy una líder

Speaker1: [00:06:46] Fantástico y eso fue cuando, en qué año, en qué año estamos hablando? En el 2010, en el 2010, entonces, y por qué crees que te volviste líder? Tenía que ver simplemente con el contexto en que estabas, el que estabas en ese colegio y se volvió como modelo regional o en particular te seleccionaron a ti específicamente para ese rol. Cómo pasó todo eso?

Speaker2: [00:07:12] Es algo. Eso surgió aquí para ser seleccionado como docentes. Se hacen unos concursos pedagógicos y esos concursos consisten en hacer diferentes exámenes. Te hacen el primer día uno de psicología, luego de contenidos y luego una entrevista con las autoridades educativas. Entonces para ese proyecto calificamos siete personas, incluyéndome a mí.

Speaker1: [00:07:37] Y eso fue. Eso pasó en tu primer año de enseñanza. Es lo que me estás diciendo

Speaker2: [00:07:41] En el sector oficial.

Speaker1: [00:07:43] Fue entonces cuando empezaste a enseñar en primera infancia.

Speaker2: [00:07:49] En Primera en en el 2002 2003, por

Speaker1: [00:07:54] Enseñarte, enseñaste otro nivel antes de eso.

Speaker2: [00:07:58] Todavía yo estaba en la universidad, yo impartir unos cursos de otras instituciones, como un Botet, aquí son unos, esos son unos cursos para adultos. Es ahí yo imparte una Abian, un programa de juventud y ahí la impartía unos jóvenes, bloqueara la lengua española.

Speaker1: [00:08:19] Ah, ok, bueno, entonces si es que te entiendes bien, el cronograma es bueno, las vidas son complicadas, no? Pero esta vez en la universidad estabas haciendo este otro tipo de enseñanza con adultos y después me suena que enseñaste por unos 7 años y luego entraste en este concurso y ganaste. Sí. Y luego desde ahí ya eres maestra pública desde el 2010 aproximadamente. Ok, entonces me pregunto qué te hizo decidir de decidir hacer ese cambio entre lo que estabas haciendo entre el 2002 y el 2010, luego cambiar en el 2010 a postularte para ese concurso que te hizo decidir hacer eso

Speaker2: [00:09:05] Es realmente aquí. Cuando se estudia educación es siempre votamos para trabajar en el Ministerio de Educación, entonces esa institución que yo laboraba era privada y realmente la remuneración económica no es la más factible. Entonces era como un escalón más.

Speaker1: [00:09:27] Ok, ok, tiene mucho sentido. Perfecto. Y pues hablando ahora específicamente. Esther, cómo pasó esta selección? Pues tu selección del ministerio para participar en la red o ya estabas sesiones? Estabas haciendo cosas de Steam o no sabías mucho cómo era ese instante cuando te seleccionaron?

Speaker2: [00:09:49] No, no realmente. Todo surgió con una llamada desde el ministerio llamaron para mi centro, seleccionaron a docente de primera infancia para participar en este proyecto de d'Estaing y la Red y la OEA. Entonces las técnicos nacionales específicamente dijeron el nombre Lucy tenía gracia de operes en la llamada que hicieron. Entonces mi coordinadora del centro me pregunta como que si yo asumo el reto y yo le digo pues claro que sí. Yo realmente no sabía nada de que estaba hablando, no conocía la terminología STEM en sus siglas y. Y si yo le dije claro que sí. Ella me preguntó Están llamando del ministerio que si yo asume el reto es para hacer esto, un proyecto trabajar un proyecto de y luego tendrías que viajar a un seminario o está dispuesta tú y yo? Claro que sí, porque a todo, realmente todo lo que me presenten yo le digo que sí. Y por qué crees

Speaker1: [00:10:53] Que porque crees que eres así es es más responsabilidad, más carga no es. Pues ya tienes, pues más que suficiente qué hacer porque dices que sí a esas oportunidades

Speaker2: [00:11:06] Y no, me gusta, me gusta estar activa con los demás. Realmente en esa experiencia fue muy, muy e hizo mucho hincapié en mi aspecto profesional porque me ayudó a mejorar mi práctica. Entonces a mí me gusta siempre indagar para ir mejorando, porque aunque estamos hablando aquí de adulto, pero cuando yo mejoro mi práctica educativa, estoy trabajando para la infancia, o sea, para la primera infancia, estoy formando generaciones, porque cuando yo me documento, cuando yo aprendo más para poder mejorar mi práctica pedagógica, pues estoy ayudando a esos pequeñitos y eso era son la generación que nos van a suceder a nosotros y realmente lo que me identifico mucho con esa parte, me gusta siempre estar mejorando e indagando, investigando muy bien.

Speaker1: [00:11:58] Sabes de dónde viene ese como curiosidades e interés, esa inquietud en ti.

Speaker2: [00:12:05] Bueno, muchas personas dicen que es una herencia. Yo vengo de ya vengo de una familia donde todas mis tías son pedagoga, todas mis tías son maestras. Ya hoy en día están todas lesionadas, toda jubilaba ya en sus casas descansando, pero aun así desde su casa pensionada sigue haciendo un aporte todas a la labor educativa. Entonces al sistema. De hecho están fuera del país y aún así viven en Estados Unidos y aún así viven haciendo sus aportes a través de las redes y. Y no sé, yo, yo me lo vivo, es como algo innato. Yo diría que es algo innato porque yo me lo vivo, me lo gozo, me gusta trabajar con pequeños. De hecho, en el aspecto emocional, cuando todos los seres humanos tenemos situaciones y cuando yo llego a mi institución, que empiezo a interactuar con los pequeños y con las personas, con las demás personas, como que todo cambia, como que todo se olvida y afluir a trabajar.

Speaker1: [00:13:11] Una persona pregunta me suena que tienes y que siempre has tenido mucha confianza en todo lo que lo que todo lo que has hecho, todo lo que has decidido hacer en algún momento en hacer esas decisiones, de responder que sí a las oportunidades, a las invitaciones, a contribuir de otras maneras. Me pregunto si has tenido miedo, si has tenido una falta de confianza o siempre, siempre te has sentido así de confidente.

Speaker2: [00:13:40] En un principio sí me sentía muy, muy, muy segura. Mcp Retaban y yo era muy lanzada a los retos entonces y viceversa. Últimamente sí he tenido un poquito de miedo de los últimos en los últimos días, llámese en el último año. Y por qué? Por la situación, quizá que estamos viviendo. Han sido muchas cosas. Cuando pasamos por situaciones personales y familiares, como que eso nos resta en el ámbito profesional, entonces. Pero antes de ello tú me retaba y repítame que mejor para mí. Yo lo hago

Speaker1: [00:14:21] Y theres perdón por seguir preguntando, pero sabes de dónde viene esa confianza? Que es lo que te hace sentir que que sí puedes. Porque hay muchas personas que dicen eso. No, no es para mí. Yo no estoy lista, no me suena que no es así para ti. Entonces de dónde viene? De dónde viene esa?

Speaker2: [00:14:39] La seguridad. Me me gusta leer y dice que la persona que que lee tiene derecho a la palabra.

Speaker1: [00:14:51] Si es verdad, es verdad, muy bien. Y en particular en aceptar este reto de Danforth de informarte, supongo, con las metodologías STEM. Tenías miedo de eso o no?

Speaker2: [00:15:05] Cuando antes de conocerlo.

Speaker1: [00:15:09] Recuerdo que cuando tu directora te y pues cuando el Ministerio te nominó y cuando te dijeron que se trataba de Ster, cómo te sentías al respecto?

Speaker2: [00:15:19] No, yo inmediatamente me dije aquí sí. Desde que hicieron la llamada le dije sí, pues claro, por supuesto, yo lo asumo y yo también me puse a investigar qué era este.

Speaker1: [00:15:30] Bien, bien, pues fantástico. Déjeme ver mis otras preguntas. Hum. Me pregunto si esas oportunidades en general que has tomado, pero bueno, particularmente respecto al liderazgo y esto de la Real, yo sé que como que apareció de la nada, pero me has hablado un poco de como que quieres ir escalando o al menos que querías ir escalando en tu carrera. Entonces en tu vida has tenido planes para ti como desde el principio de ser maestra en tu primer año tenías planes hacia dónde ibas a ir? O tienes planes ahora o ha sido más como. Como. No quiero decir de la nada, pero. Mi pregunta es si tus todas tus interacciones como líder sí han sido algo planificados o algo que simplemente fluyó.

Speaker2: [00:16:24] No, se han dado las oportunidades, se han dado y ha fluido este. Cuando empezamos todo tenemos nuestros sueños y realmente mi meta. Yo decía, yo recuerdo, decía ahora cuando estaba en la secundaria que yo decía que yo quería ser maestra universitaria. Entonces realmente he ido trabajando para para ese rol. Pero puedo ser sincera aquí, verdad? Sí, claro que sí. Y a la política educativas de nuestros países son un poquito. Tienden a ser de otro tipo de políticas y. Para tu poder ascender, no importa tu intelecto, tu preparación, entonces hay que tener como esas ciertas relaciones y realmente en esa parte hay como que no voy muy de acuerdo. Son cosas, aspectos más de de ideologías. O sea, esa es mi ideal. Yo no, yo quiero. Por ejemplo, si yo quiero hacer en la universidad, ok, que yo llegue como llegue al ministro de Educación por mi arduo trabajo, porque fui a un concurso, porque aprobé a través de algo cognitivo y que realmente se demostró que yo soy capaz. No porque yo tenga relación con Rebecca y Rebecca, me coloque en un cargo y me entienda, entonces ese es mi ideal. Personalmente yo como persona, como profesional, esos son mis principios y mis valores. Entonces la política educativa se gira en torno a sí y realmente esa parte como que n e declinaba un poquito. Pero si en un principio, cuando yo empecé la universidad, yo decía yo quiero ser maestra universitaria, o sea, ir escalando, claro que es y como.

Speaker1: [00:18:16] Bueno, yo voy pensando en mí misma cuando yo iba a la universidad y pues bien, pues como tú dices, todos tenemos sueños, no? Pero yo creo que no necesariamente los pensaba así estratÃgicamente. Entonces, cómo llegaste a ser tan sabia? Digamos, en este mundo de los sistemas del sistema educativo en [país], cómo llegaste a tener tanto conocimiento como para ir pensando como quieres ir cambiando el sistema a esa edad tan temprana?

Speaker2: [00:18:50] No, tú sabes que es que realmente yo vengo de una familia con muchos principios y valores éticos y profesionales. Entonces desde un principio queremos hacer las cosas bien hecha, como corresponde y como demanda. Entonces, políticamente hablando, hay muchas limitaciones en el sistema y decimos cómo te lo explico que tú no puedas entender? Son cosas y manejos políticos que yo no voy de acuerdo. Realmente son arraigados en mi familia, que tampoco vamos ninguno de acuerdo y porque son expertos, cómo te explico? Como hone degradantes para la persona, tú tienes que ser un poquito permitis permisiva en el sentido de permitir cosas que tú considera que son incorrectas.

Speaker1: [00:20:00] Me puedes dar un ejemplo específico?

Speaker2: [00:20:03] Mira, generalmente para ascender a un cargo. Tienes que tener relaciones con los superiores, empieza la corrupción, es decir,

Speaker1: [00:20:19] Si no, pues sí, es una lástima, pero pasa en todos los países,

Speaker2: [00:20:24] De acuerdo?

Speaker1: [00:20:26] No, no es una sorpresa para mí, para nada. No, no, yo no. Yo sí entiendo claramente y pues es una pregunta que me interesa mucho. Entonces, pues yo personalmente mi enfoque ha sido en las ciencias, porque pues de ahí vengo. No, yo sé que en la primera infancia son asuntos más generales, más temáticos, más integradas. Entonces me pregunto cómo tú ves cómo contextualiza esto de estar en esta visión que tú tienes para el futuro del sistema educativo en [país]? Y no sé si me estoy haciendo clara, pero mi pregunta es yo te veo como no quiero decir maestro y rebelde, lo cual me encanta, no? Pero yo te veo como alguien que sí quiere como? Pues causar cambio, no? Y entonces me pregunto. Qué parte de la historia incluye STEM para ti es simplemente. Pues no estoy aquí para juzgar ni nada, pero me pregunto si tú lo ves más como. Como algo en el periférico o si lo ves como algo integral. Si eso es una vía para eso, me entiendes? Pregunta No!

Speaker2: [00:21:42] Sí, sí, sí. He STEM como como estrategia para pretender. Ah, no, mira, te digo que en este proyecto yo he crecido bastante como profesional y también como persona, porque realmente te abre las puertas y te da muchas oportunidades y y están. Es algo que en primera infancia lo veíamos como imposible. Te voy a hablar en particular yo lo veíamos como algo imposible, en el sentido de que decíamos como un niño puede trabajar y tiene vida, como un niño puede trabajar matemáticas, ciencia. Qué es esto, verdad? Entonces no cuestionaba mucho, pero realmente sí se puede, porque los niños son por naturaleza científicos, por naturaleza son investigadores. Entonces este yo lo veo como una un gran salto y una iún y una gran oportunidad para crear cambios.

Speaker1: [00:22:45] Y me estás hablando de cómo puede cambiar cambios desde el aula. Me pregunto también qué parte de la historia tiene tu liderazgo docente en Ster? Cómo estás usando el Stam para impactar al sistema a través de la profesión docente, a través de los docentes? Me entiendes?

Speaker2: [00:23:06] Bueno, eh, sí, sí, eh, a través del liderazgo y de ÍDE y de mostrar y ver que realmente trabajar con el género y que las niñas puedan, puedan ser científicas, que puedan ser investigadoras y a lo que te digo, trascender en colegas ya se está mirando, o sea, ya las siembra, los frutos de la siembra, ya está germinando, ya se está mirando que muchas colegas quieren implementar la metodología estéril, quieren hacerlo y de hecho me han cuestionado. Veámos variado mucho acerca de cómo hacerlo y para qué. Entonces sí, sí lo veo. Como bueno y vale.

Speaker1: [00:24:05] Déjame ver que terminé un poco fuera de tu historia, es muy interesante, así que me he desviado un poco. Si me preguntas, me pregunto ahora hablando específicamente de tu trabajo. Bueno, me gustaría que tus palabras me dijeras exactamente qué sientes que has logrado como líder docente en asuntos de. Entonces, por lo que tengo entendido de tu historia, estamos hablando básicamente después de. Pero si es una vez que, ya que es conocida la metodología STEM que hace que la hayas implementado. Y ahora que estás impactando a otros docentes, sí me puedes decir un poco que han sido tus acciones, tus actividades en liderazgo docente en la temática de ster.

Speaker2: [00:24:52] Ok, ppero e iniciamos con lo que lo llamamos un grupo pedagógico. Hicimos una presentación, vamos a llamarle como una plataforma a mis colegas de qué? Que es este? Para qué sirve y cómo implementarlo y y creamos y recreamos variadas actividades y de cómo hacerlo. Y esto dentro

Speaker1: [00:25:22] De tu escuela o en que en toda esta región.

Speaker2: [00:25:28] Si eso es dentro de mi distrito, dentro de mi centro educativo. Entonces después seguimos promocionando a través de nuestras redes personales. Entonces se acercaba y me preguntaba Qué es eso? Cómo lo hago? Y bueno, desde mi estado de Oaxaca colocaba a veces actividades que yo realizaba y me decían ay, que interesante, me gusta, me lo puedo compartir. Y entonces por ahí se iba como llevando. Entonces realmente el el punto. El Detone fue nuestro curso promoviendo el sostén para maestros y maestras de primera infancia. Ese fue el detone que que colocó la corona que ya todas las maestras están como impregnadas ya de esa energía de lo que es la metodología este fantástico.

Speaker1: [00:26:27] Gracias. Y me pregunto si durante este pues ese recorrido que me has contado, me pregunto si has recibido motivación o desmotivación.

Speaker2: [00:26:41] Hacer dudar de no tener te refieres, te refiere a que internas, si tiernamente.

Speaker1: [00:26:50] No estoy hablando necesariamente de que ni de mía específicamente, estoy hablando más de personas que están en su contexto, que te están Rohde.

Speaker2: [00:26:58] Sin la segunda parte que ha pasado? No, no hay motivación. Al contrario que le vivo siempre mencionando acerca del método a mis hijos, a mi coordinadora, a mi directora. No he tenido mucho contacto con mi técnica distrital en cuanto al respeto, en cuanto al tema a mis superiores nacionales. También he querido como inyectarles a esa dinámica de que de la emoción que estoy sintiendo a través después de yo conocer Stain y la mejora que he tenido como profesional y realmente estamos al frente

Speaker1: [00:27:44] De tus colegas en general.

Speaker2: [00:27:48] Escila Las colegas se han motivado bastante en cuanto a liderazgo, o sea, ven que son

Speaker1: [00:27:55] Ellas que participaron en el curso, no?

Speaker2: [00:27:57] Sí, sí, sí, en olas, sí.

Speaker1: [00:28:01] Entonces, pues pues obviamente yo sé que has tenido tu plan de liderazgo. Ah, pues también has estado con este equipo fuerza. Ah, pero me pregunto si. Nuevamente me pregunto por qué sigues haciéndolo pod? Podrías decir pues yo, yo no. Yo no quiero, yo no recibo la motivación, yo no recibo el apoyo que necesito, al menos dentro del país. Entonces porque por qué lo hiciste y seguirás haciéndolo?

Speaker2: [00:28:27] Porque yo sé que aunque no sea yo y aunque no sea en el 2021, aunque no está en el 2022, pero se babar.

Speaker1: [00:28:35] Y porque como sabes eso que te hace devorar?

Speaker2: [00:28:41] Porque no me voy a callar, no me voy a quedar quieta.

Speaker1: [00:28:45] Muy bien, pero muy bien. Ok, déjame ver mis otras preguntas. Pues ya te he preguntado bastante sobre tu pasado a. Me pregunto si pues pensando hacia el futuro, considerando todo lo que has logrado como líder en general y también con esto que has hecho con la Rier, que ha sido un trabajo fantástico a nivel no no solamente regional, no solamente en tu propio país, sino internacionalmente. No han sido muy gran trabajo. Me pregunto qué crees que puedes hacer hacia el futuro? Cuáles serían tus siguientes pasos para llegar a ese gran sueño que tienes para ese cambio para la educación?

Speaker2: [00:29:31] Perdón, que no te escuché de nada.

Speaker1: [00:29:34] No pregunté. Considerando todo lo que has logrado, me pregunto si tienes planes para el futuro de cómo seguir impactando a docentes. Y cuál es? Si es así, cuáles serían los siguientes pasos?

Speaker2: [00:29:52] Eh, bueno, en mi sueño siempre ha sido eso o seguir impactando, pero el futuro inmediato te voy a hablar de cercano, eh? Yo siempre soñaba con con crear páginas interactiva y crear blog y de hecho nuestro proyecto en conjunto con fuerza fue ese entonces para el futuro inmediato. Lo que estamos haciendo es que vamos a crear en conjunto con otras docentes que han sido reclutado o seleccionadas, que también son líderes bien poderosas y. Y pensamos eso cómo crear herramientas donde a las docentes de aula se les sea su trabajo, se le haga como más factible. Y ese siempre ha sido mi sueño. Porque tú sabes que cuando tú de las dificultades podemos crear nuevas oportunidades, entonces cuando tú vives algo en el diario vivir que tú piensas y tú quieres mejorar y tú quieres compartirlo. O sea, ese es nuestro rol como líderes que trascienda y que pueda ser compartido y que otras puedan apropiarse de las ideas y de lo que queremos lograr para mejorar nuestra práctica. Entonces, esto es como crear cajas de herramientas para APPO para poder llevarlo a la práctica y trabajarlo, que son las ciencias, la ingeniería, las matemáticas.

Speaker1: [00:31:27] Fantástico. Bueno, me alegra escucharlo. Um, déjame ver. Me pregunto si en tu vida personal sientes que has estado recibiendo apoyo, porque me has dicho de tus administradores que han sido como no sé cómo se llamaría en español como sordas. Que me has dicho que simplemente no están prestando atención, pero alguien ha metido obstáculos en tu camino?

Speaker2: [00:31:55] No, no, no..

Speaker1: [00:31:56] Ok, gracias. Me alegra escucharlo. Pero que eso si, algunas veces

Speaker2: [00:32:02] Lo mando, pero simplemente indiferencia

Speaker1: [00:32:05] E indiferencia. No sé si me pregunto. Me pregunto si pudieras auto evaluar tu trabajo. Me pregunto qué es lo que tú piensas que te hace a ti una persona efectiva en hacer el cambio educativo? Lo digo nuevamente desde pasado. Me pregunto a ver? Lo que estoy tratando de preguntar, siento que algunas de mis preguntas como que no caen perfectamente, así como me encantaría, pero pero, pero me pregunto. Tú me pareces, pues, como mencioné, que tienes muchísima confianza, muchísima seguridad de ti misma y me preguntó por qué eres una líder con eficacia? Qué hay de ti que te ha sido una buena líder?

Speaker2: [00:33:08] Lo primero es que me gusta estar en constante mejora. Un líder reconoce y reconoce lo que hace bien y lo que puede mejorar. Un líder reconoce cuando se cae y cuando se levanta y. Y realmente a mí en lo personal me gusta siempre estar en constante mejora. Y creo que eso sería una de las características principales.

Speaker1: [00:33:42] Cantaste con. A ver qué más. Me comentaste al principio que no necesariamente te reconocía como líder, aunque siempre has sido líder. Entonces me pregunto cómo ha cambiado tu perspectiva de lo que crees que es el liderazgo? En ese tiempo?

Speaker2: [00:34:06] En aquel tiempo, no realment en aquel breve

Speaker1: [00:34:08] Carrera sobre tu carrera, como como has cambiado tu concepto, tu conceptualización de lo que es ser líder docente,

Speaker2: [00:34:16] Si realmente antes yo pensaba que un líder era algo como inalcanzable, que uno nunca podría ser líder, pero realmente con la experiencia he logrado que que realmente un líder se nace y se puede formar. Que un líder puede trabajarse de un líder identifica otros líderes. Un líder identifica. Vuelvo y te repito cuando debe mejorar. Un líder es un agente de cambio y yo sueño y yo sé que papá Dios me lo va a hacer posible. Yo sueño con que la educación del sistema [de país] sea una educación más sistemática en el sentido de que pueda. Ser mamá planeada, más planificada, que no haya tantas improvisaciones en sus políticas. Yo sueño con todo eso. Entonces un líder es un agente de cambio?

Speaker1: [00:35:29] Pues una pregunta, si fueras la ministra de Educación, si fueras la ministra de Educación, qué harías para lograr eso?

Speaker2: [00:35:39] Eh, bueno, eh. Se cuarto en este momento de Cristo.

Speaker1: [00:35:53] Un momento, estás congelada. A ver, creo que te escucho, pero creo que el video no me podría hacer. Ya está bien. Hay. Debió haber descubierto ahora está bien, adelante.

Speaker2: [00:36:13] Bueno, si yo fuera ministro en este momento, en este tiempo, realmente ha sido muy difícil y hubo que improvisar ciertas cosas. De hecho, nosotras misma como docente empezamos una planificación ahí rápida, que para poder contactar a los padres con el asunto del distanciamiento y de la enseñanza en casa que yo haría como ministra, usaría más. Escucharía

más la voz de la de los docentes, o sea, escucharía más sus experiencias y sus prácticas para poder documentar y realmente enfatizar y contextualizar. Y Contextualizan me escuchais a ver

Speaker1: [00:37:05] Si ahora este se corto rápidamente, pero ya estás de regreso. Escuché tu respuesta. Si sabes. En efecto, el ministro de Educación de los Estados Unidos hace dos presidentes cada domingo, no creo que era un domingo al mes. Invitaba a docentes a tomar un té con él. Tenía como mesas redondas donde los escuchaba. Yo creo que eso fue algo espectacular. No hay más nada decir. Bueno, como somos un par, bueno, más como una federación, entonces el ministro de Educación Nacional no tiene mucho, mucho impacto a nivel práctico, aunque más que ver con como distribuimos el dinero. Pero, pero probema, no? Me encanta esa idea. Y qué? Cómo sería tu visión para la educación o la enseñanza STEM en primera infancia si fueras la MA la ministra de Educación?

Speaker2: [00:38:05] Que le pusieran las alas de ensueño. No, no, realmente es un gran reto, porque tú sabes que está bien, es más de indagación, experimentación, acción, es, es hacer, es que los niños puedan hacer y experimentar y explorar. Entonces brindarle el que se yo esos espacios e diseñar aulas apropiadas para que puedan explorar todas esas experiencias.

Speaker1: [00:38:42] Muy bien. Bueno, yo creo que ya, ya. Básicamente con cuántos historias ricas es respondido casi todas las preguntas que tenía, pero sigo preguntándome por el rol de tu familiar particular. Me mencionaste tus tías y qué ha sido el rol de tus tías en tu crecimiento como docente en tu centro, tu trabajo como líder docente?

Speaker2: [00:39:09] Eh? Hay alguna te voy a hablar de uno en particular, aunque esa ha sido mi mi soporte, mi bastón. Realmente cuando. Yo todavía estaba, me parece, en secundaria. Yo salía de mi escuela y me iba a la de ella a acompañarla y asistirla. Yo era prácticamente su asistente y yo aprendí mucho de ella. El amor, el amor por hacer las cosas bien hechas, el amor, mejorar cada día las prácticas. Y ella ha sido como mi espejo y yo la la veo a ella como como mi. Cuando tú tiene a alguien, como se diría, se ha parado

Speaker1: [00:39:56] Como media naranja.

Speaker2: [00:39:59] Mi inspiración, como mi inspiración es, o sea, me admiro, la admiro realmente como profesional y era ella era o es. Es porque está viva, pero ya no está en la práctica. Era una maestra que todos sus alumnos la miraban, la respetaban, la querían. Todavía, todavía la mencionan. Aquella fulana no está en las aulas. Que sí me gustaría que le diera clase a mi hijo. Todavía la mencionan y ella está aprisionaba. Y idealmente, si ella jugó un papel fundamental para yo hacer mi selección en estudiar educación inicial, estudiar en la primera infancia.

Speaker1: [00:40:43] Muy bien. Además, estoy checando para ver si me faltó algo. Yo creo que no. Yo creo que has tocado todos los puntos que yo sé que quería sacar de ti. Si hay algo más que crees que yo debería de saber sobre las influencias en todo, en tu decisión de volverte a ser líder o el impacto que estás teniendo, algo más que yo debería de saber si. Si yo voy a escribir un artículo sobre cómo como van creciendo y desarrollándose los docentes hermos las experiencias

más importantes que deberían de tener y también el impacto que pueden tener en el sistema educacional. Qué más debería de saber que no me has dicho?

Speaker2: [00:41:35] Bueno, que seguimos preparándonos. Seguimos compartiendo, nos seguimos en contacto con las demás colegas e interactuando a través de la mejora de como lo podemos hacer, como tú lo haz, como yo lo hago. Compartir nuestras, nuestras experiencias con los demás para que pueda trascender muy bien.

Speaker1: [00:42:01] Y eso es algo que aprendiste en la universidad? Tuvo algún impacto en la universidad, en tu liderazgo dirías o no tanto? Me refiero a tu preparación formal,

Speaker2: [00:42:12] No a refieras a la formalidad

Speaker1: [00:42:18] Como tu formación en la universidad, para tu certificado, para poder enseñar o lo que sea.

Speaker2: [00:42:26] Sí, sí, sí, porque realmente yo soy egresada, realmente yo estudié en dos universidades, pero a la que la que se lleva como el mérito woww es la Autónoma de [redacted]. Ahí fue que yo hice mi licenciatura en Educación Inicial. Y sí, sí, realmente fue. Fue impactante, porque así cuando tú tienes una institución exigente y te pide que tú ve más de lo que tú puedes dar, entonces te informa con buenos, con buenas raíces

Speaker1: [00:43:01] Y entrega esas raíces que forman. Crees que crees que están tratando de motivar el cambio a través de los docentes? Sí, es que me entiendes. Es que yo he visto y algunas veces recibimos críticas en algunas de las instituciones de formación, de que forman los docentes a ser seguidores de reglas, a seguir conformándose con lo que dice el gobierno, por ejemplo, en vez de pensar por sí mismo. Entonces me pregunto cómo fue tu experiencia en esa época?

Speaker2: [00:43:32] En ese entonces cuento, visto la muestra un botón. En ese entonces yo siempre he tenido mi identidad, firmo e idealmente quien yo soy. Porque a veces no siempre la institución no siempre te forma como profesional. No siempre tienes que tener tu identidad bien arraigada. Y yo recuerdo como ahora, que muchas personas comentaban de mi persona que yo era como aislada, como que no me gustaba compartir porque porque yo sí tenía una hora libre, yo me iba a la biblioteca, porque en ese tiempo yo te estoy hablando a ti del dos mil. Entonces yo lo que hacía era que no tenía lo suficiente en libro y ya en ese entonces Pappi no me lo compraba y yo hacía una hora libre de espacio que tenía en vez de yo vine a conversar con otros a una cafetería. Yo me iba a la a la biblioteca a leer y no importara que si tuviera tarea o no tuviera, yo seleccionaba una lectura y me iba a leer. Entonces en ese tiempo me veía como una persona que no interactuaba y es una cosa y yo considero que eso me formó, me formó o profesional. Y realmente si la personas no tienen identidad propia puede declinar y no siempre, no siempre la institución va a tener todo a sus espaldas. En la formación docente o de la formación profesional.

Speaker1: [00:45:09] Okay, muy bien. Bueno, pues muchísimas gracias por compartir el método de tu historia. Todo todos muy interesante, pues me emociona. Pues lo que sea el futuro para ti. Am Ok, bueno, pues voy a dejar de grabar.

Appendix J: Vanessa Interview Transcript

Speaker1: [00:00:03] Ok, muy bien. Ok, bueno, pues en primer lugar, muchísimas gracias por su tiempo. Creo que existe una entrevista, no sé si fue conmigo o si fue con Pilar, hace como más de un año y medio. Sobre tu liderazgo personal, te acuerdas o no? Fotis. Se cortó.

Speaker2: [00:00:34] Cochon a? Rebeca.

Speaker1: [00:00:39] Me escuchas o no? Nací ahí. Ahí estás.

Speaker2: [00:00:57] Sí, fui a ver qué estaba pasando con el internet de acá de la casa.

Speaker1: [00:01:01] Ok. Ok, bien, si tenemos muchos problemas siempre, siempre podemos hacer el audio por WhatsApp. Igual mi computadora no puede ir. Muy bien. Bueno, pues yo te estaba preguntando hace como más de un año y medio. Creo que fue Pilar que te entrevistó.

Speaker2: [00:01:22] No fui yo nacido, fue la enfa y la pena.

Speaker1: [00:01:27] Ok, pues en esta entrevista yo quiero expandir un poco más de lo que estamos hablando, porque lo que a mí me ahora ahora me está interesando mucho. Es como el desarrollo sobre la carrera de un docente, no en su liderazgo personal. Ah, pero antes de empezar a básicamente lo que va a pasar es que voy a tener varias preguntas. Puedes responder de la manera que quieras. No hay respuestas correctas o incorrectas, nada más. Son para provocar que me cuentes sobre tu historia. Y también algo más que quiero poner como enfoque es que a mí me interesa tu trabajo como ah, como docente, como ah, como líder, como docente, específicamente en las temáticas de STAB. Entonces, obviamente los docentes puedan ser líderes de muchas maneras y tal vez está un poco vinculado todo eso, pero me interesa específicamente las veces y las ocasiones que realmente has apoyado a tus colegas o a la profesión docente en la enseñanza de ésta. Claro, ya se está viendo perfecto. Entonces yo voy a bajar a mis preguntas a mejor. Por qué no me dices un poquito primero sobre cuánto tiempo llevas enseñando y también cuánto tiempo llevas encendiéndose STEM específicamente como un punto de énfasis.

Speaker2: [00:02:55] Mira, yo estoy en el nivel inicial, tengo aproximadamente 23 años de LABORES y Esteban, en realidad propiamente dicho, como tomando conciencia de lo que necesiten, la educación esté del 1019. Desde esa fecha es lo que está este inicio exacto.

Speaker1: [00:03:19] Y me pregunto si te acuerdas. Qué pasó en 2018 2019? No dijiste que 2019 2017?

Speaker2: [00:03:31] Perdón, este es de Vega. Esta la la red lenta que cuál era la pregunta

Speaker1: [00:03:38] Amper, que si dijiste que empezaste a enseñar STEM propiamente en 2017 o bien vendarle

Speaker2: [00:03:45] Destaparon. No te voy a pedir escuchado bien porque

Speaker1: [00:03:52] Apaguemos el video. Apaga el video.

Speaker2: [00:03:55] Ya, ya, ya, ya.

Speaker1: [00:03:59] Listo, ya entendemos con eso, si esto no funciona, entonces te llamo por WhatsApp, está bien,

Speaker2: [00:04:05] Ya está bien.

Speaker1: [00:04:07] Ok. Mi pregunta era. Dijiste que en 2017, ojue en 2019, que empezaste a enseñar allá?

Speaker2: [00:04:15] Yo empecé a enseñar STEM en el 2019 a partir de mi ingreso a la Arrietty de la OEA. Ok, sí, perfecto.

Speaker1: [00:04:25] Y me pregunto, pues entonces me imagino que fue desde ese momento que que empezaste tu carrera como líder docente. A mí me pregunto exactamente cómo pasó eso, cómo te seleccionaron y por qué.

Speaker2: [00:04:41] Bueno, mira, yo en el 2017 gané un concurso de que convoca el Ministerio de Educación, convoca un concurso nacional de buenas prácticas. Entonces yo me presenté al concurso con un proyecto que se llama De. La matemática o el arte, el arte, una forma creativa de aprender matemática. Así se llamó la idea de la propuesta, en donde los niños aprendían matemática a través del arte, por ejemplo, de pinturas de de Paul Klee, donde ellos iban observando las líneas, las formas, porque él tiene una una propuesta, es un arte, es abstracto, no presenta formas geométricas, líneas abiertas, líneas cerradas, sino muchas obras plásticas que son muy interesantes para los niños. Y les despierta el interés este de observar, de apreciar el arte, pero también yo lo aproveché y aprender matemáticas y veámoslas las las pinturas e íbamos identificando con ellos las formas geométricas, no la del cuadrado, los triángulos y eso. Ellos iban reconociéndolo. También lo relacionaban con el material concreto que les rodeaba en el aula, en el contexto donde se desenvolvía y a través de estas experiencias los niños aprendían matemática de verdad de una forma muy, muy creativa y también se divertían mucho. No, porque a veces lamata en las matemáticas. Bueno, acá en [país] el aprendizaje a veces es demandante para los niños. Todavía los padres de familia no entienden que las matemáticas se aprenden jugando. Entonces los dos someten las tareas a los cuadernos de una manera pues que no son motivadoras para ellos, no? Entonces hicimos ese proyecto y ganamos el primer puesto en el Concurso Nacional de Buenas Prácticas, no? Y refiriéndonos a todo lo que era la enseñanza de la matemática enseñanza, aprendizaje de las matemáticas,

Speaker1: [00:06:58] Pues entonces a mí me suena que tal vez sin saberlo, si estabas haciendo Steam, tal vez no tanto con la ciencia, pero seguramente con las matemáticas, no en el sentido de pues de estar haciendo proyectos, cosas renovadores, haciendo conexiones con la vida real desde la perspectiva de STEM como metodología, integración o no estás de acuerdo?

Speaker2: [00:07:23] Claro, el en realidad del Este me parte de este proyecto, la verdad es que de varios años, porque yo estudié una especialización en didáctica de las matemáticas y

comunicación. Entonces nosotros hicimos. Cada uno tenía que hacer una investigación itan y esta investigación esta se le llama investigación acción en el aula, o sea, parte de la reflexión docente de cada maestra de cómo es que está realizando su o cómo son sus prácticas pedagógicas y cuál es el impacto en los niños. No y. Y reflexionamos sobre qué? Que varios aspectos los teníamos como puntos de mejora o puntos críticos. Entonces yo reconocí que era la enseñanza de la matemática. Que yo cuando estoy en cursos con las maestras. Es explico que hago ese proyecto porque de niña yo aprendí las matemáticas de una manera muy, muy tradicional y la verdad es que no entendía, son secundarias. Se me ha hecho siempre bien difícil. Esta área no? Entonces me dediqué a estudiar, a ver enfoques, más que nada a los aspectos teóricos de la didáctica de las matemáticas en el nivel inicial. Ahí es donde parte la esa entusiasmo, esa este reto para mí. Y empiezo a investigar y hacer que todo lo teórico se vuelva práctica. A mi profesor de matemática, a la universidad me decía a este profesor, a usted. Este es muy privilegiado porque usted sabe la teoría y lo va a lo va a ser, es de estrategia didÃctica.

Speaker2: [00:09:10] En cambio me decía yo sé la teoría, pero no tengo los niños y él me apoyó bastante. Entonces hicimos el proyecto de. De matemática no me presenté en ese año, pero dos mil trece, catorce. Me presenté señor concurso, no por mí, sino que la directora me dijo vaya depresores total la presenta un concurso acá en [ciudad] Metropolitana y también en el concurso. No, y porque hicimos con los Dinoes ximos eso, por ejemplo, la noción de seriación en matemática, que es la que menos se trabajan en la primera infancia. Entonces desarrollamos la na ción de seriación, que tiene que ver con la originalidad del número en donde el niño después puede reconocer el número mayor, el número menor o cuál es el número anterior y posterior, no? Y pues lo prepara prácticamente para para el futuro en la educación primaria, pero de una manera de juego, no? Entonces si se un proyecto de dinosaurios donde conseguí dinosaurios de diferentes tamaños y a partir de esa situación de contexto no.Que significativa para el niño de su interés, empezaron, empezamos a trabajar la seriación. Trabajamos con un proyecto muy bonito de investigación. A partir de ahí ya empecé a estudiar un poco más la matemática Piaget no Constans Camy que trabaja mucho en la matemática, en niños pequeños escolares y bueno, de ahí seguí desarrollando, desarrollando todo lo que hace la pensarian la matemática hasta que ese proyecto que presenté en una universidad y ya lo fui como se dice, mejorando porque uno va revisando y dice no, pero esto no lo está.

Speaker2: [00:10:58] Yo lo puedo, se puede hacer así, se puede hacer mejor. Y pasó el tiempo y ya est. En el año que presenté ese concurso este ya salió muy bonito porque también trabajamos la interculturalidad. Por ejemplo, acá nosotros tenemos un instrumento musical que se llama Zampoña. Entonces lo construimos con los chicos. Y por qué? Porque la zampoña tiene los tubos de diferentes tamaños y están seriación. Entonces hicimos este instrumento, tocamos una canción que aprendimos con el instrumento y lo decoraron muy bonito. Entonces estaba el arte, no con la matemática genial. Así empecé a descubrir que que la matemática estaba en todos sitios, en los elementos concretos que nos rodean, como también en estas pinturas de Kandinsky, pol plina, porque son dos pintores que trabajamos en esa, en ese proyecto y nos resultó, pero realidad excellente con los chicos. Se maravillaron, empezaron a admirar lo que son las pinturas, apreciar estas expresiones plásticas y al mismo tiempo trabajamos con el cuerpo. En fin, hoyes. Es muy bonito. Rebecka, pero bueno, vamos continuando con tus preguntas,

Speaker1: [00:12:16] Es honestamente même, pues me interesan mucho los motivos que tiene uno para parar, pues no solamente estudiar la matematicos dentro, enseñarlo y buscar como vías pedagógicas para transmitir ese ese amor. Entonces me interesa mucho eso. Yo si tengo, tengo, pero esto me parece todo esto es experiencia mereces que empezó como en 2012/2013 cierto?

Speaker2: [00:12:45] Y 2011 2012 en el 11 ingreso a la universidad para especializacion que ganas dieron una beca. Entonces este empecé a estudiar la la matemática porque bueno, no nos llamaron, nos dijeron que nosotros los maestros teníamos que tener la reflexión docente permanente, no? Entonces que teníamos que ser muy muy objetivas con nuestra forma de enseñar y en donde de repente estaba, como te decía hace un rato, el punto crítico, el punto más débil donde nosotros necesitábamos este, reforzar nosotras mismas, retroalimentar lo que habíamos aprendido. Entonces, como un reto, porque en realidad ella me asesora, me decía puedes hacer cosas de comunicación, porque comunicación era oes, era mi fuerte, no sé, yo manejaba lo que es este, lo que es producción de textos, en fin, i i pero la profesora, los profesores de la universidad no siempre se siente sobre esto, es que tienen que trabajar lo que no, no lo están haciendo bien. Entonces ya trabajé matemática, elegí eso, realidad que sí me costó mucho trabajo amanecidas casi todas las semanas me mancillan a los viernes o jueves viernes porque yo los sábados tenía mis clases, pero en realidad fue fue muy interesante y eso me sirvió mucho para mi crecimiento profesional también como persona. Y esa vez seleccionaron de todo el programa Especialización, un proyecto para ser expuesto al ministerio, al ministro que iba estaba invitado para la clausura y hicieron como. Vino en una presentación de proyectos y ahí fue que seleccionaron el mío para la presentación de la clausura.

Speaker1: [00:14:24] Entonces tengo varios premios. Antes de este premio nacional que recibiste en 2017, ya estabas recibiendo reconocimientos hasta durante todo tu especialización, cierto? Sí, lo tengo.

Speaker2: [00:14:38] Bien, así es Zizi. Y este si ese concurso que me presenté era un concurso a nivel inicial, primaria y secundaria. Y el ganador era de los tres niveles, no? Y bueno, y nosotros llevamos este incluso encima se Rebeka un xilófono diabo que yo lo llamé aqua fono que los niños iban se llenan del volumen de agua en diferentes cantidades para la seriación, no? Y tocamos. Ellos descubrieron que tenían. O sea, me metí en diferentes sonidos y que podíamos cantar canciones con ese instrumento y esas explorábamos, desencadenÃ

Speaker1: [00:15:17] Además de matemáticas y arte. Eso, eso. A mí me suena como la física,

Speaker2: [00:15:23] La cual a mí me encanta, ya ve, claro. Y a ver si, por ejemplo, ustedes que se manejan más estos temas, porque la verdad yo te confieso que que siempre era todo lo que es ciencias, me resultaba muy muy difícil. Van al colegio porque me ponían el libro, tenía que repetir la fórmula. Entonces como que esa parte se bloqueó en mí. Entonces creo que eso también me motivó mucho a estudiar para que nuestros niños, para que las niñas no tuvieran esa, como te digo, esa necesidad de aprender, de esa necesidad de aprendizaje que a mí nunca sé, se llegaron a desarrollar. Pues no, entonces me motivó mucho. Y claro, por ejemplo, tú has descubierto la física, yo no entiendo mucho trato a mi hijo le pregunto y todo porque a y me explica también no, pero fíjate que si trabajamos empíricamente eso claro, yo le iba, yo me iba por el lado de la seriación, era la noción que yo estaba investigando. Pero si yo, yo, yo ahora si

soy plenamente convencida de que la ciencia, la matemática, en fin, el sexo es algo integral, set integra y sobre todo que como es de mucha manipulación y mucho de mucha exploración del niño. Entonces les les causa mucho, mucho interés por aprender. No les despierta conflictos cognitivos. Pero aquellos que a los niños los llama mucho a vencerlos, no? Entonces bueno, yo te digo que en realidad yo aprendo con los niños, a ellos me enseña muchas cosas, no sólo yo les digo a ellos por chico si yo le digo chico, pero estamos aprendiendo todosâ€, porque yo les digo chicos que yo tampoco sé mucho, siempre converso con los niños así ellos se ríen. Pues no, no crean que yo sé todo, si no que todos estamos aprendiendo, sabemos y así ese concurso y yo también.

Speaker1: [00:17:18] Si, fantástico no? Pues es una historia muy bonita y entonces yo veo que ya se está haciendo mucho el STEM desde hace mucho, honestamente

Speaker2: [00:17:27] Y en serio.

Speaker1: [00:17:28] Pues yo tengo una pregunta, entonces en qué momento sientes que empezó tu liderazgo profesional en en STEM o en tu caso en matemáticas? Cuando yo digo STEM, honestamente, para mí no tiene que ser necesariamente integrado a esta consciencia con tecnología. Puede ser como lo que tú estás diciendo. Yo contaría eso como STEM, lo que estabas haciendo con ese enfoque en matemáticas y artes. Pero mi pregunta es cuando sientes que tomaste el primer paso hacia el liderazgo profesional, y lo que quiero preguntar con eso es ese primer paso a impactar a otros docentes y no simplemente pensar en todo, en tu propia, en tu propio grupo ahora o hasta en tu propia escuela, sino pensar un poquito más allá que puedo impactar a los demás. Cuando empezó eso, cómo pasó? Cómo te dicen ya pasó?

Speaker2: [00:18:20] Dime. Mira, en el 2000, en el 2009, o sea, te voy a hacer, te voy a remontar, me hubiera montaГa. Cómo empezó? Bueno, siempre te diré desde que, desde que inicié mi carrera, desde muy chiquilla, cuando entré a mi primer colegio, mi prima en la escuela, el director me decía Profesora, se trae cosas lindas acá, porque todo lo que mi profesor me enseñó en realidad yo Rebecca tuvo un maestro maravilloso en la universidad, que era constructivista desde antes que aparezca eso

Speaker1: [00:18:55] Quieres decir con tu primer título? Esto fue antes de que se

Speaker2: [00:18:58] Acostó conmigo en el pregrado, como se dice acá. Entonces este profesor había hecho una especialización en en Alemania. Este sobre el constructivismo lo habían mandado a Kade, pero allá estuvo. Creo que un año o dos años. Entonces él enseñaba en la universidad donde yo obtuve mi título de maestra de [redacted]. Entonces él nos nos hizo oler a pellet, nos nos mandó a que investiguemos, a que conozcamos otras realidades, así muy de privadas. Acá en [ciudad] este hay sitios, este Rebecka muy pobre es donde la gente vive en los cerros, con este gas no tienen escaleras para subir realidades. Muy, muy triste. Entonces él nos nos gusta. A mí me encantó el profesor, la verdad, porque nos hablaba de cosas tan interesantes y nos hacía leer demasiado. A partir de ello, yo cuando salgo de la universidad y ingreso a trabajar en con niños de primaria, porque yo he trabajado con niños de primaria varios años y el este y yo llevo contó todo lo que había aprendido y aplicarlo con los niños y en mi director me decía que bonito y rÃditos, que bonito trabajo haces con los chicos y ahí como que empezó este Rebeka,

como que siempre estaba como que me tomaban en cuenta en cosas que hacían este en el colegio no paras incluso en concursos de que habían para para los niños este mis niños iban a los concursos y ganaban los concursos no? En primaria se trabaja esa cosa, pero de allí no paso a nivel inicial que es mi especialidad a.

Speaker2: [00:20:53] Y en el 2009 ya entrenan en una capacitación. Era un programa de formación en la Universidad [redacted], acá en [país]. Entonces tuve la suerte también de que fuese a ese programa que duró más o menos ocho meses. Y la profesora la a nuestros, a los jardines, a, monitoreamos a nosotros para ver cómo estábamos trabajando con los niños. A partir de esa observación que hace la profesora Delia no, ella me y me dice Milagritos, no te gustaría trabajar en un programa de capacitación igual al que tú has seguido para la universidad anión? Y yo le digo uy, pero yo voy a ir ahí, sí, me dijo. Entonces sí, en el 2010 fui a ese programa y y me van a hacer formación docente con la profesora, no desde ahí. Rebeca Es un mundo muy bonito porque compartes con maestras de todos los niveles este aprendizaje, porque así como los niños tienen sus formas de aprender y sucesi y los también los maestros no todas manejan desde aspectos teóricos.

Speaker2: [00:22:08] Es una diversidad completa de de profesoras y me encantó trabajar con ellas. Ellas también se encariñarme mucho conmigo. En realidad que cuando nos despedimos nos despedimos con mucha tristeza. Ya tenía 15 maestras a mi cargo en la cual yo las visitaba a sus a sus colegios y para mi suerte eran en sitios así deprivados. A mí me encanta trabajar en sitios donde hay muchas, muchas necesidades, no? Y y bueno, ahí, ahí empezó todo y después ya cuando regresan mi colegio a trabajar, yo ya en casa le llama mujer, que es la Unidad de Gestión Educativa. Entonces hubo una capacitación también para todas las maestras de esta UGEL y yo fui yo les dije empecé a. Hacer formación docente y no de una manera voluntaria, con voluntariado, siempre me ha gustado. Ahí empieza toda esta. Si se podría llamar liderazgo, no, porque siempre hay. A las personas les encantaba. Cuando yo les llevaba en las manos los cursos de formación, les llevaba si las prácticas que hacíamos en el aula y me decían qué lindo Milagritos no nos está mostrando lo que haces en tu co, en tu salón. Entonces aplicaba no me encantaba cuando yo iba a sus salones a verlas y estaban haciendo cosas así más o menos parece.

Speaker1: [00:23:36] No, no, claro, pues que lindo. Entonces sigue. Bueno, bueno, tengo otras preguntas, pero voy ir mejor en orden. Me. Me gustaría que me dijeras un poquito más sobre esa envites, en esa invitación que recibiste de la profesora de la Universidad [redacted]. Y me pregunto por qué le dijiste que si sentías que estabas lista? Tenías miedo o estabas muy lista para para apoyar. Por qué dijiste que

Speaker2: [00:24:10] Yo dije que primero? Yo dije que. O sea, dije que no, pero no dije ay de él y le digo pero este proy. Mira, yo yo este no hecho. Bueno, ya cuando estaba chiquita una vez iba hacía poquito compartía con los profesores, me invitaron a un a una ONG que se llamaba en esa época de apuros po y ellos hacían salían con las profesoras, así también estos lugares, así de privados. Entonces iba a hacer algunas. En esa época se le llamaba charlas, entonces iba a hacer algunas charlas, así iban hacía como mes pininos, pero ya como este, pero como la como Delia me invitó para este programa, yo es yo dije Delia, pero este yo no he recibido ningún curso de monitoreo porque este había que monitorear a las profesoras, manejar lo que es este, después la reflexión, no hacerle el acompañamiento, en fin. Y me dice Milagritos, pero mira, yo he

observado en tu salón qué bonito trabajas, me dice. Y yo, yo quiero que tú trabajes con nosotros porque las profesoras van a van a regresarse mucho y yo le dije pero ay, para esto mira, yo estaba como vinieron las alumnas de San Marcos para hacer, es que yo trabajé en un colegio donde la directora también, ya cuando me vine a trabajar por mí, por mi casa, no, porque yo he trabajado tiempo en un sitio muy lejano, han viajado casi dos horas todos los días, no? Bien, bien lejano, pero me encantó allí porque en realidad ahí tú te sensibilizan no sólo con los niños que a veces no tienen un cuaderno. En fin, eso es otra historia que el cómo se llama que tiene un yo para contar. Yo no sé, soy un poco habladora, pero bueno, no es que me estás haciendo recordar todo eso,

Speaker1: [00:26:18] Pero

Speaker2: [00:26:19] Si me estás haciendo recordar esas de esas épocas tan lindo donde trabajaba con mi niños de esos lugares porque tenía años, trabajaba ahí y la verdad que cuando me vine a [ciudad], a la ciudad, me dio mucha pena porque los dejaban los papás también se entendieron. Bueno, entonces le acepté y le dije bueno, pero me dice no te preocupes que nosotros te vamos a te vamos a ayudar. Milagritos Por qué te sientes inseguro así si vas a poder? Además, tú cuando en la universidad, porque también presentamos nuestros trabajos, tú lo haces muy bien, así que le acepté la verdad este y así fue como un reto difícil. Que bonito y total que me fue muy bien. Mírala. La Univer sidad dio unos 1 sese cartas de felicitación a la a las profesoras, a las capas, a la formadoras que destacaban, destacaron en el programa y a mí me dieron esa carta de felicitación. Un abrazo. Fue muy emocionante porque ellos habían hecho una encuesta las a las profesoras no para que en esa precisión sobrelas las capacitadora sino y bueno, pues sabían pues les había salido este gustado mucho. Estaban muy contentas con con la capacitación que yo les daba porque yo dictaba las clases los días domingos todo el día desde las 8 de la mañana hasta las 6 de la tarde. Y los días este de semana iba a IVAM, a los colegios, pues ahí sí me iba a los cerros y todo lo que yo te con lo que te comentaba. Soy de tenido suerte porque siempre me ha tocado esos sitios y a mí me encanta trabajar por él entonces. Entonces me fue muy bien allí y ya de ahí, como te digo, regresé a mi, regresé a mi cole, a mi jardín y al siguiente año como ya había Esthela a las de estos eventos, entonces me invitaron y yo hice este así como un voluntariado. Hice las capacitaciones a las profesoras y al siguiente año. Dime, dime Rebeca.

Speaker1: [00:28:29] No, pues solamente quería. Bueno, hoy tengo dos preguntas. Pues una pregunta es pues yo sé que obviamente el trabajo de maestra de primera infancia es como muy muy integrada, que puede ser que enseñen por temáticas, etc.. Me pregunto si en este liderazgo inicial que estabas haciendo, si es que realmente tenía que ver algo sobre ese tema específicamente, o si lo veías como algo más general en esos tiempos y reflexionando ahora como que qué opinas de lo que es? Lo que supongo que me pregunto es que no sé si es que específicamente tenía algo que ver en esas capacitaciones que dabas o en tu liderazgo si lo notabas en ese entonces o si lo notas ahora, o si no realmente era algo específico. No lo tenías en mente como algo concreto. No sé si me explico bien.

Speaker2: [00:29:28] Una de los materiales estaba baja, no? Bueno, en esa época era de la la capacitación que nosotros que yo daba, este era bien integral. Si enseñamos matemática y enseñamos comunicación porque eran las dos áreas que se estaba realizando en la capacitación

en esta era, o sea, eran las dos áreas. Cuyas el propósito del programa era en desarrollar a las maestras porque no se estaba trabajando, porque se trabajaba mucho, lo que es la la que hay un área que se llama personal social, como que no había aprendizajes deseados sobre el área de matemática y de comunicación. Entonces el dictamos esos dos cursos, no? Pero no, no creo que era más general, o sea, específicamente todavía como que no podría decir que estábamos trabajando STEM.

Speaker1: [00:30:27] Entiendo. Pues entonces mi segunda pregunta sería pues en qué momento sientes que tomaste el primer paso hacia el liderazgo profesional, el STEM o en matemáticas en la matemática?

Speaker2: [00:30:41] En el 2000 el dos mil once empezó todo, toda la o toda, como se dice el despegue en matemáticas siempre digan matemática a las mil once porque está esta especialización que yo estaba haciendo, duraron dos años. Bien, entonces once y doce. Yo como que me involucré mucho, estudio bastante, leí varios autores, no principalmente como digo. Y ah, ah, ah, incluso este libro que se llama Iten interpretando a Pellet este con un poco así para mí un poco denso para Silas no lo revisé bastante para poder hacer mis mis mis estrategias didácticas sobre matemáticas, no el atinados. Entonces, bueno, ahí empezó todo liderazgo. En el 2011 aminoÃcidos estuvo en la especialización, gané su concurso a nivel de los tres, o sea los tres niveles de educación básica regular acá. Y de ahí empezó todo, porque al siguiente año la directora de Del Rogel de acá de donde yo estoy, eh. Bueno, nosotros íbamos a trabajar, había un programa nuevo. Que se llamó Rutas del aprendizaje, las rutas de aprendizaje justamente trabajaban, no es este el área de comunicación y nuevamente matemática. Pero ella ya estaba más empoderada. Entonces trabajé. O sea, fui a trabajar allá. Fui al Eiger para dar capacitación docente. Por dos años he trabajaba allí, no prácticamente me sacaron del aula para para trabajar en esta en este programa. Y ahí te digo de si la matemática era muy fuerte. Ya ahí empecé o saltar a darle con fuerza matemática. Y ha sido hasta el momento. Hasta ahora siempre sale alguna directora. Me llama para para ayudarlos. Yo voy y bueno, ahorita no, pero siempre iba los colegios y les daba. Y si a la capacitación por las profesoras siempre van.

Speaker1: [00:32:54] Y cuando fue la primera vez? Y dime, cuándo fue la primera vez que diste una capacitación a tus colegas sobre matemáticas o tema específicamente? Te acuerdas de ese momento?

Speaker2: [00:33:11] A mi, en mi colegio o a

Speaker1: [00:33:15] Mi puede ir, puede ser en tu colegio, pero si hay algo, algo más que existe, dímelo también.

Speaker2: [00:33:21] Si, si, en el hoja, en la hoja del este, el año que hiciera hicieron una que se llama Redes desde que se juntan varios colegios para hacer este capacitacion. Entonces la coordinadora de esta de esta red me llamó y me dijo Milagritos, tú podrías apoyarnos en el taller que vamos a dar? Y le dije que sí. Entonces ahí di un taller de matemática, también comunicación, di un taller de matemática con las profesoras donde jugábamos. En fin, lo que es la propuesta de cómo se enseñan matemáticas en inicial. Eso fue con los niños en el 2002 y en el 2013 ya empecé a dar matemáticas para profesoras, ya probadme a nivel de [ciudad]

Metropolitana, o sea, ya era más macro, no? Desde esa época yo ya empecé a trabajar hacia fuera, como se dicen otras maestras o directoras como Trecet, las especialistas también.

Speaker1: [00:34:17] Y todo este tiempo también estabas con tu propia ola, no?

Speaker2: [00:34:21] Sí, ya mira, cuando yo este, cuando por ejemplo me llaman a mí y me dice Milagritos porque un especialista de wacho que es un lugar lejano de la zona norte acá, pero te sacaron dos quería. Me sacaron dos años de ayer, regresó de mi Saló y cuando me requiere la directora me da permiso para salir ponte un día, dos días y yo voy al colegio y hago la capacitación y de regreso a mi salón. La verdad, Rebeca, te digo que yo estuve trabajando en esto de lo que es una formación docente, pero a mí me encanta el salón. Me encanta estar con los niños porque no sé, los niños te dan muchas energías, no? Entonces yo he optado por estar en mi aula, pero también hacer formación docente. Entonces que tengas perdón si te escucho.

Speaker1: [00:35:18] Pues mi pregunta. Me interesa saber un poquito más sobre tu motivo para responder a todas esas invitaciones que estás recibiendo. No sé si si esto impacta tu sueldo en el sentido de que si es suplementar o si es algo voluntario y a veces uno tiene que ver con el motivo. Como sea, pero si deseas estar en el y no estoy tan como cómo lo digo, simplemente me interesa saber cuál es tu motivo para liderar a otros docentes y no simplemente mantenerte en tu aula haciendo buen trabajo, mejorando lo que haces. Bueno. Pero, pero, pero por qué no simplemente mantenerte en tu escuela? Porque? Porque ir afuera?

Speaker2: [00:36:07] Porque mira, Rebeca, yo yo pienso que esa carrera de de ser maestra es no, eso es un servicio social que haces, es un modo de vida ya para en mi caso. Entonces yo creo que los maestros tenemos que estar siempre prestando un apoyo de un servicio a los demás, no? Y si son en beneficio de los niños y para otras maestras que creo que requieren, que lo requieren, yo voy gustosa y dentro de esta desha. De esa forma de ver yo la educación, yo tenía esa oportunidad, que si esos dos años que me llamaron, que salí de mi aulas, a mi me, me, me remunerada o no. No recibió bien, o sea, en vez de en vez de ganar mi sueldo en el aula, yo ganaba sueldo como capacitadora, pero ganaba el doble, ganaba poco más, porque a nosotros los profesores nos pagan poco, no nos pagan mucho. Mira, no llegamos de clonadas 800 dólares. Antes no llegábamos. Espérate, te digo, antes no llegábamos ni a los doscientos dólares a. En esa época que yo te hablo, así ganamos. Entonces, cuando me llaman el primer trabajo, así que tuve el que hoy se dice que gané más, fue cuando me llamaron para trabajar en rutas del aprendizaje.

Speaker2: [00:37:38] Yo te confieso este Rebeka, que yo no sabía cuánto me iban a pagar. Simplemente yo fui porque quería trabajar, porque me encanta. Me gusta esa caja con profesor, conocer otros niños, porque también tenía la oportunidad que iba a los pueblos, a los colegios y cuando yo veía que tenía que ir a ayudar un poco más a la maestra, ayudaba a las clases, a los niños y también a las desmontaba, porque es así, mejor, porque acá vienen a veces sí y solamente se sientan y nos observan, pero todos nos ayudan en las clases. Y después cuando nos dice a ver Esteban a su recibo por honorarios y yo ni tenía recibo por honorarios porque no, no pasaba nada, no trabajaba sin nota. Y total, se cambio Lucio por honorarios y todo. Y cuando me dijeron firma por esta cantidad, yo me quedé asombrado. Rebeca Kappas entre en serio Rebeca, nunca pensé que me iban a pagar tanto y tanto. Para mí era un montón. Te confieso que lo las las otras

es profesora formadoras que solamente se dedican a eso. No era nada que yo veía que ellas tenía. Tenían este solvencia, carro y todo. No, yo no pues porque yo yo era la profesora.

Speaker1: [00:38:53] Pues de una pregunta y esto es tal vez una pregunta un poquito más profesional, más como sobre sobre. Ah, no sé, no sé. Mi pregunta es pues de dónde viene en ti ese? No quiero decir obligación, pero ese amor por el servicio social, ese amor por querer decir, responder que sí a estas invitaciones a capacitar a otros docentes, de dónde viene eso?

Speaker2: [00:39:20] Yo creo que viene desde mi niñez y es porque mi mamá fue una persona muy no sé. Yo le di cuenta de mis hijos, este mira. Venían visitas, familias, no sé. Siempre en mi casa estaba llena de personas y no tienen, no, pero siempre venían personas y mi mamá decía dónde comemos? Nos comemos tres. Y siempre había era de invitar el almuerzo y lonche cuando yo tenía una amiguita que del colegio, que a mí me gusta mucho el folclor. Entonces teníamos que bailar y mi mamá me hizo a mi traje todo porque mi mamá Cocó se cocían y ella me decía Por qué estás triste? Es mi amiga. No, no puede bailar porque su mamá este no lo ve, no, no le va a hacer la ropa y mi mamá le hizo la ropa y todo. Bueno, yo te contaré mi batallas entonces yo creo que de ahí se despierta esa sensibilidad hacia las personas y ya cuando entró en la universidad y me encuentro con este profesor que te comento como que ya este y el ya pues nada, daba el mensaje de cómo ser buenos maestros no? Entonces a partir de lo que nos mandaba a estos sitios a a investigar, a conocer. Entonces se despertó nuestra sensibilidad docente. O sea, yo pienso que el maestro tiene que ser sensible siempre y así este. Yo veo que cuando cuando me llaman así, yo sé que esa directora no me va a poder este sello, no se que me da cobrar esta renta, la verdad. Entonces el año pasado me llamó justo la pandemia una directora que yo no la conozco, sino que ya se había enterado de mí y le habían ubicado a mi directora y de mucho.

Speaker2: [00:41:14] Tú crees que Milagritos pueda darnos una capacitación que ella dijo pero ya está ocupada, tiene bastante trabajo, está estudiando, pero bueno, te doy me dio el teléfono y me me. Me contactó la directora, entonces me pidió que por favor le diera y le dije ya le di una capacitación, estudié basta de no está revisar y total que después me dice y milagritos, dame tu cuenta de banco. Entonces yo le demoraba, pues me daba vergüenza y después le digo sabes qué? Le digo no te preocupes, le digo estamos en pandemia y de ninguna manera este yo voy a poder, te voy a dar, este voy a cobrar. No, eso es imposible, dijo Milagritos. No puedes, pero no, le dije no, no, y fíjate que ni la conozco. Y de pronto para Julio, pues por estas fechas este tocan la puerta y me me mandaron una. Ella me mandó unos brownies muy ricos ya para ser como ese. Gracias a ti, maestra, y eso me dio mucha emoción. La verdad es que esas cosas no tienen precio. Yo les decía a mis hijos mira tú, uno siempre tiene que dar y tú no, no, no veas si eso te van a remunerar a uno. Mira esto valen más de mi mesa. Directora seguramente gastó de su plata, no sé porque es muy difícil que salga de los fondos de Ministero ni nada bueno, pero mira, eso te enriquece un montón.

Speaker2: [00:42:42] Entonces yo yo siempre pienso así es en función de eso. Miravalles Estoy aquí trabajando, trabajo acá también. Es fuerte y me ha llamado con otros maestros que ya me han conocido. Pues de años no? Y me dice mi daditos no puedes ayudar, que estás haciendo todo con ella un ratito. Entonces yo agarro el arreglo o algo y les mando y me dice gracias Binary, siempre trato de compartir Rebeka lo no que uno aprende no? Y eso es lo que me motiva más. Y por ahí te digo que si Esther me a veces si me llaman de ministero algunas veces, pero también

acá te digo que es como un círculo que se tiene a [ciudad]. Acá se trabaja mucho por Anfi, pero a este me han llamado. He viajado a veces a [ciudad], he tenido la suerte de viajar al [ciudad], a diversos sitios del [país] y ahí también doy este las capacitaciones y ahí se me paga y pido mi permiso en el colegio, mi licencia por dos, tres días, cuatro días y este me voy y ahí me pago. Entonces yo les digo a los chicos miren bien. Por otro lado también me todo lo que tú das aparece por otro lado. Te digo mi mamá siempre decía tú tienes que dar sin recibir nada, soy sin esperar nada, porque después por otro lado te van a retribuir pues y así, así este año me bitual, no?

Speaker1: [00:44:11] Muchísimas gracias por compartir. Pues ahora tengo otras preguntas, tal vez para alcanzar un poco más hacia de. Ahora que me has dicho un poco más sobre tu pasado y yo sé que no me lo has dicho todavía, porque yo sé que hay mucho que que está ahí por descubrir. Pero me pregunto si fuera a ser resumir a tus logros en tu liderazgo docente, específicamente en amor o en matemáticas, no a las temáticas relacionadas que sientes que realmente has logrado para impactar a otros docentes. Hasta el momento.

Speaker2: [00:44:53] Mira. Lo que no. Lo que yo puedo decir que he logrado es cuando yo regreso al colegio, donde donde trabajo, trabajo con las docentes en esos espacios de formación docente y encuentro lo que yo les he enseñado algo en la capacitación. O sea, nosotros generalmente damos, damos el taller acá lo llaman talleres y después vamos a las aulas a ver si se aplica menos. Y cuando dentro de los salones están las profesoras aplicándose, están realizando sus estrategias de acuerdo a lo que a lo que yo les he ido compartiendo, mostrando. Entonces este eso para mí es eso, para mí eso es un logro, es un logro que de repente no es tangible. Desde ese cariño que recibo de las profesoras, no han pasado tantos años y ni me recuerdan siempre y me ponen cosas bonitas. A veces en el bazar me escriben esas algo, después en mi escuela. Básicamente esto, eh? Yo hago capacitación docente todos los años, todos los años se empiezan a nuestro trabajo y yo hago una semana de capacitación docente y en el aula de las aulas de mi institución se ve plasmado lo que lo que vamos compartiendo con ellas, no? Y eso para mí es muy, muy interesante, muy para mí es un logro porque los niños de mi pueblo, o sea, la propuesta pedagógica de mi escuela, es diferente a las otras escuelas. Nosotros respetamos mucho la naturaleza del niño, tenemos una mirada de niño en donde privilegiamos el juego.

Speaker2: [00:46:49] Entonces tenemos tengo, por ejemplo en el proyecto de El Arte, una forma creativa de aprender matemática. Está ya institucionalizado en mi jardín. Está como un proyecto innovador, no? Y actualmente lo de este también ya está institucionalizando porque lo vemos como un proyecto innovador en mi escuela. Entonces el año pasado y estoy trabajando este en como con mis niños primero, pero ahora estamos haciendo en tablas de cinco años para que el próximo año en el que ya vayamos, Dios mediante a la presencialidad podamos aplicarlo en todos los salones de El Jardín, no en edad. Eso sí, eso para mí es este. Ahorita estamos en lo de estén en la institucionalización de esto, estamos en un proceso. El año pasado hemos tenido un taller de inducción con las profesoras de este. Les compartí lo que estábamos haciendo ascéticos en STEM. Ya con esto que hemos estado en el en el curso de de las Viet-Nam promoviendo este yayas, todas han asistido a la mayoría porque habían dos maestras que estaban con COBIT. No pudieron sí y sí, pues es que estábamos. Estamos en ese contexto y ahora estamos aplicando con una compañera. Yo tengo una amiga, una profesora que siempre ella esté y cuando me veía hacer

cosas a mí sola entraba a mi salón. Entonces yo un día le digo a Carmen por qué no trabajamos juntas? A mí no me gusta trabajar sola, le digo no, yo prefiero.

Speaker2: [00:48:26] Además se beneficia más, más, más este más niños, no solamente a mí, sólo a mí, sino también a los niños. Entonces con ella, por ejemplo, estamos estamos trabajando. Este proyecto descendio, le estoy enseñando. Los días viernes nos reunimos. La directora nace de esa facilidad de reunirnos los viernes para hacer todo lo que es la planificación. Entonces nos reunimos las dos y vamos analizando lo que lo que no podemos realizar en la semana con los chicos, intercambiar este. Cuáles han sido sus resultados? Los míos y vamos este. Vamos subiendo un poco más de lo qué más podemos hacer, except entonces para mí es un logro. Y efectivamente, lo que es todo lo que está en la formación docente es que yo puedo compartir con las profesoras, con las directoras. Para mí también es eso, un gran logro de beca, porque las personas siempre me dicen cosas porque me positivas de mí, de mi rol, no de mi desempeño. Bueno, y los concursos que he ganado? Pues no, y sin querer, porque también a la directora me decía Ballas me trataba de usted. Pues vaya señora Milagritos, tiene que ir al concurso hoy le digo, pero porque qué voy a ir? No, no, no tiene que ir. Total, que con el impulso de mi primera directora gané ese concurso y ya después el otro concurso que que gané, pues este año el concurso nacional.

Speaker1: [00:49:53] Am Fantástico. Y en general diría es que este desarrollo de ti como líder fue algo planificado o fue algo que. No, pues no planifica. Reflexiona sobre lo que fluyó.

Speaker2: [00:50:12] Es algo que fluyó solo porque yo me fui, o sea, siempre algo que he hecho lo he tratado de compartir con los profesores. Yo, por ejemplo, cuando llegué a este jardín, o sea en mi jardín de ahora, cada uno trabajaba en su salón a puerta cerrada, y entonces me sentí. No me sentía tan bien porque yo venía en un sitio de provincia, prácticamente no venía del campo y acá era una zona más urbana y en el primer año estaba media. Si esto llega a mi colegio, pero ya después poco a poco este yo dejaba mi salón abierto y y empezó a entrar esta chica Carmen empezó a entrar, pues entraba así poco a poco. Este como que todas empezaron a entrar a mi alumnos, me preguntaba y yo les explicaba chicas miren, vamos a hacer esto. Total que formamos emos realmente rebeca de mí en la institución este profesoras no tenemos ningún tipo de problemas entre nosotras, al contrario, somos buenas amigas, nos hemos hecho inclusive amigas y todos compartimos, trabajamos.

Speaker1: [00:51:27] Eso me suena ideal. Y pues has mencionado a profesores, has mencionado directores, asesores y ahora colegas que te han apoyado. Me pregunto has tenido a personas dentro en tu carrera que han puesto obstáculos frente a ti o que tal vez no les ha gustado esto que estás haciendo como como líder?

Speaker2: [00:51:51] Bueno, sí, siempre hay un no, siempre hay personas que no sé. Hay personas que como ven que tú de alguna manera. Bueno, se podría decir que destacas como que no les gusta. A mí me pasó cuando estaba trabajando en rutas del aprendizaje con una. Sea prácticamente este, me dijeron que me dijeron no te preocupes, que nosotros vamos a traer el material. Y cuando llegó el día no me trajeron el material, yo era la única de las cuatro capacitadores que en esa época de mesa Ángel y no tenía el material. Entonces yo dije y ahora qué hago? Porque ya era el día de la capacitación y llamé a mis amigos de mi colegio, pues no

digo chicas, por favor, me pueden de esto? Y ellas me trajeron los materiales bien lindas, me ayudaron bastante. Entonces, y ahí yo sentí ese tipo, de esas actitudes que a veces te extrañan porque te dicen que la vida te dice ahora es mía, pero después a la hora de la hora como que sí, como que esa ha sido una vez. Mmmm. Bueno, cuando en colegio, en mi jardín estoy hablando hace 26 años atrás. Tan también como que todas me miraban raro. Y la profesora que compartía el aula conmigo, que era el turno de la mañana porque ya estaban aquí. Más tarde me decía pues por qué pones, por qué no? Porque pones así acá es que mira a este se colgaba los trabajos y ponían los trabajos de las niñas en alto.

Speaker2: [00:53:25] Entonces cuando el niño quería ver su trabajo, tenía que prácticamente es como que si yo estoy mirando al techo porque son niños pequeños, entonces yo ponía mis partes, sí, pues entonces yo ponía mis percheros a la altura del niño, o sea, para que el niño pueda colgar o sacar lo berlo, no esté a su altura. Este para él, pues no es una Hanni. Y la profesora me decía y tú porque pones así? Tú tienes que poner igual que acá. Y yo la miraba, nomás le escuchaba y por eso este año no me sentí tan bien. O por ejemplo día preparamos uno y aunque me recuerdo lógicamente, es que los niños baten, entonces se caen y empiezan a dijo que habían dejado el salón, o sea, se ponen zancadillas. Pero después Rebeca, este más ha recibido mucho cariño de la profesora de francés de la directora. Está envidiosa. No, no he sentido mucho eso, la verdad. Como que a veces la gente un poquito como que le despierta cierta cosano que tú ahí ella te está haciendo pusé, pero al menos en mi colegio ya sean sean sabes de que estoy haciendo 14 milagritos? Que él lindo cúidate. No, no, este es este desvelándose mucho porque tú te amaneces ese cariño recibo no

Speaker1: [00:54:43] Se qué bonito. Pues pensando muy hacia el futuro. Ahora me pregunto considerando todo lo que has hecho, a qué quieres llegar respecto a tu impacto en otros docentes? Y específicamente, aunque entiendo que tal vez tienes intereses más, más, más abiertos que simplemente extern, pero qué quieres y que quieres lograr en el futuro?

Speaker2: [00:55:10] Con estem. Mira, con este, uno de mis dos primeros pasos que he hecho he realizado con Juan, este es recabar material para leer. Yo cuando tengo o con leer en las ciencias estoy preparando. He reconocido que nosotros trabajamos, por ejemplo, con los niños elementos tridimensionales, estamos haciendo ingeniería, no? Entonces estoy preparándome para eso y a la par ya estoy con mi propósito. Es que en mi colegio mi jardín sea un si, no el primer Stratten acá en el [país]. Te confieso en donde nos estén Iseo, una escuela, estem y yo veo eso y la directora de esa parte me apoya, o sea, ella quiere, entonces me apoya. Ahora te digo que el apoyo de las demás personas es muy fundamental para que un líder también salga adelante entonces y no está dando ese apoyo. Por ejemplo, yo estoy realizando sesiones diferentes a las que estamos haciendo, que aun aprendo en casa, no para de ver STEM, por ejemplo. Mira el hasta la semana pasada hicimos un proyecto que se llamaba Cocina con sabor a ciencia. Oh, entonces las niñas se han fascinado porque hemos hecho, por ejemplo, pan. Se han hecho a mantequilla. Y eso lo hice el año pasado, sino que ahora lo estamos aplicando en otros salón más, en los salones más y. Y entonces? No tengo esa oportunidad. Ahora está en este segundo que estamos celebrando las Fiestas Patrias. No estamos desaprovechan de Steem porque ya nosotros hemos hecho o hemos construido.

Speaker2: [00:57:04] Cuando yo les digo hoy día vamos a ser ingenieros, no? Entonces vamos a construir un sombrero bonito en un sombrero. Para bailar este gualicho porque son cojones o seas tú. Cuando todo va bien en todo, todo tiene forma, no hay. Hemos trabajado los papás también hemos hecho un trabajo muy bonito. Entonces esa es mi proyecciÃn, es que el próximo año, este, este se apliquen en más salas de de mi institución. Y también me gustaría, no sé, trabajar en una, en una universidad, en una institución donde pueda trabajar con futuros maestros. No para que ellos estén preparados. Yo trabajo siempre con quien siempre tengo practicantes de la universidad y con cosas muy muy bonitas. No me dicen profesora, que cosas tan lindas. Esto no nos enseñan en la universidad. Si desde ellas ese también es otro logro que tengo que me dan mis practicantes. Este están siempre. O sea, se van contentos y me dicen que han aprendido bastante. Y la semana pasada ha sido una cosa que fue el día del maestro. Acá me llamaron así para saludarme, me profesor, profesores, qué está haciendo ahora? Entonces me gustaría trabajar con jóvenes fantástico y trabajar y seguir estudiando lo que se estem. No tengo que. Yo reconozco que me falta eso de la física, de la química y todas esas cosas,

Speaker1: [00:58:45] Pero bueno, me fue muy bien pues. Pues yo creo que pues yo tenía como 25 preguntas, pero yo creo que honestamente has respondido a prácticamente todas. Te pregunte acerca de las raíces de tu liderazgo en general a tus primeros pasos en el liderazgo profesional en Stamm, específicamente las personas y las situaciones que te motivaron o que personas que tal vez te intentaban desmotivar. Me dijiste de tus logros y hacia dónde quieres ser el impacto que quieres tener. Yo creo que hay algo más que me quieres decir sobre. Tu experiencia como docente líder y hay algo que quieres que yo sepa sobre. Pues supongo que lo que estoy. Lo que estoy haciendo con estas entrevistas es que obviamente estoy buscando similitudes. No estoy buscando similitudes entre las historias de docentes de toda la región y es sumamente interesante que si estoy encontrando cosas que son, son similares. Y también estoy viendo grandes diferencias entre este liderazgo educacional y el liderazgo que se encuentra en la literatura como en los negocios, que es una perspectiva muy pues mucho más masculina y algunas veces tiene como motivos muy distintos. No que a diferencia de lo que dices del servicio social y cosas así. Pero me pregunto hay algo más que hay algo más que debo saber?

Speaker2: [01:00:29] Sobre sobre liderazgo, sobre este,

Speaker1: [01:00:31] Sobre, sobre el liderazgo docente y tu experiencia en lo que has aprendido de la vida, de ser líder docente.

Speaker2: [01:00:43] Bueno, qué te podría decir de? Yo creo que también es agotador. Sí, a veces es que no sé, a mí me dicen que yo misma me presiona mucho y a varias personas me han dicho mis amigas no, sobre todo si yo por ejemplo no sabía que eras, que era seguir aprendiendo y que cuando comparto con las profes igual me pongo a estudiar, aunque son temas que son ya conocidos por mí, pero igual sigo revisando, volviendo a leer algo que de repente me gustaría precisar más al otro, al anhelosa, a lo que les digo a las profesoras. Al fin es que todas tenemos que tratar de ser líderes en la escuela, no? Qué más se podría decir del liderazgo docente?

Speaker1: [01:01:45] Pues no tiene que ver algo más, pero creo que ya me has dicho mucho.

Speaker2: [01:01:51] Y yo creo que si lo único que es este, bueno, a seguir adelante, que si es agotador este rabieta, te digo que es muy cansado, eso si, porque tienes tienes praticamente mucha o tienes o tienes carga porque todos están esperando lo que tú te vas a dar, entonces eso te demandará mayor esfuerzo. Cuando estuvimos haciendo el proyecto de matemáticas, el arte de matemática, este tenía que ir a los salones a ver a las profesoras y orientarlos, no? Eso también es un esfuerzo grande. Entonces sí, es, es, pero es satisfactorio. Eso sí que te damos funciones en tu vida como persona, como maestra. Yo creo que siempre es ese anhelo. Es bastante, al menos yo pienso que yo lloro, no lo siento siempre y a veces pienso que me va a faltar tiempo, que debería tener más tiempo para hacerlo, más años en todo caso. Pero bueno, es parte de nada.

Speaker1: [01:03:01] Yo creo que estoy muy de acuerdo contigo, que siempre hay el riesgo de esto, de tirar del liderazgo docente. Es que llega un momento en que tal vez no nos sirve a nosotros de manera individual. Y lo que quiero decir con eso es que hay que recalcar en nuestras baterías, como tú dices, puede ser agotador. Se pueden volver como mártires los docentes, que es todo el tiempo están haciendo lo extrano y o algunas veces podemos creer. Ese es el estereotipo que muchas personas ven como un estereotipo bueno del docente héroe y luego se vuelve algo inaccesible. Es especialmente para los docentes que apenas están empezando y sienten que ni pueden ni pueden con el ahora no y entonces pues hay que tener muchísimo cuidado, no me de los límites no y hay que honrar los esfuerzos. Pero tuvimos una situación aquí en Washington DC, fue increíble donde una de las docentes en aquí durante la pandemia aparentemente tuvo que tener un rol una como se llama un transplante de riñón. Ya solamente tomó un día para su cirugía, el día después, pues seguía en el hospital, pero aún estaba enseñando en línea y la. El distrito público mandó un correo a todos diciendo pues muchas gracias a este docente, pues casi casi dejó de trabajar hasta hace durante su cirugía y su recuperación. Y como que a mí me llega eso y me digo que no merece. Que no debió haber tomado el tiempo para curarse. Y esas expectativas de que el docente no se cuida a sí mismo sí mismo es es un riesgo. No puede ser problemático a un nivel muy extremo, no?

Speaker2: [01:05:05] Ah, sí, sí, sí. Por eso hay que darse más espacios, como el oxigenarse un poco y recargarse. Pero lo bueno es que siempre tienes esa, ese bichito de seguir adelante, no? A veces es agotador, un agotamiento, este que te da una satisfacción también.

Speaker1: [01:05:24] Y eso en este. Yo he visto en todas las personas que he estado en Treves entrevistando así me gusta como lo dijiste, el bichito, el bichito de seguir adelante. Es como una inquietud que yo he estado viendo. Pues voy a dejar de grabar porque creo que he dejado de hablar, de hacerme mis preguntas, pero.

Appendix K: Andrea Interview Transcript

Speaker1: [00:00:00] No voy a. Ya no voy. Bueno, tal vez con excepción de esquilar, sí, si estás de acuerdo, me gustaría apelar, ver esta grabación simplemente porque iba a estar haciendo entrevistas con sus asistentes. Ah, pero me imagino que tus respuestas

Speaker2: [00:00:19] No son de los mismos temas, de los mismos.

Speaker1: [00:00:23] Tranquila, no habla de ello.

Speaker2: [00:00:26] No hay neni más que ver como no me peiné ni nada.

Speaker1: [00:00:30] No te preocupes, no te preocupes, nadie más va a ver videos. Esto voy a destruir. Ok, ok, ok. Pero el es el audio que realmente para mi es importante porque luego voy a transcribir todo con un sofá.

Speaker2: [00:00:47] Ok?

Speaker1: [00:00:48] Muy bien, pues entonces muchas gracias. Básicamente si te acuerdas, hace más de un año, tal vez un año y medio a 12 si fui yo, o tal vez fue Pilar que te hizo la entrevista jajaja. Sobre tu crecimiento como líder específicamente durante la época de pues de acuerdo, experiencia durante el seminario y justo después de eso y todo, tengo preguntas mucho más amplias. Me interesa muchísimo saber sobre tu desarrollo profesional y personal como docente y eso incluye todo el tiempo. Pues antes y fuera de las actividades supuse que así que no te estoy pidiendo que ahora que puedas compartir en cualquier momento una evaluación de tus experiencias, pero no es eso que estamos haciendo. Lo que quiero hacer es realmente entrar en tu historia y entender por qué, cómo te has vuelto a la persona que eres ahora como líder docente y pues por qué se bueno.

Speaker2: [00:01:58] Ok, no? Pues definitivamente hay un cambio, digamos en mi desarrollo verdad? De lo que era antes a lo que soy ahora definitivamente. Pues esto es. Ni tocarles las gracias a ustedes a a la OEA la golpead Rebeca y. Y yo no se puede ser como retórico, pero es de ustedes de verdad son como los ángeles ustedes verdad? Y nos impulsan a tantas cosas que tal vez este no hubiera conocido hace cinco años. Pues de haber dicho no, atrofiar no va a poder o quién sabe? Y también ese voto de confianza que ustedes nos dan verdad de estar siempre a nuestro lado, lo impulsa uno a atreverse a hacer cosas. O sea, por ejemplo, yo jamás me imaginé hacer un webinar jamás verdad o o participar. Bueno, en todo esto, este es de por qué Rebecka porque aquí los docentes y me imagino que en muchos países no son valorados, no son de reconocidos. Mucha gente cree que estudia educación porque es lo que me quedó, porque fue lo que no pude entrar a otra carrera, porque no pude entrar a medicina o algo así. Entonces la nota en educación pues verá este digamos en en a universidades hacen exámenes de admisión, entonces pues eso es lo que hay. Entonces se ha desprestigiado mucho la carrera como docente y la labor de docente. Cuando ustedes nos presentan todo este panorama, a lo que nos podemos enfrentar, verdad? De todo lo que podemos hacer y tal vez cuando iniciamos no teníamos claro lo que vamos a lograr. Pero si usted me pregunta que si yo iba a llegar a dar un curso virtual, obviamente no lo hice sola, lo hice con mis compañeras del alma. Jamás, jamás usted me verá.

De hecho, en el 2010. O sea, usted cree que pueda hacer un curso de esto? No, no, pero es porque ustedes nos han transmitido ese empoderamiento, verdad? He de decir no se, pues este si lo van a lograr y. Y aquí estamos nosotras para cualquier cosa, definitivamente, porque ustedes han estado a nuestro lado, pero nos hemos dado cuenta de todas nuestras capacidades y aprender a confiar en nosotras.

Speaker1: [00:04:36] Pues yo quiero empezar con eso. En efecto, yo tengo unas preguntas específicas. Si puedes puedes responder de la manera que quieras y pues está bien que, que, que, que compartes lo que deseas compartir. Yo quiero empezar con eso. Raíz la raíz de dónde viene esa confianza que tú dices? Entonces yo voy a empezar con una una definición que tal vez es una definición un poco, no sé, no quiero decir plana, pero tal vez no es tan concreto como me gustaría. Me gustaría. Creo que todo lo que has estado explicando creo que estamos como en la misma onda, pero yo en particular quiero saber sobre tu liderazgo estratégico para docentes de este ramo de ciencias, particularmente. Am Entonces, qué bueno, yo creo que estamos en la misma onda, pero básicamente me interesa mucho el proceso, el cabo, los docentes que tienen como esa visión a largo plazo para para la profesión docente y para la educación a distancia. Y me gustaría empezar con que me digas un poco sobre el primer momento o tal vez el primer periodo de tu vida, cuando realmente tuviste la oportunidad de ser líder docente más allá de tu aula o de tus necesidades, de tu descripción de trabajo. Y me gustaría que me dijeras qué fue esa oportunidad y que me lo des, que me la describas jajaja.

Speaker2: [00:06:10] Bueno, a mí siempre me ha interesado como como colaborar y ayudar, como como servir. Este es. Es como una característica mía, verdad? Siempre he creído que que uno no se puede quedar con todo ese conocimiento. Cuando yo inicié en todo este proceso de bueno a dar clases de todo, yo siempre he tenido facilidad como para comprender este cuestiones de planeamiento, verdad? Y entonces yo era siempre la que les ayudaba a mis compañeras como organizar un planeamiento y hacía sesiones de trabajo. Es de tarde de trabajo y ellas me llamaban y yo les decía y Rebeca? Y todo esto sin esperar nada a cambio, nada cambio. Pienso que eso me fue llevando a conocer a otras personas, verdad? Y no solo en mi institución y en todo. Entonces este jefe como que. Volvieron sus ojos hacia mí. Yo estuve aquí. Eso es algo muy personal, tuve una situación con una directora que yo no era de su agrado. Verdad? Posiblemente ya después lo entendí. Posiblemente porque yo sabía algunas cosas que ella no manejaban y entonces ella tal vez se sentía como como intimidada. Y entonces yo entré en un periodo en esa institución que yo. O sea, allí yo estaba. Me sentía como. Como prisionera. Verdad? En ese momento una asesora que es de educación preescolar llegó y nos hizo una visita y nos pidieron los documentos. Y ella, después de la revisión que hizo a todas las docentes, ella llegó y le dijo unas palabras a la directora y me mandaron a llamar a la dirección y me dijeron Usted como es que ha hecho estos planeamientos y estas evaluaciones? Como de dónde aprendió? Y entonces yo le dije bueno, en las capacitaciones y la verdad es que yo me he interesado en leer y en conocer.

Speaker2: [00:08:35] Y entonces la asesora me dijo nunca he encontrado un planeamiento tan bien hecho y unas evaluaciones tan bien hechos. Y entonces ella le dijo usted tiene, umm, un diamante en esa institución. Esta maestra es este maravillosa, tiene que aprovecharla porque ni siquiera en otras es. Nosotras somos eran bueno, digamos angustié central que ellos son como acrecenta docentes desde nunca he encontrado. Estas planeaciones y esta si entonces es asesora, me empezó a invitar a acompañarla, a dar capacitaciones y de todo. Y entonces me decía usted

sabe, [Andrea], usted sabe por qué le da miedo, no, no tenga miedo. Este. Al final de la situación con esta directora, pues no es este comentario, el asesora no fue de su agrado, yo pedí traslado, yo pedí traslado a otra institución porque yo me sentía muy mal y entonces ahí empecé a donde estoy ahora, no Marden. Y la directora me apoyaba y mis compañeras sí y ya era diferente entonces. Yo le decía a mis compañeras yo me sentía como como prisionera y y como era un gusano, verdad? Por decirlo así. Pero ya después como que me convertí en una mariposita, me diese espacio verdad? Para. Para ayudar y. Y esa ha sido mi temática. Verá, ahora con todo esto. Verá, yo dije yo no sé nada de Steen, yo no sabía nada. Y yo recuerdo que cuando Laura me mandó una entrevista para todo esto del estèn y todo, ella me preguntó Usted estaría dispuesta? A compartir sus conocimientos con otras profesoras, no sólo de su institución, no sólo de su círculo, digamos cerrado.

Speaker2: [00:10:48] Y por supuesto, eso es lo que hay que hacer. Es de lo que hay que hacer. Y yo creo que eso es lo que me ha abierto este, como estos espacios, porque yo siempre he creído. A veces yo veo que hay personas como egoístas, verdad? Como dicen hoy, yo soy la que sé más y yo soy la más experta y y mejor no digo nada porque después me pueden como sobrepasar o algo así. Y digo yo no, eso no está bien, eso no está bien. Y entonces este yo le dije a Laura esto lo vamos a hacer así este y ya hemos empezado, ya hemos empezado este con mis compañeras, con bueno, con este curso. Que dimos verdad que no solo son docentes de mi institución a las que invitamos, hemos invitado a otras docentes y y ya por ahí este jale, ya saben que tal vez uno conoce un poquito de esta. Estèn como yo siempre digo no lo sé todo, es que no somos expertas definitivamente, pero tenemos el interés de compartir y de aprender de Becka. Esto no ha sido fácil, o sea, este trabajo en la red nos ha demandado mucho tiempo y mucha dedicación. Pero ha valido la pena. Ha valido la pena porque nos hemos transformado e. Para bien, pienso yo, para bien remontarlo.

Speaker1: [00:12:28] Puedes darme un poco de y pues gracias por compartir. Es una historia muy bonita. Vietnam suena cuando me puedes dar una idea de los tiempos como cuánto tiempo trabajando como maestra? Después de cuántos años tuviste esto? Esta celebración con la la que realmente no te valió y el A de Laura como como paso todo eso en tiempo?

Speaker2: [00:12:54] Yo yo empecé a trabajar como docente en el 2001 este y pues anduve con varios verdad? Primero trabajé en primaria y después ya logré que me nombraran en preescolar. Era interina y yo obtuve propiedad en el 2003, que ahí fue donde fui a esa institución, donde no era no grata, verdad? Bueno, por las compañeras sí, pero por ella no, verdad? Este está. La asesora llegó a la institución en el 2016 a hacer la visita y entonces ahí fue cuando yo empecé a y ella me empezó a invitar a formaciones y a talleres y yo la acompañaba a dar todo eso. En el 2017, precisamente porque como ya desde Asesoría, me veían un poquito diferente, entonces ya la situación era muy, muy difícil. Fue cuando yo logré hacer el traslado. Entonces este ya me pase a Homar tengo. Yo había intentado hacer escalaban el 2015, pero no me lo dieron. Pero bueno, ya en verdad todo, todo tiene su tiempo en rebecas, digo yo. Tal vez si yo me hubiera ido antes, tal vez no hubiera visto la la asesora, la asesora no hubiera conocido. Me documento si me tenía que esperar, entonces este ella guantes

Speaker1: [00:14:26] Y unas preguntas como cuándo? Pues déjeme ver mi lista en primer plano. Pues yo me pregunto como que mencionaste dos invitaciones la invitación de la asesora que no

necesariamente tenga nada que ver con ciencia ni con el tema específica. Y luego esta invitación de Laura que a medida que va a conciencia interna específicamente me pregunto si puedes comparar esas experiencias porque dijiste que si. En ambos casos me imagino que como maestra cansada, estresada, aprendo demasiado que hacer. Entonces por qué dijiste que si esas son oportunidades?

Speaker2: [00:15:05] Porque yo pienso que son oportunidades para aprender y para crecer y porque pienso que que así como yo fui docente y yo quería tener el apoyo que tal vez al inicio no tuve verdad? Yo pienso en todas esas que vienen iniciando o mis compañeras que tienen la misma cantidad de años que uno y a veces no entienden nada y uno siempre está como buscando ese, ese de formación. Además, yo pienso que como docente uno se tiene que actualizar y que mejor estar con díscolas, con los expertos, con los que saben. Mi papá era este, una persona muy activa y él siempre me decía las oportunidades no se desaprovechan. Me dice hoy que hay que usar enlaces de aprovechar y de todo se aprende, de todo se aprende. Entonces, por eso Anatot dije que sí y es cansador y de todo, pero ha valido la pena.

Speaker1: [00:16:12] Fue algo que, como cuando recibiste estas dos invitaciones, dijiste de la nada. Sí, sí quiero. Fue algo que fue algo de inmediato. No tenías que pensar.

Speaker2: [00:16:23] No, nunca lo he pensado. Nunca. Yo no sé si eso bien o mal, pero digamos. Y con la asesora Karina se llama la asesora. Ella me dijo [Andrea], me podrías ayudar en algo? Y una de mi respuesta es Sí, claro, en qué te puedo ayudar? En qué te puedo colaborar? Yo sigo sin saber qué era verdad. Y entonces es que cesaron las capacitaciones y a las 12. Bueno, bueno, si hoy nos preparamos y mi posición siempre ha sido esa. O sea, yo tal vez no soy la número uno, pero puedo estudiar, puedo aprender y puedo repasar con la hora. Yo ni la conocía. Yo no sabía ni quién era este. Y a mí me llamaron del líder P. De hecho, llamaron a otra compañera primero y le dijeron Usted es Sufrieras Algueró y le dicen No, pero es mi compañera. Ah, es que tengo un número. Y entonces ya León no es esto, le dice ella. Hasta aquí a la cerca mío, si quieres en la mesa, [Andrea] la llaman del ministerio. Y yo decía Dios mío, que sea. Y me dices qué queríamos ver, si se nos podía colaborar en un proyectito y ya. Bueno, sí, claro, en qué les puedo servir? Mire, no le vamos a mandar una documentas un cuestionario se nos puede llenar el cuestionario. Y era sobre esas preguntas de liderazgo que si a mi me gustaba compartir, que si me gustaba. Y yo dije así. Entonces ahí fue donde lo llené, como hasta los 15 días leí que Laura me dijo de qué se trataba, pero. Pero esas cosas pienso yo que no! A ver cuando se fijan en no, no, Rebecka. Y sin uno buscarlo. Verdad? Es porque los otros tal vez han visto algo en uno que tal vez uno inconscientemente no lo ha hecho conscientemente no lo ha hecho, verdad? Como diciendo yo quiero, yo quiero, no, si no que puedes ayudarme. Entonces llego. Si me están pidiendo ayuda es por qué tal vez sirvo para verdad. Entonces este de ahí yo me tiro al la.

Speaker1: [00:18:52] Pues es, es. Es algo que honestamente he visto también en muchos otros docentes que he revisado, así que no me parece fuera de lo normal. Bueno, como líderes ustedes están fuera de lo normal, no? Pero quién sabe, tal vez es por eso. Pues una pregunta, entonces cuando supiste que la oportunidad se trataba de Stamm, cómo te sentiste sobre eso?

Speaker2: [00:19:21] Asusta. De hecho, empecé a buscar qué era este en verdad. Y yo decía Ay, no este, pero cómo, cómo? Pero yo no soy tan brillante matemática, verdad? O sea, yo, yo, yo no

fui tan caiga en el colegio el mate. Bueno, nunca me quedé ni nada, pero yo recuerdo que yo matemática tenía que estudiar mucho, mucho. Me fascinaba física en física siempre me eximía, pero en matemáticas yo era así como yo me veo este. Y bueno, aparte que no tuve un buen profesor, era un caso y entonces eh. Yo creo que yo empecé a tener tranquilidad y confianza cuando fui al seminario y cuando empecé en Perú, entender que no solo era yo la que tal vez no era tan experta este en todo esto. Pero usted nos empezó a entender que era este, que no era solo hacer cosas de matemáticas, que no era este hacer proyectos así fuera de serie, verdad? Sino que era verdad como desarrollar todo ese pensamiento crítico. Me acuerdo la charla de esta de la que escribió el libro es de Christi. A ella me impactó mucho, verdad? Y entonces yo dije Sí podemos, entonces sí podemos. No, no tengo por qué tener miedo, verdad? O sea, si lo vamos a lograr. Y cuando yo llegué y ya, ya me encontré al Lucilia Ley y paz, estábamos de iguales que no sabíamos que era. Escenas están tan cargás y ninguna era científica ni, ni matemática, ni nada. Chaouen. Estamos iguales. Entonces. Entonces este. Pues sí, sí, me puse a investigar y bueno, y con Laura y José aquí hicimos visitas a a instituciones educativas, a conocer un poco como trabajar un poco más solo el pensamiento y entonces eso me fue generando. Como más serenidad, verdad? Porque el primero era como el choque, verdad?

Speaker1: [00:21:48] Pero pues has mencionado a Laura y también a las otras tres y a José, etc.. Me pregunto si recibiste apoyo o como cómo lo digo a alguien necesitó poner obstáculos en tu camino o algo? Alguien a alguien más o no es este?

Speaker2: [00:22:18] Ok, Labre y José han sido incondicionales en todo este proceso, eh? Definitivamente las chicas de fuerza definitivamente, y eso me ha generado mucha paz, pero no todo mundo. Rebeca se alegra cuando un docente tal vez sobresale y precisamente porque yo soy es una docente nada más. No soy una asesora, no soy una directora, no soy. Y entonces mucha gente y bueno, algunas personas no lo ven bien y tal vez no este, no valoran o no validan este el esfuerzo y todo eso. Por qué? Porque porque no reconocen todo lo que puede salir de las docentes. Este bueno aquella situación que tuve con con la asesora verdad? A mí eso me marcó mucho,

Speaker1: [00:23:26] Esto fue que ahora te

Speaker2: [00:23:28] Asesora. Si Karina Karina, la que me ayudó es una asesora regionales de San José, digamos, es de una provincia con la que tuve la situación, es una asesora nacional a nivel país, verdad? Y o sea es como más superior. En realidad yo he tenido buena relación con ella porque ella en algún momento fue jefa mía y porque yo cubrí a Karina durante un periodo de incapacidad y todo eso. Pero sí aprendí que existe la envidia y que existe y existe esos sentimientos que a mí, mi jefa y mis compañeras me decían porque yo lloraba. Bueno, bueno, esa vez yo la llamaste llorando bajito, pero yo lloré como una semana, verdad? Y es de. Y yo me sentía malito, es. Y yo decía es que no todo mundo se alegra. Y entonces mi jefa me decía usted no tiene que andar contando las cosas buenas que le pasan, eso no es verdad. Y yo decía pero si es algo que tampoco detec la verdad no es de andar aquí se dice como andar rajando, de andar usted exhibiendo porque no, porque yo no soy así. Pero ella me decía usted tiene que entender que un mal existe y hay personas que no se alegran con usted. Merciantes, usted no a todo mundo le pue. Y yo a ella. Lo que hice fue una consulta y respetuosa, verdad? Porque ella de cierta manera estaba ligada un poco con nosotros, pero. Pero bueno, entonces sí, sí, sí, hay gente

que no se alegra del todo, si hay gente que que no responde igual porque? Porque soy una Mahesh verdad? Digo yo. Y entonces una maestra nunca es más que una asesora o una directora o algo así. Pero bueno, todo, todo, todo pasa y ya pasa ya.

Speaker1: [00:25:41] Prancer CS Bueno, pues me gustaría que me dijeras un poquito más sobre cómo ha cambiado tu visión de ti misma como líder y lo que puedes hacer entonces. Bueno, son dos preguntas que yo tengo. Pues la primera es me gustaría que me contaras en tus palabras exactamente cómo has desarrollado como este líder docente en ciencia o STEM desde ese primer encuentro con Laura. Así que yo, pues yo sé todo lo que has hecho, pero me ayudaría escuchar de ti en tus palabras exactamente qué sientes que has logrado. Y pues tengo pruebas de que va a salir, eso sí, a que?

Speaker2: [00:26:23] Pues definitivamente cuando yo iba a entrar a la universidad yo decía nada de ciencia, nada de

Speaker1: [00:26:33] Química, nada de eso.

Speaker2: [00:26:36] Este y era curioso, no sé si yo te había comentado. Nosotros somos siete hermanos. Este yo soy la quinta y gracias a Dios, pues a nivel académico este nos iba bien. Y en mi casa solo mi papá trabajaba. Mi mamá era ama de casa y es de mi papá, no decía La mejor herencia que yo les puedo dejar a ustedes es el estudio, verdad? Porque bueno, nosotros no somos millonarios ni nada por el estilo, verdad? No tenemos propiedad ni nada. Pero decía eso a ustedes les va a servir mucho. Entonces siempre fuimos muy dedicaos. Cuando yo iba a salir de quinto año es de a mí los profesores me decían usted que va a estudiar, nosotros nos decían Salguero por el apellido era porque ya yo era la quinta que estaba en ese colegio, entonces Salguero que va a estudiar y yo, yo quiero ser maestra. Yo quiero ser como Ana Salguero, va a ser maestra. Cómanse sus dos hermanas son doctoras. Los otros dos son ingenieros. Y usted una maestra. No, que no sé qué tanto desperdicio y que no sé qué. Entonces yo estaba como dudosa verdad. De hecho, el primer año en la universidad yo me quedé así como hoy que hago? Que hago? De hecho no escogí la opción, verdad? Y yo decía bueno, será que que no puede ser.

Speaker2: [00:28:12] Y mientras lo meditaba y esto y ya después me decidí y yo dije eso es lo que yo quiero. Y yo voy a ser una maestra que marca la diferencia. Verdad? Posiblemente no voy a ganar este los millones que ganan los doctores ni nada, pero eso es lo que a mí me realiza. Y entonces, desde que yo empecé mi carrera en la Universidad de Educación Preescolar y yo decía. Vamos a hacer una buena maestra y vamos a marcar la diferencia. Y mis niños se van a sentir felices y con los padres de familia se van a sentir felices. Y vamos a ver en mi familia, porque muchas veces aquí es de que hay muchas personas que estudian como por tradición familiar, verdad? Bueno, si mi papá es doctor, posiblemente yo vaya a ser doctor y todo eso. En mi familia no había nadie docente. Además, yo era la primera docente entre primos, sobrinos, todos, verdad? Este. Y entonces yo dije bueno, vamos a marcar la diferencia. De hecho, muchos amigos míos me molestaban y me decían Ah, está estudiando aquí, lo vacilan a uno, tijeritas uno o vomitas uno real. Y yo le decía no, es una carrera y es muy. Es muy válida y es muy importante. Yo le decía así no hay más allá de preescolar, los chiquitos no se desarrollan en muchas cosas.

Speaker2: [00:29:41] Bueno, la cuestión es que ese fue siempre como mi norte. Y así lo he tratado de mostrar con mis, con mis compañeras este y con todas estas oportunidades, por ejemplo, de estÈn, hemos transmitido a mis compañeras Bea este año ha sido más motivante. Ver todas las experiencias que mis compañeras han empezado a generar por medio del ESTEM, ellas llevaron el curso con nosotras, ellas me han oído hablar, ellas este ahorita. Bueno, tenemos que empezar a hacer unas grabaciones con la obra y unos videos que tenemos ahí pendientes. [Andrea] que ocupa [Andrea], qué vamos a hacer? [Andrea] que verdad? Y entonces cuando yo llegue mi kinder estaba muy caído. Verdad? Y yo les he dicho chiquillas, nosotros tenemos que hacer que nuestra institución se sea visible para muchas personas porque nos vamos a sentir mejor. La matrícula había decaído mucho y de todo. Y yo les decía lo vamos a lograr, pero tenemos que creer que nosotras somos buenas docentes y la gente tiene que reconocer que aquí, aquí, aquí hay personal de calidad. Y entonces este. Ellas este año todavía estaban preguntando por unas matrículas. Y entonces unos papás llegaron y que si teníamos campo y de todo. Y me decía Ay [Andrea], si tenía razón.

Speaker2: [00:31:25] Nos están volviendo a ver. Y le digo es por todo lo lindo que estamos haciendo. Le digo yo, porque los chiquillos y y ustedes se atreven a hacer cosas del cuerpo humano y explican así con eso oberta. Y hacemos experimentos y la combinación de colores y todo eso, que no solamente darles una copia cita y pinten y todo. No, realmente nos estamos esforzando y estamos haciendo la diferencia. Y entonces ellas me dicen sí [Andrea], si os detenia caso le digo yo y no por qué? Porque tengas la razón en todo, sino porque yo lo creo y lo vamos a ver como realizar. Ustedes también no tienen que creer, porque yo soy de las más nuevas que estoy en esa institución hay unas que tienen como 20 años, o sea, yo tengo como tres años, cuatro como cuatro, sí, como cuatro. Entonces desde gracias a todo esto, el estem verdad como que hemos querido innovar, como que hemos querido hacer cosas diferentes, pero yo tengo muy claro que yo no podría sola si mis compañeras y mi directora, porque ahora en Nueva no me apoyara y no nos. Hay uniéramos, verdad? No funcionaría. Porque qué hago yo con saber todo si las otras no quieren hacer nada? Verá entonces, pues ahí, bajo esas líneas que

Speaker1: [00:32:57] Me has dicho un poco sobre cómo has innovado y cambiado el ambiente de la escuela. No, pero dime un poquito más sobre lo que has hecho en la región.

Speaker2: [00:33:08] Ajá. Bueno, este todo esto no se ha abierto mucho en muchas puertas. Por ejemplo, que a mi Paola me contactara [colega], la de Colombia me dice lo mismo. Rebeca sostuviste? Me podría ayudar en algo? Claro. Paola contestó, qué es lo que ocupa hoy? Es para unas cositas que yo ni sabía ni que era. Y entonces este ya está, es mi invitada a la reunión y entonces nos dijeron ustedes para hacer unas sesiones. Y después ya cuando vi ese trabajo tan lindo, esas grabaciones y esto es de que yo al inicio yo decía que es esto por el amor de Dios, verdad? Pero yo me animo a ello, me anima a ir seguro al inicio no me sale tan bien y todo, pero ya después ahí ya lo hay. Y ahora, bueno, nos volvieron a invitar de beca para un proyecto de pensamiento computacional y ahí me sale a [colega]. La embarqué porque decían es que tenemos ocupamos a alguien más, así que si quieres yo invito a alguien, no invité a las otras, no porque no fueran buenas ni nada, sino porque ya había representación de [país] en [país].

Speaker1: [00:34:33] No, perfecto, es muy bien de decir y

Speaker2: [00:34:39] Porque y porque no había el Perú, verdad? Entonces yo les dije y ellas encantadas este. Pues ahí estamos. Pilar Ahora nos embarcó en otro proyecto y digo yo, ese barco nos invita a otra cosa de Ecuador, que por cierto, tengo que llamarla, a ver qué hacemos con eso. Y entonces son cosas de lindísimas. Con Malet en Guatemala yo la invito a cosas, ella me invita. Entonces es como que hemos construido con [colega], la de Chile, lindísima, qué mujer! Y entonces ella me invita y yo este los contactos con decirte que ahora aquí en [país] va a ser, va a haber ahí un congreso de talento, de ciencia y no sé qué. Y la de la Universidad de [redacted] me dijeron [Andrea], usted nos puede ayudar a contactar a algunas as que nos dijeron que usted ayude en un curso de Colombia buenísima que hacen? Si claro, yo les ayudo y que no sé qué bead porque me llaman. Bueno, yo no sé cómo es allá, pero aquí este catedrática de la universidad a pedirme ayuda y yo la verdad que es eso y entonces. Pero es eso verdad? Bajo esa línea yo les digo sí, sí, busquémoslo. Lo más que nos pueden decir es que no, si no pueden por la agenda o algo así, pero esos cursos, verdad? Yo invité a una compañera a la universidad hacerlo y ella los hizo, quedó encantada y entonces ella Nagumo ha ido regando la bola de de todo esto, entonces, pues. Pues hemos tenido contactos. Verdad que yo creo alianzas que son importantes. Y hay? Verdad?

Speaker1: [00:36:32] Pues mi pregunta en ese tema es cómo? Es lo que me explicaste, es como una cascada. No es una cascada de cosas que han pasado, te has aprovechado de las oportunidades que que sé que dices que es como que de la nada dices que. Que sí sin pensarlo. Pero la verdad es un hábito. Un hábito.

Speaker2: [00:36:58] No sé,

Speaker1: [00:37:00] Pero mi pregunta ahora es pues pensando hacia el futuro qué es lo que ves en tu futuro? Como como maestra, líder o algún cambio para el futuro? Qué es lo que deseas lograr?

Speaker2: [00:37:14] Quisiera que la red no se acabara. Me encantaría colaborar como en la formación de docentes. Creo que me gusta mucho. A ver, creo que tengo como esa empatía para entender como un poco la realidad que pasamos, verdad? Y que muchas veces he de no. Como docente se frustra o se preocupa o todo verdad? Pero qué lindo cuando hay otra persona que te pueda apoyar y que te puede enseñar y que construir entre las dos. Verdad que no? Ahí es donde yo digo las comunidades de aprendizaje son importantísimas. Me da el sentir esas alianzas, o sea, por ejemplo en alianzas con Marcela, con Paola, con con personas que verá o no va. Y entonces digo yo, hoy todas deberíamos de aprender a trabajar así, de no sentirnos solas con mis compañeras. Este año, el del año pasado, iniciamos este proceso chiquilla, nos vamos a ayudar, nos vamos a para eso estamos. Este por ejemplo, yo no soy muy hábil en las en las manualidades, ese no es mi fuerte verdad, pero a nivel de planeamiento, a nivel de construcción, de documentos, de todo es ahí, ahí poquito, verdad? Y hoy me llega la luz. Entonces este ellas dicen bueno [Andrea], hagamos esto entre nosotros, lo intentamos y yo lo veo con ella.

Speaker2: [00:38:59] Yo le digo bueno chiquillas, pero no es que yo lo voy a hacer, solo lo vamos a hacer juntas, ven, sentémonos, verdad? Porque de eso se trata. Y yo también. Bueno, ok, voy a pegar estos ojitos y okay, espérese, voy a hacer eso, verdad? Entonces. Cuando a uno le enseñan con amor verdad a todo es diferente. Verdad? Y entonces yo me encantaría, me

encantaría estar en en esa parte. Pero bueno, yo trabajo en la universidad, aparte de práctica docente, yo superviso y es como darles esa confianza. No, tal vez como en un curso universitario en que están aprendiendo, sino precisamente a las que ya son docentes, verdad? Porque ya cuando se tiene 10, 15 años, usted a veces ya ni sabe ni cómo hacer ni nada. Y vienen las nuevas tendencias y todo eso. Digo yo qué lindo, qué lindo, verdad que cuando ya yo tengo 20 años, pero seguir aprendiendo verdad? No estancarse y transmitirles a las docentes sería algo algo lindo este yello quisiera poder compartir, aprender y transmitir ese pero.no vamos a ver lo que tiene la vida para uno verdad? O no? No Sankt. Hoy t t tenece el aparato, gracias.

Speaker1: [00:40:34] Pues pensando en ese futuro y en lo que deseas hacer, sientes que es algo que. Pues me pregunto si tienes planes y planes concretos para hacer que eso se vuelva realidad.

Speaker2: [00:40:49] De ahí. Eh, eh? Bueno, yo seguiré aceptando las invitaciones y las colaboraciones que pueda. Por el momento es lo más cercano que tengo para poder compartir todo. Este es nuestro proyecto de liderazgo que tenemos esta oportunidad que tenemos con Quito. Verdad que es parte de eso? Es lo más cercano. Verdad? Porque bueno, como le decía, no sé, aquí en [país], pues digamos que se yo, puestos por ejemplo, en asesoría. Me gustaría, pero eso es difícil aquí y. Y precisamente por todo, son muchos concursos y. Y bueno, y porque hay gente

Speaker1: [00:41:44] Que puedes hacer mucho desde donde estás. No sé, pero yo me imagino que reflexionando, empezando en esta entrevista, me dijiste pues nunca pensabas que ibas a llegar a hacer estas cosas y ahora estás en el

Speaker2: [00:41:59] Centro, acaso? Exacto.

Speaker1: [00:42:03] Argemí Tantear, puesto que uno tiene.

Speaker2: [00:42:06] Exacto, no? Y uno como docente. Yo creo que el ser docente. Le da esa oportunidad de saber lo que está pasando en las aulas y entonces uno comprende más las realidades, verdad? Entonces ya y seguimos ahí, seguimos, verdad? Yo no me imagino mi vida. Rebeca Ser simplemente una maestra y dedicarme solo a hacer un planeamiento, dar clases y tener mi mi tarde libre para hacer otras cosas. No, porque yo siempre he estado muy activa, verdad? Entonces mientras yo siga algo, este inventaré, algo seguiré dando porque siempre hay que aprender, verdad? Nadie me mete un curso de inglés rebecas

Speaker1: [00:43:10] Pues alguna vez

Speaker2: [00:43:12] Se me metí un ratito en esto. Entonces este lego Joffre ya, ya me toca aprender inglés, o sea, ya me entiendes, es como mi posición, le digo a mi esposo. Él me dice si usted es usted muy capaz de todo el acero, pero de ahí es ahí como un reto, hay que seguirle a eso.

Speaker1: [00:43:36] Excelente. Bueno, yo creo que pues honestamente ya cubriste todas mis todas mis preguntas. Yo tenía como 20 preguntas, pero así como contaste tu historia fuiste

volviéndolas, así que no tengo nada más que preguntar. Hay algo más que que me quieras decir sobre tu aire?

Speaker2: [00:43:56] Estoy muy triste porque ya llegamos a diciembre, te decimos a las chiquillas ayer ayer tuvimos reunión, le decíamos a chiquillas de ya en diciembre no, no, pero ahí seguimos inventando algo y

Speaker1: [00:44:12] Es la verdad. La verdad es que yo siempre he visto a la Real como la plataforma, todos los acechamos pudistes. Bueno, no, no quiero. Como tú dices, es la comunidad de aprendizaje que importa, pero esa comunidad es la rier y sigue la rier.

Speaker2: [00:44:29] Si yo me voy

Speaker1: [00:44:31] O que Pilar se vaya, pues vamos a seguir existiendo como

Speaker2: [00:44:35] Personas, claro está.

Speaker1: [00:44:37] Y para seguir esas redes es que

Speaker2: [00:44:41] Vamos a estar en contacto y todavía seguir haciendo cosas, cosas bonitas. Este ha sido de gran beneficio personal y profesional. Cada vez que uno que alguna publicación, bueno, las publicaciones también y eso no me cayó jamás me imaginé escribir un artículo, ya me iba y todo, pero fue lindo y digo yo qué linda experiencia sea y en donde uno valora todo lo que uno hace, verdad? De todo, pero si este ya los ojos son diferentes, te ven diferente a mirar y. Y es una motivación para mis compañeras verdad? Porque yo soy una docente igual que ellas, no soy nada este diferente porque posiblemente los que hacen estas cosas siempre son los de arriba. Pero pero no docente de. Pues hoy vamos y todo.

Speaker1: [00:45:45] Disfruté mucho con docentes, es la parte más bonita de este trabajo que hacemos. Nada se parece más a photoshop, a veces un poco más aburrido.

Speaker2: [00:45:59] No sé si es este, pero bueno,

Speaker1: [00:46:03] Pues bueno, gracias por el tiempo. Yo voy a consolidar todo esto y en los siguientes meses pues estoy esperando presentar mi tesis. Se puede dejar de grabar?

Appendix L: Case Study Cards

Ana

Member-checked on **7 April 2021**, with no substantial changes requested.

Synopsis: Ana credits her first step toward self-efficacy for strategic leadership with her school administrator noting her interest in science and her dissatisfaction with her current teaching scenario. After receiving encouragement to take part in a STEM-focused teachers workshop, she was recognized by the workshop leader for her outgoing nature (singing a song about butterflies in front of the cohort) and bilingualism. This experience led to her being actively pursued for an opportunity to lead teacher workshops in Central America, and ultimately led to a very close friendship with a program director, with whom she continues to collaborate. The recognition she receives on a regular basis from peers, parents, and children themselves continues to propel her to continue her leadership work, rarely saying no to any opportunity.

Now, she is actively involved in building virtual communities of practice across the Caribbean, between her home country and Mexico, and in supporting a strategic plan for preparing STEM resources for teachers in an ITEN Project Team that includes collaborators from Colombia, Costa Rica, and Honduras.

At the core, Ana feels dedicated to this work because she wants to give back to Spanish-speaking (and often underserved) communities both in her local area and throughout the

hemisphere. She feels indebted to her parents for having brought her as a migrant to where she lives now, while emphasizing to her the value of her native language skills. She also wanted to have a project to show herself that she was capable of doing great things following the end of her marriage.

Prominence of Self-Efficacy for STEM Teacher Leadership: Very high. This individual expressed persistent self-doubt at the initial part of her STEM teacher leadership development, but it was almost always counteracted by a supportive, friendly relationship.

Tentative Findings: Self-efficacy for STEM teacher leadership originated from:

- Administrator support / recognition of science identity in service of teacher leadership identity
- Being invited and continually motivated by a close friend (even going to each other's houses)
- Personal empathy and philanthropic motives—service-minded (seeing self in others, being grateful for contributions of others to own life, and wanting to mimic it)
- Migrant status, serving as a bridge between English and Spanish-speaking worlds
- Identity as an "do-er"

Possible Excerpts:

So I was thinking to myself because I didn't have very much confidence. I was like, Oh my God, I opened my mouth. And I don't know if I could do this. And so, uh, but I stuck with it. I said, I'll do it if you want me to do it

I was shocked because for what I did think that I was going to be chosen to go, and then I was more in shock because I had said that I would do this.

…that I can be something then, and, you know, uh, help other teachers see that within themselves, that was like the main motivation for me, because I put myself in their shoes. Uh, when I listened to these people talk, uh, to amongst themselves, I can say, you know, I can never do. And I would say, yes, you can, can do it because I, I, you know, it just put me in their place and just, and we were from, you know, [my country] is, it's not very dissimilar from, from [your country].

And she's great at getting back to you and she helps you in whatever, and she'll come to your house if she has to, and blah, blah, blah.

I hope that this, you know, this, uh, tactical serendipity that, that, uh, has led, um, getting [Colleague 1] and I to, to have this, this, uh, partnership, uh, never ends. And I, and I hope that that, uh, I will still be doing this until I can't do it anymore.

Uniqueness among Other Cases: Ana did not follow a traditional pathway into a teaching career, having started in business. Some of her ambition as a teacher leader seems to be related to the struggles she experienced early on in getting acknowledgement as a legitimate teacher in the context of a daycare facility that employed educators who were not necessarily certified.

Commentary:

This teacher is primarily focused on grass-roots, community-based efforts to shift teaching practices by helping acclimate early childhood teachers to STEM through hands-on activities with everyday materials. She is proud of her accomplishments and appreciates recognition, but I also find her to be very humble. She seems constantly surprised at how people admire her and view her as a resource.

Cara

Member-checked on **7 April 2021**, with no substantial changes requested.

Synopsis: Cara credits her first step toward self-efficacy for strategic leadership when she saw children and teachers in Peru doing STEM—in doing many of the things she herself does with

her own children, particularly when she saw how it was possible to do so with limited resources. By seeing what is possible in other contexts, she feels that no preschool teacher should feel that STEM is impossible because of lack of resources or knowledge, and she passionately wants other teachers (and their students) to feel the joy that she (and her students) feel when they do STEM.

While her ministry of education initially engaged her following her trip to Peru through an island-wide series of workshops, much of her official work with the ministry on STEM has come to a halt because of COVID. Now, she has been actively spreading her enthusiasm for early childhood STEM through her work with the STREAM Virtual Community of Practice with pre-service and in-service early childhood teachers enrolled at the University of the West Indies, as well as with local schools, including two Islamic schools with which she has a personal connection.

At the core, Cara exudes joy in her teaching, and she wants to share that joy: “I think the most important thing for me is, I feel like I want them to experience what I am experiencing.” She attributes her appreciation for education and teaching to her mother, who did not have the advantage of advanced education. Although the invitation from the Ministry to be a leader might have been unexpected, her development as a STEM teacher leader has been paired with careful contemplation and intentionality to perfect her own craft and influence those in her school, while carefully assessing the readiness of those around her for embracing STEM.

Uniqueness among Other Cases: Because of her small island country, Cara is very close to

high-level ministry leadership and is very aware of the significant impact she can have on the profession.

Prominence of Self-Efficacy for STEM Teacher Leadership: Very high. She describes her time before and after Peru as night and day. Rather than dramatically shifting her teaching, she describes the *realization* that she has already been doing lots of STEM activities without knowing it, as well as the *realization* that she is the credible source of knowledge about STEM for much of her island (the de-facto expert).

Tentative Findings: Self-efficacy for STEM teacher leadership originated from:

1. Administrator support / recognition of science identity in support of teacher leadership identity
2. Expectation from the Ministry of Education to share back what was learned through curricular and instructional reform
3. Muslim faith, serving as a bridge between the public and some private (Islamic-based) schools
4. Mother's influence in valuing education, serving as a bridge between those who have quality educational experiences and those who have not had them
5. Identity shift - Did not see herself as a STEM teacher until the ITEN experience, and did not see herself as fully competent in STEM until she began to go through the curriculum reflection process with the Ministry.

Possible Excerpts:

I really did not know much about STEM. We, I used to hear about STEM in the primary school and the secondary school, but I never thought much about it.

every time I made a new, every time I had a new experience or I visited somewhere else, all I could think about is when I return, when I reach home, when I go back to school and I keep thinking about all the things I have to tell my teachers, and I did not know what their thoughts would be off or anything like that, but all I could see in my mind was their smile.

And as I saw what it did, I knew I, I, because I was working with schools beside, uh, like our ministry school and our ministry teachers, I said, but I have to introduce this to these others, if it is that I am helping these schools and they look to me for guidance and systems and helping them to not remain stagnant, but to be able to move forward…

But I had to remember, I too was just like them. I was no better than them. I too was now learning about online.

We had firsthand experience. I think that was the main reason why we were chosen to, to assist with these workshops. And it's only when we really started those workshops. And we started the work with the curriculum team at the ministry. Then that was another time that I realized how much I have learned about STEM. And I never realized that, you know, I never taught. I said, but I can't believe this is me talking about STEM.

I feel I could just move straight into STEM, full blown STEM. I just want to be a STEM teacher…

The teachers at my school, it felt very comfortable. I felt I was, I felt I was capable enough to do justice.

I think the most important thing for me is I feel like I want them to experience what I am experiencing. ...I just want you, I wanted you to see, first of all, I want to, I want you to see how your teaching and learning can change. I want you to see, I want you to see most importantly, I want you to see the benefit to the children. I want you to see how you could change the lives of children and how they could look at learning.

And I feel because I know that I feel, I want others who are in our teaching, younger children. I want them to know that too. And I want them to know that they can make a huge difference and they can have a huge impact on the, on the outcome of the children that they interact with. And they can either make them, or they can break them and they can get them to love learning, or they can get them to never want to see school.

And when I realized that there was no outside input, there was nobody else that came to our school and gave us information about STEM or about how to do activities or about what experiments to do and how to make it, um, effective for children at specially

We can see STEM. I think it's just that you really have to really want to do it and love it and want to know more about it.

Commentary:

In her initial interview, she spoke strongly about how she noted that the students and teachers in Peru were the same as in her home country. She also felt that the experience was like theory that came to life for the first time. This teacher shared previously that she had never left the country before, and had never flown on an airplane.

Amanda

Member-checked on **14 December 2021**, with no substantial changes requested.

Synopsis:

Amanda's self-efficacy for STEM teacher leadership is rooted in a persistent longing for self-improvement and desire for others to grow as she has been encouraged to grow, which in turn comes from encouragement she has received both from family members and unexpected strangers. Her first mention of STEM-specific leadership centers around the visualization activity she did with the four other Spanish-speaking early childhood teachers at the Dinámica early childhood center in Perú with the ITEN Fellowship. This was followed nearly immediately by her sharing this vision with the pre-service teachers she mentored, who expressed their enthusiasm and support for executing that vision.

Amanda cites multiple specific sources of self-efficacy for being an agent for positive change in her own life and that of others. She vividly described how she was determined to take charge of religious education for the young children at church who were being unattended,

bolstered by her grandmother to not fear taking leadership on things that needed to be done, even though Amanda herself didn't feel as though she was the most qualified. Her stepfather, an electrician, also impressed upon her the need to become a professional, and encouraged her to study math—reminding her that one cannot do things until they actually begin to do them.

Another pivotal moment in her trajectory as a teacher leader came after she received an offer from a man in a marketplace who thought she would be a good candidate for a scholarship to study education. Coming from a humble background with a family that engaged with small merchandise, she did not have the means to become a civil engineer, as she desired. However, this chance encounter with a member of an education college led to a spiritual experience with the college administrator, who later granted her a full scholarship based on her drive for self-improvement.

Now, Amanda sees her role as a multiplier. In collaboration with the four other Spanish-speaking ITEN Fellows from Peru, she has co-developed and led two STEM communities of practice lasting six weeks each for 110 teachers across Colombia, Costa Rica, Dominican Republic, and Peru. She has also been recruited by the Ministry of Education to co-star in a weekly TV series to support at-home learning for preschool children across her country, which she does alongside her regular teaching duties.

At the core, Amanda's desire to be a leader comes from a place of gratitude: "I want to do everything I can to help other people, so that they grow and develop just as I have. I want to do it because today I am who I am thanks to people who believed in me, and who decided that I

should throw my knowledge at the world." Amanda attributes her success as a teacher leader, generally, to two elements: "God was in that process, but there was also a human sacrifice. There were people, communities who helped push me toward the positive side, the negative side, but they were the catapults to finally achieve success."

Uniqueness among other cases:

Amanda identified two critical points in her experience when she was encouraged to engage in envisioning of her future as a teacher leader: once when she was asked by a ministry official at a teacher professional development event to think about her potential role as an educational leader, and once when she was in Peru as part of the ITEN Teacher Fellowship. The ministry official asked her how far she dared to believe she could go, and she said that she would not hesitate to think as far as being the Minister of Education herself. When in Peru, at the suggestion of an early childhood teacher colleague that they complete a 5-year letter as a group, she envisioned where they would be as STEM teacher leaders in five years. (Although not discussed during this interview, Amanda has shared this letter with me—and she has commented on how so many of the things they envisioned have already come true, less than three years out from when they first authored that letter).

Prominence of Self-Efficacy for STEM Teacher Leadership:

Amanda exudes confidence, and she does so in a way that demonstrates a very spiritual conviction that her work is in service to both God and man. She sees STEM as one dimension of her teacher leadership, but it is part of a much more complex process of self-development. Prior interactions, however, suggest that STEM is deeply meaningful to her because she was

originally discouraged from pursuing civil engineering because she was a female, and it was not seemly for her to do so. She feels that teaching STEM "is stepping up to what scares us" as educators. Her self-efficacy for STEM teacher leadership is high because she has always had a tendency toward technical subjects, and was strongly influenced by her stepfather, who helped her to have a growth mindset.

Tentative findings: Self-efficacy for STEM teacher leadership originated from:

- Encouragement from her grandmother and her faith to engage in leadership where it is needed
- Initial desire to be a civil engineer, emulating her stepfather's work as an electrician
- Belief that you cannot become successful until you do it—you do not need to believe that you are capable now, but that you *will become* capable once you begin.
- Visioning activities as part of an administrator visit and as part of the Peru ITEN experience

Possible Excerpts:

People would talk about my vocation for the service of education. But I really didn't see it as a big deal until that day [Sunday school teaching]. It wasn't until that day that I saw all of the children, brought together, listening to me. And then I said, my God, I could make a little extra money to pay for my university courses by giving classes to children.
La gente decía de mi vocación por el servicio de educar. Pero yo realmente no lo veía como un gran impacto hasta ese día. Hasta ese día que vi a todos los niños reunidos escuchándome. Y ahí dije Dios mío, yo puedo ganarme un dinerito extra para pagar la universidad dándole clases a los niños.

Yes, there are others that have the role [of leader] and they don't take advantage of it, but you do have the interest.' I keenly remember that. 'If you have the interest, do it, that it doesn't really matter who is the leader; what matters is that the work gets done. The work needs to get done.' And she used a Christian phrase that said that there is much work to be done, but the workers are few. So that there was my challenge, and that's what I did.

Si hay otros que tienen el rol y no lo ejercen y tú tienes el interés. Gestualmente recuerdo eso. Si tú tienes el interés, hazlo, que no importa quién sea el líder, lo importante es que lo hagan. El trabajo debe hacerse. Y usó una frase cristiana que dijo que el trabajo era mucha, mucho trabajo, pero pocos eran los trabajadores. Entonces que me era reto y así lo hice.

[Another Teacher Fellow] said that we shouldn't think about ourselves any more as students, but rather that we should visualize what we would be, and we started to joke around and say ok, well, we are already STEM leaders.
[Another Teacher Fellow] dijo que no pensáramos que éramos más estudiantes, sino que visualizamos lo que ya éramos y comenzamos entonces a bromear y a decir bueno, pues ya somos líderes STEM.

Instead of starting to give class, I started by telling about my experience, and they were really motivated. They told me, 'At lunchtime, let's together so you can tell us more. And that's where I started to impact others about what STEM is.
En vez de iniciar dando la clase, inicié contando la experiencia y ellos muy motivados me dijeron En la hora de almuerzo nos juntamos para que nos cuentes más. Y ahí comencé a impactar de lo que es STEM.

I made a mental comparison chart. I saw what they were doing in Peru via the Seminar and the visits that we made to the different locations and schools. And I said, 'They are kids of the same age. The difference in the country. The teachers are the same as us. The difference is the methodology… So, it's easy; we just need to get to work…' And then the principal said, 'It's a challenge, a big dream; we will achieve it in a barrio like this one.'
Yo hice un cuadro comparativo mental. Vi lo que estaban haciendo en Perú a través del seminario y las visitas que hicimos a las diferentes estancias, a las escuelas. Y yo dije son niños de la misma edad. La diferencia es el país. Son maestras igual que nosotros. La diferencia es la metodología. … pues simple es poner manos a la obra … Y entonces me dijo la directora Es un reto, es un gran sueño, lo lograremos en un barrio como este.

[Thesis advisor] He told me, 'You know your own potential, and you know who you are.'
Thesis advisor: Me dijo Usted sabe su potencial y usted sabe quién es.

[Mother-in-law] 'You will get to wherever you want to go. And you will go far, because we have seen your motivation and your interest in educating and everything you do.' Even now I remember that frase, 'Everything that you have decided to pick up, you have done it with love and vocation.'
Mother-in-law: Tú llegarás a donde tú quieras llegar. Y tú llegarás lejos, porque hemos visto tu motivación y tu interés por educar y a todo lo que tú. Hasta ahora recuerdo esa frase todo lo que tú has decidido emprender lo has hecho con amor y vocación.

And I told her that the top tier I think I could achieve would be Minister of Education. I would be Minister of Education, and he told me, 'You think big. It's all about the limits one puts on themself.'
Y yo le dije que si el máximo escalón para yo crecer era ser ministra de Educación. Yo iba a ser ministra de Educación y me dijo tú piensas en grande. Es que el límite lo pone uno.

I want to do everything that will help me help others people, so that they grow and develop just as I have done. I want to do it because I am who I am thanks to an opportunity from people who believed in me and who decided that I should throw my knowledge out at the world.
Yo quiero hacerlo todo lo que me sirva para ayudar a otras personas, a otras personas, a que crezcan y se desarrollen como yo lo hice. Yo quiero hacerlo porque hoy yo lo que soy fue gracias a una oportunidad de gente que creyó en mí y que decidió que yo lanzara mis conocimientos al mundo.

And there, I said again, like my mind focused on my church, and I again said the same phrase that I used in my education as a launching pad to pay for my studies in civil engineering.
Y ahí dije otra vez como que mi mente se focalizo a mi iglesia y dije otra vez la misma frase que yo utilicé utilizar la educación como trampolín para pagar mis estudios ingeniería civil.

I looked at him in the eyes and I said, 'I want to be a professional to help others become entrepreneurs like I've done myself, I am one and I want to do it.' He put his hand on my shoulder and he said, 'God is with you.'
Y yo lo miré a los ojos y le dije Yo quiero ser profesional para ayudar a otros a emprender como yo lo acabo de hacer, lo estoy y lo quiero hacer. Y me puso la mano en el hombro y me dijo Dios está contigo.

He told me, 'You can do this. Math comes to you through your hands, and if you don't do it, you won't achieve it. You first have to do it, but before doing it, you have to believe in yourself.' I told him, 'Let's go. I think I can do it, but that's not enough. You have to execute that belief, and starting at that point I promised myself I would keep moving forward.
Él me decía tú puedes. Las matemáticas entran por las manos y si no lo haces nunca lo vas a lograr. Tienes primero que hacerlo, pero antes de hacerlo tienes que creértelo. Yo le decía Dame, pero yo creo que puedo creer, no es suficiente, hay que ejecutar esa creencia y a partir de ahí siempre me prometí seguir adelante.

I want to keep impacting [others] because I really want people to know what I have learned myself and what I continue to learn.
Quiero seguir impactando porque realmente quiero que la gente conozca todo lo que yo aprendí y lo que sigo aprendiendo.

But the story about how Amanda arrived to where she is today, it didn't come from nothing. God was in the process, but there was also a human sacrifice. There were people, communities helping to push you forward, but also back, but they were the catapult to keep moving toward success.
Pero la historia de cómo Amanda logró llegar al lugar donde estaba no llegó de la nada. Dios estuvo en el proceso, pero también hubo un sacrificio humano. Hubieron gentes, comunidades que te ayudaron a impulsarte del lado positivo, del lado negativo, pero fueron la catapulta para seguir escalando el éxito.

Commentary: Although not always explicitly mentioned in this interview, Amanda exudes a

deep Christian spirituality, and attributes both her life path and her choices to doing the will of God.

Jesica

Member-checked on **12 December 2021**, with no substantial changes requested.

Synopsis: Jesica credits her first step toward self-efficacy for strategic leadership to her teacher education program, which instilled in her a desire for leadership that goes beyond the classroom. However, she described that her first transition into a teaching setting—in a private school system—felt like an experience in which they "cut off [her] wings."

Her first explicit work as a STEM teacher leader began with the commitment of the five teachers at Dinamica in Peru, in which they wrote a collaborative letter envisioning themselves as STEM teacher leaders in five years. The experience in Peru helped her to feel like she wasn't alone, even if she felt inadequate. Unlike the other teachers, she didn't have a master's degree or the experience working with a university on teacher education courses. She also didn't feel very validated by the selection process to become an ITEN Fellow, which did not seem to be a very responsible process via her Ministry. However, she felt welcomed because she thinks that the other teachers saw something in her, and that they had similar tastes and interests.

Now, Jesica feels that she and her colleagues have achieved even more than they had dreamed with their letter of commitment written in Peru only three years ago. She is now in the second

round of leading a regional course on STEM teacher education in early childhood for teachers of Costa Rica, Colombia, Dominican Republic, Guatemala, and Peru. She thinks that her greatest contribution to leadership is her high attention to organization. She would like to write a book detailing her experiences to help other teachers grow.

At the core, Jesica still questions whether or not she is a leader in the traditional sense of the word, especially as she views herself as more of a passive leader. She recognizes that she won't just do what others tell her to, and she feels that leadership does not come easily to her. While the public school system, in which she has been for the past six years, allows more autonomy, she feels sad that her other five teachers are unwilling to collaborate with STEM approaches. She expresses a fear that she is a *local disappointment*, even though she believes she can be (and is) successfully working in a group at a higher level.

Uniqueness among other cases:

Youngest and least experienced of all teachers (only 7 years of experience at the start of the fellowship).

Least amount of support for her leadership locally.

Uses her involvement in the OAS an excuse for being different from her peers.

Feelings of isolation

Low individual self-efficacy, high collective self-efficacy

Prominence of Self-Efficacy for STEM Teacher Leadership:

Tentative findings: Self-efficacy for STEM teacher leadership originated from:

1. Pre-service teacher education (origin)
2. A "desire to do something different", to not only be a regular classroom teacher
3. ITEN involvement (recognition/commitment) → realizing from her interactions with like-minded peers that she wasn't totally crazy, and then the desires to do things different returned
4. Experiences in multiple schools, allowing her to compare systems.

Possible Excerpts:

Let's say I never really considered myself a leader. And even to the day, it's a little hard for me because let's say that no, I really haven't stood out, in the way that one considers a leader should stand out in terms of characteristics. If today, let's say that with the formation and the pathway I've had up to now, I can say, well, yes, yes I am a leader, but I am also more of a passive leader. I don't know if that's the right word...and a leader needs to continue on that path, looking for ways to get stronger.
Digamos que nunca me consideré una líder. Sí, y a la a la fecha aún me cuesta porque digamos que no, no he sobresalido, como en muchos aspectos que uno considera que normalmente debe tener un líder. Si hoy en día, digamos con la formación y el recorrido que se ha tenido en el momento, pues yo puedo decir ah, bueno, sí, sí, soy una líder, pero también soy una líder como más pasiva. No sé si sea la palabra y una líder que necesita continuar en ese camino de buscar cómo las formas de de fortalecerse.

So everything becomes systematized, like we all need to walk in the same way. So then there is, like how we say colloquially, they "cut off your wings" and you forget yourself a little. And when one passes to the public sectors, things change a little despite, or rather, yes, there is more autonomy. Today there's a lot more room for each person to define their strategies and whatever. But even so, well, one gets blocked, and suddenly your colleagues don't allow you to [do something].
Entonces todo se hace como sistematizado, como que todos debemos marchar de la misma forma. Entonces hay como que como decimos coloquialmente, cortan alas y uno olvida eso un poco. Ya cuando pasa uno al sector público, la cosa cambia un poco a pesar, o sea, así, si hay con mayor autonomía hoy en día la hay mucho más en definir cada quien sus estrategias y lo que lo que sea. Pero aún así, pues se bloquea uno como el de pronto con colegas y que pronto no lo permiten.

Let's say that I overcame it, and I don't know if this is the right word...because, let's say, I

disconnected from my team work on some matters, and I had to take the decision and tell them well, if you aren't going to do this as I'm suggestion, and if we can't do it [together], then, I will do it on my own, yes.
Digamos que solo lo superé y no sé si es también la palabra, pero digamos que hoy se me fue la que iba a decir como parcialmente, porque digamos, me desligue del trabajo en equipo con ellas en algunas cosas ya se lo tuve que tomar la decisión y decirles bueno, si ustedes no van a hacer esto como yo lo estoy sugeri sugiriendo o si no lo podemos hacer, pues yo, yo lo voy a hacer por mi parte, sí.

...I always had in me like that, that desire to do something different. Why not try something more, or why not do things in a different way? Why not leave this?
...pero siempre en mi estaba como esa, con esas ganas de hacer algo diferente, porque no intentar algo algo más o por que no hacer las cosas de otra manera? Por qué no dejar esto?

And so I should say, when one begins to grow or begins to hear other stories, eh, let's say that I can't just leave to the side what I've lived during the past two years. Well, like that desire begins to appear, for me to say, I really wasn't so bad. Or perhaps, these desires that I have, these ideas that I had, they aren't crazy, or so out of left field, and yes they can give good results.
Y pues ahí si debo decirlo, cuando uno se empieza a formar o empieza a escuchar de otras historias cuando eh, digamos que no puedo dejar de lado lo que he vivido durante estos dos años. Pues como que vuelven a aparecer las ganas de decir pues yo no estaba tan mal. O sea, estas estos deseos que yo tengo, estas ideas que yo tenía, no están tan locas, ni están tan salidas de los cabellos ni ni están tan mal y sí pueden dar buenos resultados.

Yes, and the experience allows someone to make comparisons or look at what works and what doesn't work, and one can change, as one wants… So now I've been at this for six years, and when more time passes, well, I have had more criteria to judge certain actions, to make decisions and to be more autonomous in certain things.
Sí, y la experiencia hace que también uno pueda establecer comparaciones o o mirar qué funciona y que no funciona, que se puede cambiar y y ya, digamos, donde más se sentido. … Duré un año o dos años así ya ni esa, pues voy para seis años, entonces es donde más llego a tiempo y donde también, pues he tenido con más criterio para decidir ciertas acciones, para tomar decisiones y para ser más autónoma en ciertas cosas.

Well, yes, in general terms, being able to work toward a shared goal. So, well the experience was very, very good. And one realizes that on one side, one isn't alone. That there are more colleagues, with the needs and interests, and on the other hand, there is that support.
Pues sí, en términos generales de trabajar por un fin común. Entonces, pues la experiencia pues fue muy, muy buena. Y se da cuenta uno por un lado, que uno no está solo. Sí que hay más colegas con Etra, con las necesidades e intereses y por el otro que hay como ese apoyo

And well, I was finally able to. I should say that, initially when we formed Team Fuerza. I started to see it take shape and yes, maybe I allowed the enthusiasm from others to impact me, in saying whether this was going to take us far or with this we are going to do a lot of things. So I now know, I should say that when we made the team as it was, I felt more affectionate

toward it and more enthusiasm to do something.
Y bueno, ya pude. Como comprender entonces inicialmente debo decir que no cuando conformamos el equipo fuerza. Ya le vi más forma y si, tal vez me dejé contagiar por él por el entusiasmo de las demás. En decir esto nos va a llevar lejos o con esto vamos a hacer muchas cosas. Entonces ya sé, debo decir que cuando ya hicimos el equipo como tal, le tome más, con más cariño y más entusiasmo por hacer algo.

So the fact that we were able to create the course and call on other teachers, well that was something that we ended up seeing a bit like a dream, but we hadn't imagined that it was so, so achievable and so quick. We eventually started to visualize more, more ahead. And now with the new Teacher Leadership Fund, well, we say ok, we'll continue. So certain there will be many more things that we can achieve and more we can write about.
Entonces el hecho de poder haber hecho el curso y llamar a otros docentes, pues eso sí era como algo que de pronto lo vimos como un sueño, pero no lo creímos, que fue tan, tan posible y tan rápido. De pronto lo habíamos visualizado para más. Para más adelante. Y pues ahorita con el nuevo fondo de liderazgo, pues decimos bueno y vamos a continuar, entonces seguramente son muchas más cosas que se irán logrando y hasta más de lo que escribimos.

And it was that I didn't want to just simply be a classroom teacher. Rather, not that there isn't merit in that labor, because I know that it is the most important, but when you don't have a mirror to look at those teachers, for example, that are 60+ years old and they continue in the classroom, well, surely they do their work with a lot of love. But I kept saying, I don't want that.
Y era que yo no quería ser sencillamente docente de aula, si no con ello no es mérito la labor, porque sé que es lo más importante, pero cuando no tiene espejos en los que esos docentes, por ejemplo, que ya tienen más de 60 años y siguen en el aula y y bueno, seguramente hacen su su labor con él con mucho amor. Pero yo decía yo no quiero eso.

So let's say that perhaps the desire to accept those proposals comes from when one gains experience, acquiring other learnings, gets to know other worlds that can enrich your life project and grow upward.
Entonces eso y pues digamos que tal vez en las ganas de de aceptar estas propuestas es es que uno va ganando experiencia, va adquiriendo otros aprendizajes, va conociendo cómo otros mundos que le pueden enriquecer ese ese proyecto de vida más adelante crecer.

Well, for me it has really been my own decision to continue. Or rather, the decisions that have been made have been very voluntary. But, it is like, perhaps, it is birthed from interest. Let's say that it has to do with the fact that I have dreams and its like, no, I don't want to just stay in the classroom. The community like the one I am part of, helps me to be like a vanguard (leading the way in innovation), not staying still. I feel that if I suddenly stop participating, I should keep educating myself about something that interests me.
Entonces yo pues realmente ha sido por por propia voluntad que he tomado la decisión de continuar o. O las decisiones que se han tomado, pues han sido muy muy voluntarias. Eh. Pero. Pero si es como. O sea, nace en parte por el interés. Digamos que tiene que ver con lo que yo tengo como sueño y es como no, no quedarme solamente en el aula si la labor. … a una comunidad como la que ya pertenezco, pues eso me ayuda a estar como a como a la

vanguardia, no quedarme. Siento que si de pronto dejo de participar o debo de estar informandome en algo que me interesa, pues se va a quedar ahí. Entonces el sueño que tengo de pronto no lo voy a poder lograr. Entonces si ha sido, sí ha sido muy voluntario.

Yes, well on one hand it's about gaining confidence in knowing. Well, all of us at our core have something of a leader. What happens is that we say, the actions are different. There are some leaders who attract a lot of attention from others. And I am one of those that no, that does not call a lot of attention to herself, but if in some way I have characteristics I could do it if it was beneficial, or at least I could do a lot with it.
Sí, pues por un lado es ganar confianza de saber qué? Pues que todos en el fondo tenemos algo de líderes. Lo que pasa es que la pues digamos, las acciones son diferentes y hay líderes que llaman mucho más la atención que otros. Y yo soy de las que esos que no, que no llaman mucho la atención, pero pues de alguna manera tengo características que que si potencio pues puedo sacarle provecho si, o por lo menos puedo hacer más con ellas.

Miranda

Member-checked on **11 December 2021**, with no substantial changes requested.

Synopsis: Miranda did not originally see leadership in herself, but she feels like the more that there are eyes on her, the more she becomes a leader (i.e., Pygmalion effect). She initially felt that leadership was unattainable. Opportunities for leadership snowballed in her life, first starting with the experience in Peru, immediately followed by changes in her classroom practice that her peers saw. Then, after doing a virtual course with individuals hand-picked and administrators notified by her, she was viewed even more strongly as a leader among her peers.

Miranda credits her first step toward self-efficacy for strategic leadership through the experience she had when she moved out of the private sector into the public sector. She applied to a contest that tested her skills in educational psychology, content, and an interview. Upon her selection with six other teachers, her classroom practices were more open to the view

of others, allowing her to be more easily recognized as a leader. This experience increased when she returned from Peru. She first introduced what she learned to a pedagogical group, and then it started to expand out by word of mouth.

At the core, Miranda exudes a strong sense of confidence that has only recently wavered because of the challenges imposed by COVID. She feels highly motivated to learn all she can and to be involved as a leader because it helps her classroom practice, and helps pave a more solid foundation for the future of society. Her desire to help others is something she feels she inherited—her innate love for education comes from the fact that her whole family is made up of educators, and even those who are retired or who have left the country often still contribute back through their educator networks.

Uniqueness among other cases:

Similar to Jessica, Miranda felt stifled by the private education system. She exudes a strong sense of policy awareness and a desire to get to the Ministry of Education (which came as a surprise to me, because I have often viewed her as a "quiet" or perhaps "less communicative" member of the group). However, she wants to join politics for the right reasons. She expresses a clear sense of ethical values, and wants to go up in the system based on her own accomplishments, and wants to stay "clean" from the corruption that often exists in political systems.

Prominence of Self-Efficacy for STEM Teacher Leadership:

LG exudes a strong sense of self-confidence, although it is not clear if "STEM" is just one

opportunity to improve the educational system. She described herself as a recluse in college, but this helped her to develop a sense of identity that carries her forward to this day.

Tentative findings: Self-efficacy for STEM teacher leadership originated from:

- Family → particularly from a teacher aunt who she used to help when she was in middle school, and who is still her inspiration to this day, and from her many other aunts who continue to do good in the world, even after retirement.
- Love for reading: "readers get the right to "the word" [to speak up and use their voice]."
- Impulsiveness—she said yes, then decided to figure it out later
- Strong sense of values/ethics

Possible Excerpts:

Well, you know that generally sometimes we are leaders, but we don't identify ourselves as leaders. Rather, other people observe you and see your work, they identify themselves and they want to follow. … So, that part, really, me as a person, as a professional, I didn't identify with it. Rather, there were a lot of eyes of other professionals and from superiors on my work and on me as a person.
Bien, tú sabes que generalmente a veces somos líderes, pero no lo identificamos como líder. Más sin embargo, otras personas que te observan y que ven tu trabajo y ven tu labor, se identifican y quieren seguir. … Entonces esa parte realmente yo como persona, como profesional, no la identificaba más. Sin embargo, habían muchos ojos de muchos profesionales y de muchos superiores encima de mi trabajo y encima de mi persona.

So, I really like to explore to keep improving, because we're talking here about adults, but when I improve my own educational practice, I am working for early childhood education, and I am forming generations. Because when I document [my own learning], when I learn more to improve my pedagogical practice, well, I am helping the children. Their generation will succeed us and I really identify with that part. I like to always be exploring, investigating well.
Entonces a mí me gusta siempre indagar para ir mejorando, porque aunque estamos hablando aquí de adulto, pero cuando yo mejoro mi práctica educativa, estoy trabajando para la infancia, o sea, para la primera infancia, estoy formando generaciones, porque cuando yo me documento, cuando yo aprendo más para poder mejorar mi práctica pedagógica, pues estoy ayudando a esos pequeñitos y eso era son la generación que nos van a suceder a nosotros y

realmente lo que me identifico mucho con esa parte, me gusta siempre estar mejorando e indagando, investigando muy bien.

I came from a family where all of my aunts are pedagogues, all of my aunts are teachers. They are now all retired and resting in their homes, but even from their homes they continue contributing to educational efforts, with the system. In fact, they are outside of the country and even live in the United States, and they continue work throughout their network. And I don't know, me, I live it, it's just something innate. I would say it is something innate because I live it, I love it, I like to work with children. In fact, in the emotional aspect, when all human beings are in situations and when I arrive to my institution, and when I begin to interact with children and other people, like everything changes, like I forget everything [outside] and get into a flow as I work.
Yo vengo de ya vengo de una familia donde todas mis tías son pedagoga, todas mis tías son maestras. Ya hoy en día están todas pensionadas, toda jubilaba ya en sus casas descansando, pero aun así desde su casa pensionada sigue haciendo un aporte todas a la labor educativa. Entonces al sistema. De hecho están fuera del país y aún así viven en Estados Unidos y aún así viven haciendo sus aportes a través de las redes y. Y no sé, yo, yo me lo vivo, es como algo innato. Yo diría que es algo innato porque yo me lo vivo, me lo gozo, me gusta trabajar con pequeños. De hecho, en el aspecto emocional, cuando todos los seres humanos tenemos situaciones y cuando yo llego a mi institución, que empiezo a interactuar con los pequeños y con las personas, con las demás personas, como que todo cambia, como que todo se olvida y afluir a trabajar.

I like to read, and they say that the person who reads has the right to the word.
Me me gusta leer y dice que la persona que que lee tiene derecho a la palabra.

No, I immediately said yes. Since they made the call, I said yes, of course, I will do it and I began to investigate what it was about.
No, yo inmediatamente me dije aquí sí. Desde que hicieron la llamada le dije sí, pues claro, por supuesto, yo lo asumo y yo también me puse a investigar qué era este.

I come from a family with many principles and ethical and professional values. So, from the beginning we want to do things right, as it corresponds to the situation and is demanded of us.
Yo vengo de una familia con muchos principios y valores éticos y profesionales. Entonces desde un principio queremos hacer las cosas bien hecha, como corresponde y como demanda.

I see STEM as a strategy for learning. A no, look, I tell you that in this project I've grown a lot as a professional and as a person, because it really opens to you doors and gives me many opportunities, and there they are. It's something that in early childhood we thought was impossible. I'll tell you about something in particular that we saw as impossible, in the sense that we would say how a child can work and have life, have a child can work through mathematics, science. What is this, right? So, I didn't ask a lot, but really it is possible, because children are naturally scientists and investigators. So I look at this and I see it as a big jump and a big opportunities for creating change.
STEM como como estrategia para aprender. Ah, no, mira, te digo que en este proyecto yo he crecido bastante como profesional y también como persona, porque realmente te abre las

puertas y te da muchas oportunidades y y están. Es algo que en primera infancia lo veíamos como imposible. Te voy a hablar en particular yo lo veíamos como algo imposible, en el sentido de que decíamos como un niño puede trabajar y tiene vida, como un niño puede trabajar matemáticas, ciencia. Qué es esto, verdad? Entonces no cuestionaba mucho, pero realmente sí se puede, porque los niños son por naturaleza científicos, por naturaleza son investigadores. Entonces este yo lo veo como una un gran salto y una iún y una gran oportunidad para crear cambios.

I'm not going to shut up, and I will not remain quiet.
Porque no me voy a callar, no me voy a quedar quieta.

The first thing is that I like to be in a state of constant improvement. A leader recognizes what he does well and what he can improve. A leader recognizes when he falls and when he gets up. And really, for me personally, I like to always be in a state of constant improvement. I think that that would be one of the principal characteristics.
Lo primero es que me gusta estar en constante mejora. Un líder reconoce y reconoce lo que hace bien y lo que puede mejorar. Un líder reconoce cuando se cae y cuando se levanta y. Y realmente a mí en lo personal me gusta siempre estar en constante mejora. Y creo que eso sería una de las características principales.

Yes, I really used to think that being a leader was something unachievable, that one could never really be a leader. But really, with the experience that I have had, que a leader can be born and a leader can [also] be made. That a leader can work on himself and identify other leaders. A leader identifies, I say it again, when he should improve. A leader is an agent of change, and I dream, that God will make it possible for me.
Si realmente antes yo pensaba que un líder era algo como inalcanzable, que uno nunca podría ser líder, pero realmente con la experiencia he logrado que que realmente un líder se nace y se puede formar. Que un líder puede trabajarse de un líder identifica otros líderes. Un líder identifica. Vuelvo y te repito cuando debe mejorar. Un líder es un agente de cambio y yo sueño y yo sé que papá Dios me lo va a hacer posible. Yo sueño con que la educación del sistema dominicano sea una educación más sistemática en el sentido de que pueda. Ser mamá planeada, más planificada, que no haya tantas improvisaciones en sus políticas. Yo sueño con todo eso.

Commentary:

It is clear from this story how important steppingstones are to leadership: capacity-building, instructional change, and then the resources to support systemic change. (Is this more than a "train-the-trainer" model? Yes, I think so, because this is also about building up direct peers and administrators into the network).

Vanessa

Member-checked on **18 December 2021**, with no substantial changes requested.

Synopsis: Vanessa became skilled as an early childhood mathematics education because of a personal choice, encouraged by a university faculty member in a two-year professional development program, to specialize in her area of greatest weakness. Vanessa feels that she learned math and science in a very traditional way (worksheets, equations), and she feels like she "blocked" that part out of her brain since childhood, feeling as though she was unable to really embrace math. One of her main goals is to demonstrate to others that math can be taught through children's play.

As part of her pre-service education, one university professor, who had previously studied in Germany, was particularly inspirational. He introduced her to constructivism, encouraged her to read widely, and to reflect on the importance of her role as innovative educators to pull children out of poverty. Once certified, she began to put this ethic into her work at an underserved school outside of Lima. After about fifteen years of working in rural school settings, one of her supervisors observed her instructional skill, and in 2009 asked her to support her in providing professional development to other teachers. A year later, she was offered a scholarship to take part in an in-service program for "second specialization" put on by the Catholic University, which required her to take on an active research project focused on what she perceived as her biggest *weaknesses* as a teacher. As a result, she chose math (as opposed to the communication emphasis), because she felt that math and science had always been abstract for her. This experience helped her to become familiar with educational theory on discipline-specific teaching and learning, and to recognize her own classroom as a

laboratory for her own learning.

Vanessa's leadership in STEM education began when Vanessa became a coach to fifteen other teachers in under-resourced schools, which she loved. Working with a branch of the national ministry of education, Vanessa was asked to give a group training session. Her supervisor encouraged her to have confidence in herself as an evaluator because her own classroom practice was exceptional.

As part of the closing ceremony of the university professional development program, Vanessa's final project was selected to be showcased. The Ministry of Education attended the closing ceremony, helping her to get recognition for her project, which connected math and art. At the urging of her supervisor, she entered the project into a local teaching competition, and has won numerous local, regional, and national prizes since then.

Since then, Vanessa now is regularly called out of her own classroom to do professional development programs for others. She was initially worried about teaching in the big city, but she has had a supportive set of colleagues, and is currently working to institutionalize her approach across her own school.

Vanessa credits her first step toward self-efficacy for strategic leadership to her mother, who helped her to see that her life is ultimately about service, and about being a person who contributes to humanity. She also regularly makes mention of her supervisor and her inspirational professor, who helped her to think deeply about constructivism.

Uniqueness among other cases:

This is the only case in which a teacher delved deep into STEM content head-on. Her underlying passion seems to be helping others to find joy in realizing that math is everywhere, from indigenous music to the form of the human body. Because of her background, she feels a strong affinity to working in schools with limited resources.

Prominence of Self-Efficacy for STEM Teacher Leadership:

This individual demonstrates exceptionally strong STEM identity (primarily through the integration of math and art). While she has needed encouragement along the way,

Findings: Self-efficacy for STEM teacher leadership originated from:

- Generosity of mother towards those who were more needy, including a girl who loved folklore dance, but she couldn't participate alongside Vanessa because of her need. So, her mother sewed the dress for her.
- University professor who pushed them to embody constructivism, to see things from other perspectives (including exploring areas of high deprivation)
- Stepping toward her own fear of math
- External recognition for her excellence in teaching, generally

Possible Excerpts:

I explain that I do this project because as a child I learned math in a very, very traditional way, and the truth is that I didn't understand. It's always been hard for me, this subject, no? So I dedicated myself to study, to see emphases, more than anything, to the theoretical aspects of mathematics pedagogy in early childhood. That's where that enthusiasm comes from. That is

the challenge for me.
Es explico que hago ese proyecto porque de niña yo aprendí las matemáticas de una manera muy, muy tradicional y la verdad es que no entendía, son secundarias. Se me ha hecho siempre bien difícil. Esta área no? Entonces me dediqué a estudiar, a ver enfoques, más que nada a los aspectos teóricos de la didáctica de las matemáticas en el nivel inicial. Ahí es donde parte la esa entusiasmo, esa este reto para mí.

So I started to discover that math was everywhere, in concrete elements that surround us, as well as in those Kandinsky paintings and (inaudible), because they are both painters that we worked with in that, in that project, and which ended up excellent for those kids. They were fascinated. They started to admire paintings, appreciate plastic expressions, and at the same time we worked with the [human] body.
Así empecé a descubrir que que la matemática estaba en todos sitios, en los elementos concretos que nos rodean, como también en estas pinturas de Kandinsky, pol plina, porque son dos pintores que trabajamos en esa, en ese proyecto y nos resultó, pero realidad excellente con los chicos. Se maravillaron, empezaron a admirar lo que son las pinturas, apreciar estas expresiones plásticas y al mismo tiempo trabajamos con el cuerpo.

In high school they would give me a book, and I had to repeat the formula. So that part got blocked [in my mind]. So I think that that also motivated me a lot to study so that our children, so that our children wouldn't have that, as I say, the need to learn, that need to learn, that was never developed in me.
Van al colegio porque me ponían el libro, tenía que repetir la fórmula. Entonces como que esa parte se bloqueó en mí. Entonces creo que eso también me motivó mucho a estudiar para que nuestros niños, para que las niñas no tuvieran esa, como te digo, esa necesidad de aprender, de esa necesidad de aprendizaje que a mí nunca sé, se llegaron a desarrollar.

I tell the kids, 'kids, we're all learning together, because I don't know a lot either.' I always tell that kids that and they laugh. Well no, they don't think I know everything, but that we are all learning.
Yo les digo a ellos por chico si yo le digo chico, pero estamos aprendiendo todosâ€, porque yo les digo chicos que yo tampoco sé mucho, siempre converso con los niños así ellos se ríen. Pues no, no crean que yo sé todo, si no que todos estamos aprendiendo.

So this professor had done a specialization in Germany. This guy, about constructivism, they had sent him to Kade, and that's where he went. I think one year or two years. So he taught in the university where I got my teaching degree, Saint Martin de Porres. So, he sent us to explore, to get to know other realities, where there was a lot of deprivation.
Entonces este profesor había hecho una especialización en en Alemania. Este sobre el constructivismo lo habían mandado a Kade, pero allá estuvo. Creo que un año o dos años. Entonces él enseñaba en la universidad donde yo obtuve mi título de maestra de San Martín de Porres. Entonces él nos nos hizo oler a pellet, nos nos mandó a que investiguemos, a que conozcamos otras realidades, así muy deprivadas.

There was also a training for all of the teachers in UGEL, and I went and I said let's start doing teacher trainings in a voluntary way. That's where everything started. People loved it. When I

took them in my hands to training courses, I took to them the practices that we did in the classroom, and they told me 'How lovely, Milagritos! You are sharing with us what you do in your own classroom.'
Entonces hubo una capacitación también para todas las maestras de esta UGEL y yo fui yo les dije empecé a. Hacer formación docente y no de una manera voluntaria, con voluntariado, siempre me ha gustado. Ahí empieza toda esta. Si se podría llamar liderazgo, no, porque siempre hay. A las personas les encantaba. Cuando yo les llevaba en las manos los cursos de formación, les llevaba si las prácticas que hacíamos en el aula y me decían qué lindo Milagritos no nos está mostrando lo que haces en tu co, en tu salón.

But as [colleague] invited me to that program, I told her, '[colleague], but I haven't received any course about monitoring,' because one has to monitor teachers, manage all of this, afterwards, reflection, do coaching, and all. And she says to me, 'Milagritos, but look, I've observed you in your classroom,' she said.
Pero como la como [colleague] me invitó para este programa, yo es yo dije [colleague], pero este yo no he recibido ningún curso de monitoreo porque este había que monitorear a las profesoras, manejar lo que es este, después la reflexión, no hacerle el acompañamiento, en fin. Y me dice Milagritos, pero mira, yo he observado en tu salón qué bonito trabajas, me dice.

Vanessa, why do you feel insecure if you are capable? Besides, when you were at the university, we also presented our work, and you do really well.' So I accepted the truth and it was like a difficult challenge.
[Vanessa], por qué te sientes inseguro así si vas a poder? Además, tú cuando en la universidad, porque también presentamos nuestros trabajos, tú lo haces muy bien, así que le acepté la verdad este y así fue como un reto difícil.

Because look, Rebecca, I think that the career of being a teacher is, it's a social service that you do, it's a way of life, and for me, in my case. So, I think that we teachers have to be always offering a support of service to others, no?
Porque mira, Rebeca, yo yo pienso que esa carrera de de ser maestra es no, eso es un servicio social que haces, es un modo de vida ya para en mi caso. Entonces yo creo que los maestros tenemos que estar siempre prestando un apoyo de un servicio a los demás, no?

I tell you, my mother always said, 'You have to give without receiving anything.' I give without expecting anything, because in some other way they will give you retribution.
Te digo mi mamá siempre decía tú tienes que dar sin recibir nada, doy sin esperar nada, porque después por otro lado te van a retribuir…

Well, and the contests I have won? Well no, and without desiring it, because also my director told me, 'Go on Mrs. Vanessa, you have to go to the contest.' I tell her, 'But why am I going to go?' 'No, you don't have to go.' Totally, with the impulse of my first principal I won that contest and afterward, the other one, and well, this year, the national contest.
Bueno, y los concursos que he ganado? Pues no, y sin querer, porque también a la directora me decía Ballas me trataba de usted. Pues vaya señora [Vanessa], tiene que ir al concurso hoy le digo, pero porque qué voy a ir? No, no, no tiene que ir. Total, que con el impulso de mi

primera directora gané ese concurso y ya después el otro concurso que que gané, pues este año el concurso nacional.

Commentary:

Vanessa has a very strong growth mindset, and models learning by learning alongside her classroom children.

Vanessa is very clear that she did not get into leadership or teacher education for the money. While teacher educators often make double the amount of classroom teachers, she says that she had no idea how much they made when she first agreed to become a teacher educator, and that she still prefers classroom teaching.

Andrea

Member-checked on **30 January 2022**, with a small change requested to better explain that it was *external* pressures from people who knew her family (not from her own family) who challenged her decision to become a teacher.

Synopsis:

Andrea credits her steps toward STEM teacher leadership with the fact that she did not have a positive experience at one of her first schools, perhaps because the administration was intimated. She felt unsupported and imprisoned. However, an external evaluator visited her classroom, and was impressed. The evaluator ultimately invited her to participate in teacher professional development sessions, to the distaste of the administration. Both the evaluator and

Andrea asked to be transferred from the school, to a more supportive environment, where she felt that she was able to transform "from a caterpillar into a butterfly."

Ultimately, Andrea was able to make her way onto the international stage through a personal invitation from the Institute for Professional Development of her country to participate in the ITEN Teacher Fellowship. While at first she had no familiarity at all with STEM, especially knowing her weaknesses with math, she knew that she was fascinated by physics. She grew in confidence when she realized that she was not alone in the way she felt (when she met the other Teacher Fellows), and when she heard Dr. Christine Chaillé speak and read her book as part of the activities in Peru.

Her growth as a leader has also been marked by her father's insistence on education as his best legacy. Despite this, social pressures (from teachers and family friends) to consider a career as a doctor or an engineer initially caused her to hesitate in her decision to become a teacher, as people knew that no one else in her family was a teacher.

Now, emphasizing the validity and value of being a classroom teacher is a part of her personal ethos, her "North star" that guides her work. She has carried out two professional development courses for other early childhood teachers (in collaboration with four other ITEN Teacher Fellows). Additionally, she has been deeply involved in efforts of the Ministry of Education to provide virtual workshops to teachers across the region, including serving as an instructional model for a series of demonstration videos. She has also contributed to the development of a MOOC by a national scientific academy in another country.

At the core, Andrea feels that she shouldn't keep what she learns to herself. She sees her opportunities to grow in the moments when people request things of her. She has never had to ask for opportunities, and she rarely gives much thought to it when people invite her–she always says yes. She wants to ensure that all new teachers have the opportunities she has now, and that she didn't have when she started the profession.

Uniqueness among other cases:

This individual speaks very metacognitively about her growth as a STEM teacher leader. She credits the ITEN Fellowship as opening up a "panorama" of possibilities, and then helping her feel empowered because she was able to do things in community.

She also recognizes the role of luck in her life. Reflecting on her very difficult first years of teaching, she realizes that had she not stuck around at her school for some time, she probably would never have been identified by the evaluator, and therefore would not have had the opportunities she has today.

Andrea received some direct whiplash from one of her evaluators more recently, because Andrea doesn't think that people like to think that teachers have the potential to do more than instructional work. She feels she needs to be careful, even if she is a humble person, to avoid inciting the ire of others.

She did not receive encouragement from family friends to become a teacher. While their

family deeply valued education, most of the members of her family were doctors and engineers. No one was a teacher. She regularly felt she had to defend her decision to study education, which she made only after entering the university.

Prominence of Self-Efficacy for STEM Teacher Leadership:

Very high.

Tentative findings: Self-efficacy for STEM teacher leadership originated from:

- External evaluator's recognition of her classroom teaching excellence
- Personal need to combat resistance, both in justifying her career choice as an educator (a life of service) as well as her engagements as a credible leader
- Finding consolation in peers that she could step toward her fear of math to gain familiarity with STEM to help others overcome their fear as well, which she sees as an obligation of the teaching profession
- Recognizing new possibilities for service (her definition of leadership) because of her involvement with ITEN.

Possible Excerpts:

And you all encourage us in so many things that perhaps I would never have known about five years ago. Or, to have said no, it's not possibile, or who knows? And also that vote of confidence that you give us, really, to always be at our side, it pushes on to dare to do things. O maybe, for example, I never imagined myself doing a webinar, honestly…
Y nos impulsan a tantas cosas que tal vez este no hubiera conocido hace cinco años. Pues de haber dicho no, atrofiar no va a poder o quién sabe? Y también ese voto de confianza que ustedes nos dan verdad de estar siempre a nuestro lado, lo impulsa uno a atreverse a hacer cosas. O sea, por ejemplo, yo jamás me imaginé hacer un webinar jamás verdad…

When you present us this whole panorama, everything we can encounter, right? Of everything that we can do, and maybe when we started we really didn't have it clear what we were going to achieve. But if you ask me if I was going to end up giving a virtual course, obviously I

didn't do it alone, I did it with my soulmates. Never, never would you have seen me. In fact, in 2010, did you think I could have created a course like this? No, no. It's because you have transferred to us that empowerment, right?"
Cuando ustedes nos presentan todo este panorama, a lo que nos podemos enfrentar, verdad? De todo lo que podemos hacer y tal vez cuando iniciamos no teníamos claro lo que vamos a lograr. Pero si usted me pregunta que si yo iba a llegar a dar un curso virtual, obviamente no lo hice sola, lo hice con mis compañeras del alma. Jamás, jamás usted me verá. De hecho, en el 2010. O sea, usted cree que pueda hacer un curso de esto? No, no, pero es porque ustedes nos han transmitido ese empoderamiento, verdad?

I've always been interested in collaborating and helping, how to serve. That's it. It's like a characteristic of mine, right? I've always believed that one should not keep all that knowledge to themselves.
A mí siempre me ha interesado como como colaborar y ayudar, como como servir. Este es. Es como una característica mía, verdad? Siempre he creído que que uno no se puede quedar con todo ese conocimiento.

I told my colleagues that I felt like a prisoner and I was like a worm, right? To say it that way. But that afterward, like I converted into a butterfly. I gave myself that space, right? To, to help. And that has been my theme. You'll see, now with all of this. You'll, see, I said, and I don't know anything about STEM, I didn't know anything. And I remember when [colleague] sent me on an interview for this STEM thing, she asked me, 'Would you be willing? To share your knowledge with other teachers, not just within your own institution, not within your own closed circle.'
Yo le decía a mis compañeras yo me sentía como como prisionera y y como era un gusano, verdad? Por decirlo así. Pero ya después como que me convertí en una mariposita, me diese espacio verdad? Para. Para ayudar y. Y esa ha sido mi temática. Verá, ahora con todo esto. Verá, yo dije yo no sé nada de STEM, yo no sabía nada. Y yo recuerdo que cuando [colleage] me mandó una entrevista para todo esto del estèn y todo, ella me preguntó Usted estaría dispuesta? A compartir sus conocimientos con otras profesoras, no sólo de su institución, no sólo de su círculo, digamos cerrado.

STEM, as I always say, I don't know everything. It's that we definitely aren't experts, but we have the interest to share and to learn.
STEM, como yo siempre digo no lo sé todo, es que no somos expertas definitivamente, pero tenemos el interés de compartir y de aprender.

Because I believe that they are opportunities to learn and to grow, because I think that just as I was a teacher, and I wanted to have support that perhaps I didn't have at the beginning, right?
"Porque yo pienso que son oportunidades para aprender y para crecer y porque pienso que que así como yo fui docente y yo quería tener el apoyo que tal vez al inicio no tuve verdad?"

My father was this, a very active person, and he always would tell me that opportunities are not to be lost. He tells me today that one must use links to take advantage of, and that one can learn from anything, from anything.
Mi papá era este, una persona muy activa y él siempre me decía las oportunidades no se

desaprovecho. Me dice hoy que hay que usar enlaces de aprovechar y de todo se aprende, de todo se aprende.

No, I've never thought about it. Never. I don't know if that is good or bad…
No, nunca lo he pensado. Nunca. Yo no sé si eso bien o mal…

I think that I started to feel more calm and confident when I went to the weminar, and when I started in Peru, to understand that it wasn't so much that I wasn't an experte in all this. But you began to help us to see that this, it wasn't just a matter of doing mathematics, that it wasn't just about doing drop-in activities, right? Rather, that it was really about how to develop critical thinking. I remember a talk by the woman who wrote the book, Christine Chaille. She impacted me a lot, right? And then I said Yes, we can! So, we can! No, I don't have any reason to be fearful, right?
Yo creo que yo empecé a tener tranquilidad y confianza cuando fui al seminario y cuando empecé en Perú, entender que no solo era yo la que tal vez no era tan experta este en todo esto. Pero usted nos empezó a entender que era este, que no era solo hacer cosas de matemáticas, que no era este hacer proyectos así fuera de serie, verdad? Sino que era verdad como desarrollar todo ese pensamiento crítico. Me acuerdo la charla de esta de la que escribió el libro es de Christine Chaille. A ella me impactó mucho, verdad? Y entonces yo dije Sí podemos, entonces sí podemos. No, no tengo por qué tener miedo, verdad?

Beatriz

Member-checked on **7 April 2021**, with no substantial changes requested.

Synopsis: Beatriz credits her first step toward self-efficacy strategic leadership with a friend who previously worked as a science teacher evaluator on behalf of the Ministry of Education. She says that she was initially more interested in spending time with this friend, who asked for her help when visiting science teachers, than in taking on a leadership role. This friend became like a second mother to her, supporting her personally as well as professionally, shifting the direction of her career. This experience led her colleagues and the public ministry to see the work she was doing, and helped here become a resource person in general for her peers.

Now, she is actively involved in offering in-person laboratory methods workshops to teachers

in her country on behalf of her regional Ministry of Education, creating a national physics teachers association, and developing and executing a course on gender perspectives in STEM education with partners in Mexico.

At the core, Beatriz feels dedicated to this work because she believes it is in her nature to help others. This personal inclination is something that even her own preschool teacher saw in her, and she believes she emulates the generosity she saw in her own parents, who were of humble origins. She recognizes the potential she has to use her voice and be a multiplier for good practices. She also has a nuanced understanding of the political system in her home country, and understands both the formal role she might play in the future to impact policy, as well as when the timing might be right for change.

Uniqueness among Other Cases: Beatriz described both the support and discouragement she received from various levels of government for her work. Beatriz is very aware of the interplay between policy and practice, and aspires to a formal quasi-political role.

Prominence of Self-Efficacy for STEM Teacher Leadership: Very high. This individual focused mostly on her growth in instructional self-efficacy for science teaching. Becoming a resource to others was an unanticipated effect.

Tentative Findings: Self-efficacy for STEM teacher leadership originated from:

1. Administrator support / recognition of science identity in service of teacher leadership identity

2. Being invited by a close friend (even going to each other's houses)
3. Values placed on social work, political influence for equity
4. Generational advancement from humble origins, serving as a bridge between privileged and underserved communities.
5. Identity shift - Did not see herself as a leader until recently; recognizing that she has greater competencies than others in leadership positions over her

Possible Excerpts:

The first interview that Doctor Pilar did for us, when she asked us that question, I, in reality, said, inside of myself, why is she saying this? If I, in reality, don't see myself as a leader.

I couldn't stay in my seat, like others, just listening, rather something inside of me opened up, causing me to stand up and bring something to the table, but I didn't realize it until now.

So she, seeing in me what she saw, she invited me to accompany her. Let's go. And like that, without me knowing it, I started collaborating without even knowing anything about it. So I've always done it, but not with the intent to see myself as a leader even for esteem, because I didn't even even realize that I was influencing other teachers.

Well, we were friends, and she asked for my help. Can you help me with this? I don't want to go alone. And as we were friends. I'll go with you. What I want is to help you so you don't feel so overwhelmed with so much work. And that was it. That was the reason why I accepted to do it.

I was practically like her daughter and whatnot. She would always say to me, my daughter, how are you my daughter? She's not around any more in her job, because she arrived at retirement, but she left, I believe, that legacy in me, now I've realized.

Yes, when she extended the invitation to me, I didn't see it like help. Rather, that I liked to be with her and learn. I enjoyed her presence, and what I wanted was to be with her and learn what she was doing. But in reality I never did it thinking that I was going to learn much about this.

Even in preschool, my preschool teacher would say that I would stop doing what I was doing to help my little friends next to me, and she always should share that anecdote. I'm a little older now, but in thinking about that anecdote, I think there's something to it.

I can't participate in that and I shared that with her as I'm telling you. And then she told me I

believe in you.

Yes, I would like to get to that, to the level of the state (national), which I sometimes see as so difficult to get to, because I think that I can get there. My voice can be heard and perhaps things can get better in different inhospitable places of our country where nothing gets to.

I don't know where I learned it, but I tend to throw myself at things.

Commentary:

This teacher has political aspirations, perhaps influenced by the fact that her husband is an official of the Ministry of Education. She proactively reached out to me to get a letter of support to introduce herself to the prior and current regional director, and is unafraid to knock on doors. She sees potential for herself in politics, and knows that she is competent (while others who have more status might be less so!).

Appendix M: Triangulation of Tentative Findings for Each Case

Ana

Findings: Self-efficacy for STEM teacher leadership originated from:

1. Administrator support / recognition of science identity in service of teacher leadership identity
    a. **Interview 2021**: "...and she says, there's an opportunity for a teacher leadership program."
    b. **Interview 2020**: "Before getting to know [names her colleague], the director where I worked before, she said, hey [says her name], you know about science and it is interesting to you. Why don't you participate in these things?"
    c. **Reflection 2019**: "my colleagues recognize and respect my expertise in the STEM field… The administrators have a high trust in me."
2. Being invited by a close friend (even going to each other's houses)
    a. **Annual Reports** → This participant and the friend she mentions throughout her interviews do everything together, including international trips, taking shared calls from one of their homes together, and enjoying social time (evidenced by pictures on Facebook, observed interactions during virtual workshops, and casual conversations).
    b. **Interview 2021**: "And she's great at getting back to you and she helps you in whatever, and she'll come to your house if she has to, and blah, blah, blah."
    c. **Interview 2020**: "my friends or some of the other teachers, they say, call [says

her name] because she will help you.

3. Personal empathy and philanthropic motives—service-minded (seeing self in others, being grateful for contributions of others to own life, and wanting to mimic it)
    a. **Interview 2021:** "We don't have, um, professional development that are in Spanish. Uh, every everything that that that's coming is it doesn't touch that population of people."
    b. **Teacher Leadership Fund 2020:** "I am excited to help other teachers see themselves as teacher leaders. "
    c. **Interview 2020:** "I feel really happy that they have confidence in themselves to teach that and I can see their enthusiasm every time that they come."
    d. **Interview 2020:** "that's how our society gets better, because if the whole world has that perspective that we can all learn something from others, we can do things better, we can do everything better."
    e. **TF Application 2019:** "As a female, Hispanic early childhood educator, the other way I advocate for the inclusion of underrepresented groups in STEM fields is through my own modeling and excitement for everything to do with STEM."
4. Migrant status, serving as a bridge between English and Spanish-speaking worlds
    a. **Interview 2021:** "I, you know, it just put me in their place and just, and we were from, you know, [my country] is, it's not very dissimilar from, from Honduras."
    b. **Interview 2020:** "if I could change something, I'd like to have resources to support another 20 teachers, especially Spanish speakers because they want to

improve their education"

c. **TF Application 2019:** "I would also love to return to my home in [my country] to bring desperately needed professional development and resources to the educators there. I am hopeful this teacher fellowship might lead to an avenue for pursuing this dream I have."

5. Identity as a "do-er"

a. Annual Reports → This participant says yes to almost every opportunity ITEN presents to her, including activities with the Teacher Task Force (a UNESCO-managed coalition).

b. Interview 2021: "I'm like a little Energizer bunny. I, I really liked keeping busy..."

c. **Interview 2020:** "there are people with whom I worked, but they had the same opportunities to be in STEM classes, but they remained behind because they don't want to do the work"

Cara

Tentative Findings: Self-efficacy for STEM teacher leadership originated from:

1. Administrator support / recognition of science identity in support of teacher leadership identity

a. Interview 2021: "The director of ECC... I did not even imagine her expression. She was so happy. And she was so proud and she took pictures and she made me send activities."

2. Expectation from the Ministry of Education to share back what was learned through curricular and instructional reform
    a. **Interview 2021: "**We had firsthand experience. I think that was the main reason why we were chosen to, to assist with these workshops."
    b. **Teacher Leadership Plan 2020:** "After returning from the ITEN seminar I got the opportunity to collaborate with my Project Team to plan and develop an extensive guide for the training and development of administrators and teachers in the advancement of STEM education in my home country. In October, 2019 along with the Project Team I led a Ministry of Education Continuous Development "train – the – trainer" workshop for 36 early childhood school administrators which was held to further their understanding of STEM through first hand, hands on experiences. This was followed by a series of Ministry of Education Continuous Development Workshops held during the months of October and November, 2019 that included 41 administrators and 352 early childhood teachers from across the country."
    c. **Annual Report 2019:** Illustrative report showcasing photographs and curricular guide that she helped prepare.
3. Muslim faith, serving as a bridge between the public and some private (Islamic-based) schools
    a. **Interview 2021: "**What I have also been doing is over the past months, what I, what to they are to Islamic base, um, schools."
    b. **Personal Interaction at Seminar 2019:** Expressed her joy at being welcomed in Peru. She had some concerns about being identified for wearing a hijab.

   c. **Teacher Fellowship Application:** "As a woman in the field of education and specifically a Muslim woman who wears the hijab or headscarf I am at a double disadvantage where I may not only suffer gender problems but I may also be viewed as someone who is being oppressed. I believe that I can be an example for other young girls and women, as well as others male or female who may be marginalized in society whether it may be due to their religious, economic, social, cultural or physical appearance and also those with any form of disability."

4. Mother's influence in valuing education, serving as a bridge between those who have quality educational experiences and those who have not had them
   a. **Interview 2021:** "My mama. She, she did not, she did not have a formal education, but for some reason she always kept telling me, she said like, she would tell me, she say, you know, you have to take your education, you know, have to take your education."
   b. **Interview 2020:** "When I went to the school that was catering to the lower socioeconomic group, I felt real there. I felt that that was reality for me. I said if I ever saw something that was real, it was this school I could really relate to that because we will have to do the same thing that they will do."
5. IDENTITY - Did not see herself as a STEM teacher until the ITEN experience, and did not see herself as entirely competent in STEM until she began to go through the curriculum reflection process with the Ministry; recognizing that she has greater competencies than others in leadership positions over her.
   a. **Interview 2021:** "And I can't believe this is me sitting with the people way up

in curriculum." "And when I realized that there was no outside input, there was nobody else that came to our school and gave us information about STEM or about how to do activities or about what experiments to do and how to make it, um, effective for children at specially, for children at our level. And when they would talk about our school and the things we were doing, then I knew we had to be doing something right."

b. **Interview 2020:** "Even when I went to Peru I still couldn't believe that I have this huge part to play as a leader because when I went to Peru and I had to come back, the things we do now, I couldn't imagine then that we will be doing all of this just like me, I was part of all of this. That I would be part of the team to be now training the administrators in early childhood and the teachers in early childhood. That's a huge position to be put in." "I was naturally a really really quiet person, and what I came to start in a conversation I would be the last one actually...I would be more of the listener. Here I was now I had to be the one to be speaking, to parents, to teachers, to the children."

Amanda

Findings: Self-efficacy for STEM teacher leadership originated from:

1. Encouragement from her grandmother and her faith to engage in leadership where it is needed
    a. **Interview 2021:** "Yes, there are others that have the role [of leader] and they

don't take advantage of it, but you do have the interest.' I keenly remember that. 'If you have the interest, do it, that it doesn't really matter who is the leader; what matters is that the work gets done. The work needs to get done.' And she used a Christian phrase that said that there is much work to be done, but the workers are few. So that there was my challenge, and that's what I did."

   b. **Interview 2020:** "I remember in the university…[my name] started to be an echo among the people, and every time that anyone needed something, they looked for me, because I solved their problems. I realized I was a leader, and I thought to myself, this means a lot, and I understood that I needed to tread more lightly, because at some point one is responsible for a lot of people. My actions and my behavior was going to mold the behavior of others, and so I started to improve my character, to be kinder, more friendly to people…and I began to pray about the process. … Something that has always been in my processes is to put God in every step, and I feel like He has opened the gates to leadership."

2. Initial desire to be a civil engineer, emulating her stepfather's work as an electrician, but the need to give up on that dream because of low resources.

   a. **Interview 2021:** "I don't have enough economic resources to pay a university for civil engineering."

   b. **Interview 2020:** "Just like my classmates, I thought that STEM was something for rich people, for people from far-away places like Brussels, Europe…people far from our reality. But once I attained it, and I saw through it how people modeled and did STEM, I said to myself, I can do this! I stopped resisting myself, and I think that can happen to others as well."

3. Belief that you cannot become successful in STEM until you do it—you do not need to believe that you are capable now, but that you *will become* capable once you begin.
    a. **Interview 2021: "**He told me, 'You can do this. Math comes to you through your hands, and if you don't do it, you won't achieve it. You first have to do it, but before doing it, you have to believe in yourself.' I told him, 'Let's go. I think I can do it, but that's not enough. You have to execute that belief, and starting at that point I promised myself I would keep moving forward.**"**
    b. **Interview 2020:** "I feel that teachers have a lot of fears, because when one introduces them to the process of STEM and what students can get out of it, it's like going to the Moon–it's far. But, despite the fact that they don't believe it themselves, it's just the fear of breaking teaching paradigms, ways of teaching children and the general population, because teaching STEM… In our country, we should educate ourselves and break those barriers of fear of believing that we can do it."
    c. **Leadership Plan 2021:** "[I want to] reach teachers who need help, who don't know about STEM, with the goal to offer my help so that they can become leaders. … The biggest challenge is change, the possible resistance of teachers to the new age, to breaking paradigms, like resistance to STEM."
4. Visioning activities as part of an administrator visit and as part of the Peru ITEN experience
    a. **Interview 2021:** "And I told her that the top tier I think I could achieve would be Minister of Education. I would be Minister of Education, and he told me, 'You think big. It's all about the limits one puts on themself."

b. **Leadership Plan 2021:** "[I have the] condition of being a leader transformed by STEM."

Jesica

Findings: Self-efficacy for STEM teacher leadership originated from:

1. Visualization that STEM could be accessible to her and her students.
    a. **Interview 2021:** "[We imagined] that each of us was a teacher, leaders in our teaching centers and we were hosting trainings about STEM, and our practices were like an example and motivation for other teachers."
    b. **Interview 2020:** "There's not enough preparation for teachers to teach those particular areas (STEM). When one talks about engineering, it's like the biggest word, and it's when one considers that engineers are those who overachieve. It's a profession that likes to overachieve, has a lot of weight in society, and it contrasts a lot with what one is… If you say that you are an engineer, you think you are really good, intelligent, but when you say that you are a teacher, the intonation changes…like 'oh, you're a teacher.'"
2. A "desire to do something different", to not only be a regular classroom teacher
    a. **Interview 2021: "**So everything becomes systematized, like we all need to walk in the same way. So then there is, like how we say colloquially, they "cut off your wings" and you forget yourself a little. … Let's say that I overcame it, and I don't know if this is the right word...because, let's say, I disconnected from my team work on some matters, and I had to take the decision and tell

them well, if you aren't going to do this as I'm suggestion, and if we can't do it [together], then, I will do it on my own, yes."

b. **Interview 2021:** "And it was that I didn't want to just simply be a classroom teacher. Rather, not that there isn't merit in that labor, because I know that it is the most important, but when you don't have a mirror to look at those teachers, for example, that are 60+ years old and they continue in the classroom, well, surely they do their work with a lot of love. But I kept saying, I don't want that."

c. **Teacher Leadership Plan:** "It's necessary to be disquieted, to question oneself, and be interested in new ideas, updating oneself and trying to be the vanguard of the needs and interests of the populace."

d. **Reflection 2020:** "With regard to the definition of teacher leader, in some way it has connotations of change, and I can affirm that with this kind of experiences, they can empower the teacher to trust in his/her work and the impact it can have…"

3. ITEN involvement (recognition/commitment) → realizing from her interactions with like-minded peers that she wasn't totally crazy, and then the desires to do things different returned

a. **Interview 2021:** "Well, like that desire begins to appear, for me to say, I really wasn't so bad. Or perhaps, these desires that I have, these ideas that I had, they aren't crazy, or so out of left field, and yes they can give good results."

b. **Interview 2021:** "And well, I was finally able to. I should say that, initially

when we formed Team Fuerza. I started to see it take shape and yes, maybe I allowed the enthusiasm from others to impact me, in saying whether this was going to take us far or with this we are going to do a lot of things. So I now know, I should say that when we made the team as it was, I felt more affectionate toward it and more enthusiasm to do something."

Miranda → [Limited triangulation ability due to very late nomination of teacher to the program and brief responses to many assignments.]

Findings: Self-efficacy for STEM teacher leadership originated from:

1. STEM as a strategy for revolutionizing education
    a. **Interview 2021:** "I see STEM as a strategy for learning. A no, look, I tell you that in this project I've grown a lot as a professional and as a person, because it really opens to you doors and gives me many opportunities, and there they are. It's something that in early childhood we thought was impossible."
2. Family → particularly from a teacher aunt who she used to help when she was in middle school, and who is still her inspiration to this day, and from her many other aunts who continue to do good in the world, even after retirement.
    a. Interview 2021: "Yo vengo de ya vengo de una familia donde todas mis tías son pedagoga, todas mis tías son maestras. Ya hoy en día están todas lesionadas, toda jubilaba ya en sus casas descansando, pero aun así desde su casa pensionada sigue haciendo un aporte todas a la labor educativa. Entonces al sistema. De hecho están fuera del país y aún así viven en Estados Unidos y

aún así viven haciendo sus aportes a través de las redes y. Y no sé, yo, yo me lo vivo, es como algo innato."

b. Interview 2021: "Eh? Hay alguna te voy a hablar de uno en particular, aunque esa ha sido mi mi soporte, mi bastón. Realmente cuando. Yo todavía estaba, me parece, en secundaria. Yo salía de mi escuela y me iba a la de ella a acompañarla y asistirla. Yo era prácticamente su asistente y yo aprendí mucho de ella. El amor, el amor por hacer las cosas bien hechas, el amor, mejorar cada día las prácticas. Y ella ha sido como mi espejo y yo la la veo a ella como como mi. "

3. Love for reading:

a. **Interview 2021:** "Readers get the right to 'the word' [to speak up and use their voice]."

4. Impulsiveness—she said yes, then decided to figure it out later.

a. Interview 2021: "Entonces mi coordinadora del centro me pregunta como que si yo asumo el reto y yo le digo pues claro que sí. Yo realmente no sabía nada de que estaba hablando, no conocía la terminología STEM en sus siglas y. Y si yo le dije claro que sí."

5. Strong sense of values/ethics.

a. **Interview 2021:** "I'm not going to shut up, and I will not remain quiet."

b. Interview 2021: "I come from a family with many principles and ethical and professional values. So, from the beginning we want to do things right, as it corresponds to the situation and is demanded of us."

Vanessa

Findings: Self-efficacy for STEM teacher leadership originated from:

1. University professor who pushed them to embody constructivism, to see things from other perspectives (including exploring areas of high deprivation)
    a. **Interview 2021:** So this professor had done a specialization in Germany. This guy, about constructivism, they had sent him to Kade, and that's where he went. I think one year or two years. So he taught in the university where I got my teaching degree, Saint Martin de Porres. So, he sent us to explore, to get to know other realities, where there was a lot of deprivation.
2. Stepping toward and overcoming her own fear of math
    a. Interview 2021: "as a child I learned math in a very, very traditional way, and the truth is that I didn't understand. It's always been hard for me, this subject, no? So I dedicated myself to study, to see emphases, more than anything, to the theoretical aspects of mathematics pedagogy in early childhood. That's where that enthusiasm comes from. That is the challenge for me."
    b. Interview 2020: "We need training for early childhood, strategies, approaches, give us examples of the process that has to be followed in stem, we continue for example in mathematics with the problem solving approach under Piaget's approach, as well as learn mathematics under the classification seriation approaches now we use concrete material, material that groups according to their similarities, etc., games with problems that can overcome challenges, difficulties and can build mathematical thinking through these processes, songs,

rounds, and contextualize it in early childhood through movement and playful learning, but in science we would need to land it and relate it to stem to be able to put it into practice in a more efficient or pertinent way."

3. External recognition for her excellence in teaching, generally
    a. **Interview 2021:** Well, and the contests I have won? Well no, and without desiring it, because also my director told me, 'Go on Mrs. Milagritos, you have to go to the contest.' I tell her, 'But why am I going to go?' 'No, you don't have to go.' Totally, with the impulse of my first principal I won that contest and afterward, the other one, and well, this year, the national contest.
    b. Interview 2020: "Also where I studied the specialty in mathematics, but the boss contacted me to interview me and now in the summer they want to come to my classroom to record my classroom, to see the systematization of my practice. This is an opportunity for change, I feel in the clouds, I told my colleagues because I never thought that something like this would never change with me, they tell me how good you are, so simple, and committed that you really deserve it, I came back With great emotion and joy, as I never thought of this opportunity, I went to the Lord of Miracles to give him miracles. And my mother's joy, we are simple people, ordinary people, who through education have been improving, it is an illusion that one lives."

Andrea

Findings: Self-efficacy for STEM teacher leadership originated from:

1. External evaluator's invitation to take part in teacher education upon recognition of her classroom teaching excellence:
    a. **Interview 2021:** "No, I've never given it any thought. Never. I don't know if that's good or bad, but let's say…And with the evaluator, Karina is her name. She said to me, "Can you help me with something?" And my response is, "Yes, of course, what can I help you with? What can I do with you? And me, without knowing what it was really. Just saying I want to, I want to. … If they are asking for my help, it's maybe because I really can do something. So, it's at that point I throw myself at it."
2. Personal need to combat resistance, both in justifying her career choice as an educator (a life of service) as well as her engagements as a credible leader
    a. **Application 2019:** El que no vive para servir, no sirve para vivir. ~ Teresa de Calcuta
    b. **Leadership Plan 2020:** Como educadores debemos tener claro que podemos marcar vidas y nosotros dejarnos marcar, además mostrar una actitud de compromiso para transformar por medio de la educación, y así reflejar nuestra vocación. … Al ser docente fellow hay un gran compromiso de tratar de ser una persona que está al servicio de otros colegas, dispuesta a construir entre todos, experiencias y compartir conocimientos que nos ayuden en nuestra labor docente.
    c. **Interview 2021:** A mí siempre me ha interesado como como colaborar y ayudar, como como servir. Este es. Es como una característica mía, verdad? Siempre he creído que que uno no se puede quedar con todo ese conocimiento.

3. Finding consolation in peers that she could step toward her fear of math to gain familiarity with STEM to help others overcome their fear as well, which she sees as an obligation of the teaching profession
    a. **TF Application 2019:** La inclusión de las niñas en STEM está presente en las diversas estrategias de mediación que se realizan en la rutina diaria. … En cada estrategia de mediación se tiene como intención que todos se sientan acogidos, involucrados, aceptados y respetados, capaces de aprender y de eliminar barreras que limiten su aprendizaje … Sin olvidar la motivación que les debo de transmitir a todos mis estudiantes especialmente a las niñas de asumir retos y sentirse capaces. La educación en la primera infancia es para todos.
    b. **Interview 2020:** Hemos visto que a veces hacemos stem pero no sabemos que lo hacemos y podemos divulgar y creernos que somos capaces y que no solo es para las personas que han estudiado ingenierías sino también para nosotros empoderarnos de que somos capaces de generar esa mediación pedagógica con stem.
    c. **Interview 2021:** Me acuerdo la charla de esta de la que escribió el libro es de Christine Chaille. A ella me impactó mucho, verdad? Y entonces yo dije Sí podemos, entonces sí podemos. No, no tengo por qué tener miedo, verdad?
4. Recognizing new possibilities for service (her definition of leadership) because of her involvement with ITEN.
    a. **TF Application 2019:** I really want to be an expert in STEM. The more I know about it and the more I assume it every day as part of my work as a teacher, the easier it will be to transmit these experiences to others that what they seek is to

provide new opportunities and learning spaces. I personally take on this challenge, willingly and responsibly, being clear about my commitment and what I am called to as part of this team. I believe that each activity in which I am involved, each meeting, each reading, each visit or interaction space will be an opportunity to grow and learn, which will allow me to have more mastery of STEM and thus transmit with more ownership and share more effectively with others. The greater my effort, perseverance, determination to do an excellent job in this process, the greater the learning and the greater the possibility of making significant contributions to early childhood education. My attitude must be one of openness to share and transmit with clarity and conviction my positive experience about STEM in the classroom and the benefit for all. It is a chain that can gradually expand, the first is me, my students, parents, colleagues from the institution, community, circuit, educational region and other areas of the country and even share with other nations of America.

b. **Interview 2020:** Les conté un poco del proyecto y fue muy rico, porque les decía porque no solo soy yo la beneficiada, porque yo les transmito a ustedes y quiero que nuestro kínder sea un modelo. Como yo vivo en una zona muy poco privilegiada, imagínense que nuestra zona sobresalga y pensar que si logramos que los chicos que son hijos que son categorizados como hijos de prostitutas, de vendedores de droga, sean diferentes y podamos hacer que la zona se reconocida por otra cosa.

c. **Interview 2019:** Antes de la RIED yo ni me imaginaba que era STEM ni por la mente, después de la RIED uno va tomando conciencia de formarse uno y de

transmitir a los chicos, en propiciar en los niños lo que es stem, el pensar que son oportunidades para que puedan tener un mejor futuro.

d. **Teacher Leadership Plan 2020:** El regalo de ser parte de la RIED- OEA ha sido fundamental en mi vida, me ha permitido tomar conciencia de lo importante que es compartir aprendizajes, establecer redes de apoyo, construir conocimientos y sobre todo permitirse soñar y trabajar por conseguir esos sueños.

e. **Interview 2021:** Cuando ustedes nos presentan todo este panorama, a lo que nos podemos enfrentar, verdad? De todo lo que podemos hacer y tal vez cuando iniciamos no teníamos claro lo que vamos a lograr. Pero si usted me pregunta que si yo iba a llegar a dar un curso virtual, obviamente no lo hice sola, lo hice con mis compañeras del alma. Jamás, jamás usted me verá. De hecho, en el 2010. O sea, usted cree que pueda hacer un curso de esto? No, no, pero es porque ustedes nos han transmitido ese empoderamiento, verdad? He de decir no se, pues este si lo van a lograr y. Y aquí estamos nosotras para cualquier cosa, definitivamente, porque ustedes han estado a nuestro lado, pero nos hemos dado cuenta de todas nuestras capacidades y aprender a confiar en nosotras.

References

100Kin10. (n.d.) *Enriching America's classrooms with 100,000 excellent STEM teachers by 2021.* https://100kin10.org/

AAPT. (2019). *AAPT/AIP master teacher policy fellowship.* https://aapt.org/k12/aspiring_to_lead.cfm

AAPT Master Teacher Leader Task Force. (2017). *Aspiring to lead: Engaging K-12 teachers as agents of national change in physics education*. https://www.aapt.org/K12/upload/PMTL-Report-2017__aapt_fina.pdf

Adrien, M.-H. (2018). *Strengthening the capacity of teachers and policymakers from participating countries in innovative pedagogical skills: ITEN-phase III.* Unpublished evaluation report.

Aldemir, Jale, & Hengameh Kermani. (2016). Integrated STEM curriculum: Improving educational outcomes for head start children. *Early child development and care, 187*(11), 1694-1706 .

Alemdar, M., Cappelli, C. J., Criswell, B. A., & Rushton, G. (2018). Evaluation of a Noyce program: Development of teacher leaders in STEM education. *Evaluation and Program Planning, 71*, 1-11.

Alexander, P. A. (2020). Methodological guidance paper: The art and science of quality systematic reviews. *Review of Educational Research*, *90*(1), 6-23.

Ali, H. E., Schalk, R., van Engen, M., & van Assen, M. (2018). Leadership self-efficacy and effectiveness: The moderating influence of task complexity. *Journal of Leadership Studies, 11*(4), 21-40.

Amanchukwu, R. N., Stanley, G. J., & Ololube, N. P. (2015). A review of leadership theories, principles, and styles and their relevance to educational management. *Management, 5*(1), 6-14.

Anderson, D. W., Krajewski, H. T., Goffin, R. D., & Jackson, D. N. (2008). A leadership self-efficacy taxonomy and its relation to effective leadership. *The Leadership Quarterly,* 19, 595-608.

Anderson, J. A. (2006). Leadership, personality and effectiveness. *The Journal of Socio-Economis, 35*(6), 1078-1091.

Angelle, P., & Teague, G. M. (2014). Teacher leadership and collective efficacy: Teacher perceptions in three US school districts. *Journal of Educational Administration*, *52*(6), 738-753.

Anfara, V. A. Jr., Brown, K. M., & Mangione, T. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researcher, 31*(7), 28-38.

Antonakis, J., & Day, D. V. (2018). *Leadership: Past, present, and future.* In J. Antonakis & D. V. Day (Eds.), *The nature of leadership* (p. 3–26). Sage Publications, Inc.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice-Hall.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.] *Encyclopedia of mental health.* San Diego: Academic Press, 1998).

Bandura, A. (1998). Exploration of fortuitous determinants of life paths. *Psychological inquiry, 9*(2), 95-99.

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science,* 75-79.

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*(2), 164-180.

Bauman, C. B. (2018). *Exploring the "spaces between": Teachers' perceptions of teacher leadership within professional networks.* Unpublished dissertation. Scholar Commons: University of South Florida.

Berg, J. H., & Zoellick, B. (2019). Teacher leadership: toward a new conceptual framework. *Journal of Professional Capital and Community*, *4*(1), 2-14.

Berger, R. (2013). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative Research, 15*(2), 219-234.

Bobio, A. & Manganelli, A. M. (2009). Leadership self-efficacy scale. A new multidimensional instrument. *Testing, psychometrics, methodology in psychology, 16*(1), 3-24.

Bono, J. E., & Judge, T. A. (2004). Personality and Transformational and Transactional Leadership: A Meta-Analysis. *Journal of Applied Psychology, 89*(5), 901–910.

Bos, M. S., Aliston, E., Emiliana, V., & Zoido, P. (2016). *Latin America and the Caribbean in PISA 2015: How did the region perform?* Inter-American Development Bank. https://publications.iadb.org/handle/11319/7991

Brill, S., & McCartney, A. (2008). Stopping the revolving door: Increasing teacher retention. *Politics & Policy, 36*(5), 750-774.

Bundy, B., Dahl, J., Guiñals-Kupperman, S., Hengesbach, J., Martino, K., Metzler, J., Smith, J. F. “Trey”, Vargas, M., Vieyra, R., & Whitehurst, A. (2019). Physics teacher leaders influencing science education policy. *The Physics Teacher, 58*(3), 210-213.

Burger, K. (2010). How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. *Early childhood research quarterly, 25*(2),140-65.

Caine, G., & Caine, R. N. (2000). The learning community as a foundation for developing teacher leaders. *NASSP Bulletin, 84*(616), 7–14.

Camilli, G., Vargas, S., Ryan, S., Barnett, W. S. (2010). Meta-analysis of the effects of early education interventions on cognitive and social development. *Teachers College Record, 112*(3), 579-620.

Chaillé, C. and L. Britain. (2002). *Young child as scientist: A constructivist approach to early childhood science education.* 3.a ed. Oregon: Pearson.

Cheng, A. Y., & Szeto, E. (2016). Teacher leadership development and principal facilitation: Novice teachers’ perspectives. *Teaching and Teacher Education, 58*, 140-148.

Cheung, R., Reinhardt, T., Stone, E., & Little, J. (2018). Defining teacher leadership: A framework. *Phi Delta Kappan*, *100*(3), 38-44.

Chowdhury, T., J. Holbrook, and M. Rannikmae. (2020). Addressing Sustainable Development: Promoting Active Informed Citizenry through Trans-contextual Science Education. *Sustainability,* 12, 3259.

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology,* 13, 3-21.

Cosenza, M. N. (2015). Defining teacher leadership: Affirming the teacher leader model standards. *Issues in Teacher Education, 24*(2), 79-99.

Creswell, J. W. (2008). *Qualitative inquiry & research design: Choosing among five approaches, 2nd Ed.* Sage Publications.

Criswell, B., Rushton, G. T., McDonald, S. P., & Gul, T. (2017). A clearer vision: Creating and evolving a model to support the development of STEM teacher leaders. *Research in Science Education, 48*(4), 811-837.

Criswell, B., Rushton, G., Nachtigall, D., Staggs, S., Alemdar, M., & Cappelli, C. (2018). Strengthening the vision: Examining the understanding of a framework for teacher leadership development by experienced STEM teachers. *STEM teacher Education, 102*(6), 1265-1287.

Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? *European Journal of Teacher Education, 40*(3), 291-309.

Darling-Hammond, L., Hyler, M. E., Gardner, M., & Espinoza, D. (2017). *Effective Teacher Professional Development.* Research brief. https://learningpolicyinstitute.org/sites/default/files/product-files/Effective_Teacher_Professional_Development_BRIEF.pdf

Davies, B. & Davis, B. J. (2005). Strategic leadership reconsidered. *Leadership and Policy in Schools,* 4, 241-260.

Davis, K. S. (2009). Teaching elementary school science: The road less traveled. In K. C. Wieseman & M. Weinburgh, (Eds.), *Women's experiences in leadership in K-16 science education communities, becoming and being* (pp. 141-153). Springer.

Day, D. V., Harrison, M. M., & Halpin, S. M. (2009). *An integrative approach to leader development: Connecting adult development, identity, and expertise*. Routledge/Taylor & Francis Group.

Day, D., Fleenor, J. W., Atwater, L. E., Sturm, R. E., McKee, R. A. (2014). Advances in leader and leadership development: A review of 25 years of research and theory. *The Leadership Quarterly, 25*(1), 63-82.

DeBoer, G. (1991). *A History of Ideas in Science Education: Implications for Practice.* Teachers College Press.

Dempsey, R. (1992). Teachers as leaders: Towards a conceptual framework. *Teaching Education, 5*(1), 113-120.

Dillon, J. (2002). Managing teacher development: the changing role of the Head of Department in England. In P. Fraser-Abder (Ed.), *Professional Development in Science Teacher Education: Local Insights with Lessons for the Global Community* (pp. 172-186). Taylor and Francis.

Donaldson, M. L., Johnson, S. M., Kirkpatrick, C. L., Marinell, W. H., Steele, J. L., Szczesiul, S. A. (2008). Angling for access, bartering for change: How second-stage teachers experience differentiated roles in schools. *Teachers College Record, 110,* 1088-1114.

Doraiswamy, N. (2015). *A case study on STEM teacher leadership to address diversity and equity through professional development.* Unpublished dissertation. ProQuest: University of Toledo.

Doraiswamy, N., Portner, K. M., Wilson, G., Paprzycki, P., Czerniak, C. M., Tuttle, N., & Czajkowski, K. (2016). Development and validation of an instrument to assess teacher

leadership behaviors in a math-science partnership program. *Journal of School Leadership, 26*, 726-746.

Dreyer, Y. (2002). Women and leadership from a pastoral perspective of friendship. *Theological Studies, 58*(1), 43-61.

Dwyer, S. C. & Buckle, J. L. (2009). The space between: On being an insider-outsider in qualitative research. *International Journal of Qualitative Methods,* 54-63.

Early Childhood STEM Working Group (2017). *Early STEM matters: Providing high-quality STEM experiences for all young learners.* U. of Chicago STEM Education. https://ecstem.uchicago. edu/

Fensham, P. J. (2009). The link between policy and practice in science education: The role of research. *Science Education Policy. 93*(6), 1076-1095.

Fink, A. (2005). *Conducting Research Literature Reviews: From the Internet to Paper* (2nd ed.). Sage Publications.

Finkelstein, S., Cannella, S. F. B., Hambrick, D. C., & Cannella, A. A. (2009). *Strategic leadership: Theory and research on executives, top management teams, and boards*. Oxford University Press.

Freire, P. (1972). *Pedagogy of the Oppressed.* Herder and Herder.

Fullan, M. & Hargreaves, A. (1998). *What's worth fighting for in education?* Open University Press.

Fullan, M. (2020). *Leading in a culture of change.* John Wiley & Sons.

Galosy, J. A., & Gillespie, N. M. (2013). Community, inquiry, leadership: Exploring early career opportunities that support STEM teacher growth and sustainability. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 86*(6), 207-215.

Galosy, J., Mohan, L., Mohan, A., Miller, B., & Bintz, J. (2017a). *Math and STEM teacher Leadership Development: Findings from Research and Program Reviews.* (Research Report No. 2017-03). BSCS.

Galosy, J., Mohan, L., Mohan, A., Miller, B., & Bintz, J. (2017b). *Math and STEM teacher Leadership Development: Findings from Research and Program Reviews.* (Research Report No. 2017-04). BSCS.

Gareis, K. C., Priedman, M. K., Manning, C. F., & Goodman, I. F. (2011). *Albert Einstein Distinguished Educator Fellowship Program Final Report on Comprehensive and 2009-2010 Cohort Evaluations.*

Gaztambide-Fernández, R. A. (2012). Decolonization and the pedagogy of solidarity. *Decolonization: Indigeneity, Education & Society, 1*(1), 41-67.

Geertz, C. (1973). Think description: Toward an interpretive theory of culture. In Y. S. Lincoln and N. K. Denzin (Eds.) *Turning points in qualitative research.* AltaMira Press, pp. 143-168.

Gergen, K. J., & Gergen, M. M. (1991). *Toward reflexive methodologies.* In F. Steier (Ed.), *Inquiries in social construction. Research and reflexivity* (p. 76–95). Sage Publications, Inc.

Gess-Newsome, J. & Austin, B. (2010). The role of teacher leadership in science education. In J. Rhoton (Ed.), *Science education leadership: Best practices for the new century* (95-111). NSTA Press.

Gigante, N. A., & Firestone, W. A. (2008). Administrative support and teacher leadership in schools implementing reform. *Journal of Educational Administration*, 46(3), 302-331.

Global Partnership for Education. (2020). *2020 Results Report*. https://www.globalpartnership.org/sites/default/files/docs/results-report-2020/2020-09-GPE-Results-Report-2020.pdf

Gordon, I., Lewis, J., & Young, K. (1993). Perspectives on policy analysis. In M. Hill (Ed.), *The Policy Process A reader* (pp. 5-9). Harvester Wheatsheaf.

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and methodologies. *Health information and libraries journal, 26*(2), 91-108.

Greitz Miller, R. (2009). Whither thou goest: The trailing spouse or commuter marriage dilemma. In K. C. Wieseman & M. Weinburgh, (Eds.), *Women's experiences in leadership in K-16 science education communities, becoming and being* (pp. 111-123). New York, NY: Springer.

Guba, E. G., & Lincoln, Y. (1994). Competing paradigms in qualitative research. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105-117). Sage.

Hachey, A.C. (2020). Success for all: Fostering early childhood STEM identity. *Journal of Research in Innovative Teaching & Learn*ing, *13*(1), 135-139.

Hanuscin, D. L.; Rebello, C. M.; & Sinha, S. (2012). Supporting the development of STEM teacher leaders—Where do we begin? *Science Educator, 21*(1)*,* 12-18.

Hazari, Z., Brewe, E., Goerten, R. M., & Hodapp, T. (2017). The importance of high school physics teachers for female students' physics identity and persistence. *The Physics Teacher, 55*(2), 96-99.

Helms, J. V. (1998). Science—and me: Subject matter and identity in secondary school science teachers. *Journal of Research in Science Teaching, 35*(7), 811-834.

Hite, R. & Milbourne, J. (2018). A proposed conceptual framework for K-12 STEM master teachers (STEMMaTe) development. *Education Sciences, 8*(218), 1-25.

Hite, R., Vieyra, R., Milbourne, J., Dou, R., Spuck, T., Smith, J. (2020, 05). STEM teacher leadership in policy. In C. Johnson, M. Mohr-Schroeder, T. Moore & L. English (Eds.), *Handbook of Research on STEM Education* (pp. 470-480). Routledge/Taylor & Francis.

Hong Wan, Z., Jiang, Y., & Zhan, Y. (2020). STEM education in early childhood: A review of empirical studies. *Early Education and Development, 32*(7), 940-962.

Honicke, T. & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review, 17*, 63-84.

House & Aditya. (1997). The social scientific study of leadership: Quo vadis? *Journal of Management, 23*(3), 409-473.

Howe, A. C. & Stubbs, H. (2003). From STEM teacher to teacher leader: Leadership development as meaning making in a community of practice. *Science Education, (87)2, 281-297.*

Hunzicker, J. (2017). From Teacher to Teacher Leader: A Conceptual Model. *International Journal of Teacher Leadership*, *8*(2), 1-27.

IDB. (2016). *Latin America and the Caribbean in PISA 2015: How did the region perform?* https://publications.iadb.org/handle/11319/7991

International Task Force on Teacher Education. (n.d.) *Teacher task force.* https://teachertaskforce.org/

Johnson, S. & Brady, M. (2018). *Interactive: Nationwide efforts to elevate the teaching profession.* https://www.americanprogress.org/issues/education-k-12/news/2018/02/05/445879/interactive-nationwide-efforts-elevate-teaching-profession/

Kaleva, S., Pursiainen, J., Hakola, M., Rusanen, J. & Muukkonen, H. (2019). Students' reasons for STEM choices and the relationship of mathematics choice to university admissions. *International Journal of STEM Education, 6*(43).

Katzenmeyer, M., & Moller, G. (2001). Awakening the sleeping giant: Helping teachers develop as leaders (2nd ed.). Corwin Press.

Kenan Fellows. (2019). *Kenan Fellows Program for Teacher Leadership.* https://kenanfellows.org/

Kitchenham, B., Pearl Brereton, O., Budgen, D., Turner, M., Bailey, J., & Linkman, S. (2009). Systematic literature reviews in software engineering–A systematic literature review. *Information and Software Technology, 51*(1), 7-15.

Klassen, R. M. (2004). Optimism and realism: A review of self-efficacy from a cross-cultural perspective. *International Journal of Psychology, 38*(3), 205-230.

Klein, E. J., Taylor, M., Munakata, M., Trabona, K.; Rahman, Z., & McManus, J. (2018). Navigating teacher leaders' complex relationships using a distributed leadership framework. *Teacher Education Quarterly, 45*(2), 89-112.

Klentschy, M. (2008). Developing teacher leaders in science: Attaining and sustaining science reform. *Science Educator, 17*(2), 57-64.

Knowles Teacher Initiative. (n.d.). *Teachers are the key to improving mathematics and science education.* https://knowlesteachers.org/

Krakehl, R., Kelly, A. M., Sheppard, K., & Palermo, M. (2020). Physics teacher isolation, contextual characteristics, and student performance. *Physical Review Physics Education Research, 6*(2), 1-17.

Kurt, T. (2016). A model to explain teacher leadership: The effects of distributed leadership model, organizational learning and teachers' sense of self-efficacy on teacher leadership. *Education and Science, 41*(183), 1-28.

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation.* Cambridge University Press.

Lederman, N. G. & Lederman, J. S. (2010). Developing and sustaining leadership in science education in J. Rhoton (Ed.), *Science Education Leadership.* NSTA Press, 129-141.

Leithwood, K., & Riehl, C. (2005). What do we already know about educational leadership? In W. A. Firestone & C. Riehl (Eds.), *A new agenda for research in educational leadership* (pp. 12-27). Teachers College Press.

Leithwood K. & Louis K.S. (2011). Linking leadership to student learning. San Francisco, CA: Jossey Bass.

Lortie, D. C. (1975). *School teacher.* University of Chicago Press.

Louis, K. S. (2015). Linking leadership to learning: State, district and local effects. *Nordic Journal of Studies in Educational Policy, 2015*(3).

Little, J. W. (1998). Assessing the prospects for teacher learning. In A. Lieberman (Ed.), *Building a professional culture in schools* (pp. 78-106). Teachers College Press.

Little, J. W. (2003). Constructions of teacher leadership in three periods of policy and reform activism. *School Leadership & Management, (23)*4, 401-419.

Luft, A. J., Kauffman, J., Plank, L., Koba, S., & Dubois, S. (Summer 2016). STEM teacher leadership: Learning for a three-year leadership program. *Science Educator*, *25*(1), 1-9.

Lumpkin, A., Claxton, H., & Wilson, W. (2016). Key characteristics of teacher leaders in schools. *Administrative Issues Journal: Connecting Education, Practice, and Research, 4*(2), 59-67.

Maddux, J. E. & Gosselin, J. T. (2012). Self-Efficacy. In M. R. Leary & J. P. Tangney (Eds.) *Handbook of Self and Identity, 2nd Ed.* (pp. 198-224). The Guilford Press.

Mangin, M. M. (2007). Facilitating elementary principals' support for instructional teacher leadership. *Educational Administration Quarterly, 43*(3), 319-357.

Mangin, M. M. (2008). The influence of organizational design on instructional teacher leadership. In M. M. Mangin & S. R. Stoelinga (Eds.), *Effective teacher leadership* (pp. 77-98). Teachers College Press.

McCormick, M. J. (2002). Extending self-efficacy theory to leadership: A review and empirical test. *Journal of Leadership Education, 1*(2), 34-49.

McNeil, V. M. (2014). An investigation of the Perceptions of Elementary and Middle School Teachers Regarding their Participation in Distributed Leadership and Decision Making. (Published doctoral dissertation). The University of Memphis.

Medina-Jerez, W. (2016). Science education research trends in Latin America. *International Journal of Science and Math Education, 16*(3)*,* 465-485.

Mehra, A., Marineau, J., Lopes, A. B., & Dass, T. K. (2009). The coevolution of friendship and leadership networks in small groups. In G. B. Graen & J. A. Graen (Eds.) *Predator's game-changing designs: Research-based designs.* Information Age Publishing, Inc., 145-162.

Mentzer, G. A., Czerniack, C. M., & Struble, J. L. (2014). Utilizing program theory and contribution analysis to evaluate the development of STEM teacher leaders. *Studies in Educational Evaluation, 42*, 100-108.

Merriam, S. B. (1998). *Qualitative research and case study applications in education. Revised and expanded from "Case study research in education."* Jossey-Bass Publishers.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* 3rd Edition. John Wiley & Sons, Inc..

Movimiento STEAM. (n.d.). *¿Qué es movimiento STEAM?* https://www.movimientostem.org/

MSPNet. (2019). *Library*. http://hub.mspnet.org/index.cfm/library

MSPNet. (2020). *Home*. http://www.mspnet.org/index.html

Mumford, M. D., Zaccaro, S. J., Connelly, M. S., & Marks, M. A. (2000). Leadership skills: Conclusions and future directions. *The Leadership Quarterly, 11*91), 155-170.

Natchigall, D. (2019). *Collaborating, mentoring, and liaising: Analyzing what teacher leadership frameworks say and what STEM teacher leaders do.* [Doctoral dissertation]. Stony Brook University. https://www.sunysb.edu/commcms/sciedphd/publications/Collaborating_Mentoring_and_.pdf

National Academies of Sciences, Engineering, and Medicine. (2015). *STEM teachers' learning: Enhancing opportunities, creating supportive contexts*. The National Academies Press. https://doi.org/10.17226/21836.

National Council of Supervisors of Mathematics (2018). *The PRIME leadership framework: Principles and indicators for mathematics education leaders.* Solution Tree.

National Education Association. (2016). *Teacher leadership competencies.* http://www.teacherleaderstandards.org/

National Research Council. (2014). *Exploring Opportunities for STEM Teacher Leadership: Summary of a Convocation.* The National Academies Press.

National Research Council. (2017). *Increasing the Roles and Significance of Teachers in Policymaking for K-12 Engineering Education: Proceedings of a Convocation.* The National Academies Press.

National Science Board. (2018). *Science & engineering indicators 2018.* https://www.nsf.gov/statistics/2018/nsb20181/report/sections/overview/introduction

National Science Foundation. (2015). *Dear colleague letter: NSF STEM teacher leader initiative.* https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf

National Science Foundation. (n.d.). *Robert Noyce teacher scholarship program.* https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5733

NCTM. (2018). *Apply now for the 2018 NCTM/NSTA STEM ambassador program.* https://www.nctm.org/stemambassador/

Neumerski, C. M. (2013). Rethinking instructional leadership, a review: What do we know about principal, teacher, and coach instructional leadership, and where should we go from here?. *Educational administration quarterly*, *49*(2), 310-347.

NGSS Lead States. 2013. *Next generation science standards: For states, by state*s. The National Academies Press.

Nguyen, D., Harris, A., & Ng, D. (2019). A review of the empirical research on teacher leadership (2003–2017). *Journal of Educational Administration*, *58*(1), 60-80.

Nixon, R. S., Luft, J. A., & Ross, R. J. (2017). Prevalence and predictors of out-of-field teaching in the first five years. *Journal of Research in Science Teaching, 54*(9), 1197-1218.

Northouse, P. G. (2008). *Leadership: Theory and practice, 8th Ed.* Western Michigan University.

NSTA. (2018). *NSTA/NCTM STEM teacher ambassador program.* https://secure.nsta.org/about/clpa/ambassador.aspx

Nudzor, H. (2009). What is "policy", a problem: solving definitions or a process conceptualisation. *Educational futures*, *2*(1), 85-96.

OAS. (n.d.). *Inter-American teacher education network.* https://www.oas.org/en/iten/

OAS. (2003). *Inter-American committee on education.* http://www.oas.org/en/sedi/dhdee/cie.asp

PAEMST. (n.d.). *Presidential Awards for Excellence in Mathematics and Science Teaching.* https://www.paemst.org/

Paglis, L. L. & Green, S. G. (2002). Leadership self-efficacy and managers' motivation for leading change. *Journal of Organizational Behavior, 23*(2), 215-235.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543-578.

Palus, C. & Drath, W. (1995). *Evolving Leaders: A Model for Promoting Leadership Development in Programs.* Center for Creative Leadership.

PhET Interactive Simulations. (2022). *Global initiatives.* https://phet.colorado.edu/en/phet-global

President's Council of Advisors on Science and Technology. (2010). *Prepare and inspire: K-12 in science, technology, engineering, and math (STEM) for America's future.* https://nsf.gov/attachments/117803/public/2a--Prepare_and_Inspire--PCAST.pdf

Pejić-Bach, M., & Cerpa, N. (2019). Planning, Conducting and Communicating Systematic Literature Reviews. *Journal of theoretical and applied electronic commerce research*, *14*(3), 0-0.

Penuel, W. R. & Wertsch, J. V. (1995). Identity formation: A sociocultural approach. *Educational Psychologist, 30*(2), 83-92.

Perreault, G. (2005). Rethinking leadership: Leadership as friendship. *Advancing Women in Leadership, 18*(Spring).

Peterson, R. S. (1962). Leadership role of the state science supervisor. *The STEM teacher, 29*(8), 38-39.

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Blackwell Publications.

Pike, L. (2009). I don't want to be a principal! I want to be a teacher leader! In K. C. Wieseman & M. Weinburgh, (Eds.), *Women's experiences in leadership in K-16 science education communities, becoming and being* (pp. 183-194). Springer.

ProQuest. (n.d.). *ProQuest dissertations & theses global.* https://about.proquest.com/products-services/pqdtglobal.html

Prussia, G. E., Anderson J. S., & Manz, C. C. (1998). Self-leadership and performance outcomes: The mediating influence of self-efficacy. *Journal of Organizational Behavior,* 19, 523-538.

Raelin, J. A. (2016). Imagine there are no leaders: Reframing leadership as collaborative agency. *Leadership*, *12*(2), 131–158. https://doi.org/10.1177/1742715014558076

Rasberry, M. A., & Mahajan, G. (2008). *From Isolation to Collaboration: Promoting Teacher Leadership through PLCs*. Center for Teaching Quality.

Rawlins, W. K. (1992). *Friendship matters: Communication, dialectics, and the life course.* Routledge Taylor and Francis Group.

Rawlins, W. K. (2009). *The compass of friendship: Narratives, identities, and dialogues.* SAGE Publications.

Rice, R. A. (1961). Editorial: A salute to STEM teacher leadership. *The STEM teacher, 28*(4), 4-4.

Robert Noyce Teacher Scholarship Program. (2019). *The Robert Noyce Teacher Scholarship Program.* https://www.nsfnoyce.org/

Samimi, M., Cortes, A. F., Anderson M. H., & Herrmann, P. (in press). *The Leadership Quarterly.*

Sato, M., Roehrig, G., & Donna, J. D. (2010). Bending the professional teaching continuum in J. Rhoton (Ed.), *Science Education Leadership.* National Science Education Leadership Association.

Scales, P. C., Benson, P. L., Oesterle, S., Hill, K. G., Hawkins, J. D., & Pashak, T. J. (2016). The dimensions of successful young adult development: A conceptual and measurement framework. *Applied Development Science, 20*(3), 150-174.

Schunk, D. H. & Pajares, F. (2009). Self-efficacy theory. In K. R. Wentzel & A. Wigfield (Eds.). *Handbook of Motivation at School* (pp. 35-54), Routledge/Taylor & Francis Group.

Search Institute. (1997). *The developmental assets framework.* https://www.search-institute.org/our-research/development-assets/developmental-assets-framework/

Siemens Stiftung. (n.d.). *Experimento: International STEM Education Program.* https://www.siemens-stiftung.org/en/projects/experimento/

Sinha, S. & Hanuscin, D. L. (2017). Development of teacher leadership identity: A multiple case study. *Teacher and Teacher Education, 63,* 356-371.

Smylie, M. A. & Eckert, J. (2018). Beyond superheroes and advocacy: The pathway of teacher leadership development. *Educational Management Administration & Leadership, 46*(4), 556-577.

Spillane, J. P., Diamond, J. B., Walker, L. J., Halverson, R., & Jita, L. (2001a). Urban school leadership for elementary science instruction: Identifying and activating resources in an undervalued school subject. *Journal of Research in Science Teaching*, 38(8), 918-940.

Spillane, J. P., Halverson, R., & Diamond, J. B. (2001b). Investigating school leadership practice: A distributed perspective. *Educational Researcher, 30*(3), 23-28.

Spillane, J. P. (2006). *Distributed leadership.* Jossey-Bass.

Stajkovic, A., & Luthans, F. (2003). Social cognitive theory and self-efficacy: Implications for motivation theory and practice. In L. W. Porter, G. A. Bigley, & R. M. Steers (Eds.), *Motivation and work behavior* (7th ed., pp. 126-140). McGraw Hill Irwin. f

Stake, R. E. (1995). *The art of case study research.* Sage Publications.

Stake, R. E. (2006). *Multiple case study analysis.* Guilford Publications.

Stake, R. E. (2010). *Qualitative research: Studying how things work.* The Guilford Press.

Steel, C., & Craig, E. (2006). Reworking industrial models, exploring contemporary ideas, and fostering teacher leadership. *Phi Delta Kappan*, *87*(9), 676-680.

STEM Master Teacher Corps Act of 2015, S. 402, 114d Cong., 1st Sess. (2015).

STEMTLNet. (n.d.). STEM teacher leader network. https://stemtlnet.org/

Stephenson, T., Fleer, M., & Fragkiadaki, G. (2021). Conditions created by the conceptual PlayWorld model. *Research in Science Education*.

Strecher, V. J., McEvoy DeVellis, B. Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. *Health Education & Behavior, 13*(1), 73-92.

Sublette, H. (2013). *An Effective Model of Developing Teacher Leaders in STEM Education*. (Unpublished doctoral dissertation). Pepperdine University, CA, U.S.A.

Sun, A., & Xia, J. (2018). Teacher-perceived distributed leadership, teacher self-efficacy and job satisfaction: A multilevel SEM approach using the 2013 TALIS data. *International Journal of Educational Research*, *92*, 86-97.

Sunderman, G. L., Tracey, C. A., Kim, J., & Orfield, G. (2004). *Listening to teachers: Classroom realities and No Child Left Behind*. The Civil Rights Project at Harvard University.

Teacher Leadership Exploratory Consortium. (n.d.). *Teacher leader model standards.* https://www.ets.org/s/education_topics/teaching_quality/pdf/teacher_leader_model_standards.pdf

Teacher Leadership Institute. (n.d.). *Working to advance the profession and advance student learning.* https://www.teacherleadershipinstitute.org/

Toma, J. D. (2000). How getting close to your subjects makes qualitative data better. *Theory into Practice, 39*(3), 177-184.

Tourish, D. (2014). Leadership, more or less? A processual, communication perspective on the role of agency in leadership theory. *Leadership*, *10*(1), 79–98.

Tremmel, M., Gerdtham, U. G., Nilsson, P. M., & Saha, S. (2017). Economic burden of obesity: a systematic literature review. *International journal of environmental research and public health*, *14*(4), 435. https://doi.org/10.3390/ijerph14040435

Trygstad, P. J. (2013). *National Survey of Science and Mathematics Education: Status of Elementary School Science,* Horizon Research Inc.

Tsai, K. C. (2015). A preliminary meta-analysis of teacher leadership. *Journal of Education and Literature*, *3*(3), 131-137.

Tschannen-Moran, M. & McMaster, P. (2009). Fostering teacher professionalism in schools: The role of leadership orientation and trust. *Educational Administration Quarterly, 45*(2), 217-247.

Uhl-Bien, M. & Arena, M. (2001). Complexity leadership: Enabling people and organizations for adaptability. *Organizational Dynamics,* 46, 9-20.

UNESCO. (1995). *Issues in STEM teacher Education.* https://unesdoc.unesco.org/ark:/48223/pf0000101024?posInSet=1&queryId=32984f84-352e-46a6-aab1-3815974ce1a9

UNESCO: International Group of Experts on Science and Mathematics Education Policies. (2009). *Current challenges in basic science education.* https://unesdoc.unesco.org/ark:/48223/pf0000191425

UNESCO. (2015). *Critical issues for formulating new teachers in Latin America and the Caribbean: The current debate.* https://unesdoc.unesco.org/ark:/48223/pf0000243639

UNESCO. (2016). *State of the art and policy guidelines on the training and professional development of early childhood teachers in Latin America and the Caribbean.* https://teachertaskforce.org/sites/default/files/2020-07/state_of_art_and_policy_guidelines.pdf

UNESCO. (2017). *Cracking the code: Girls' and women's education in science, technology, engineering, and mathematics (STEM)*. http://unesdoc.unesco.org/images/0025/002534/253479e.pdf

UNESCO. (2020). *Global education monitoring report, 2020, Latin America and the Caribbean: Inclusion and education: All means all, key messages and recommendations.* https://unesdoc.unesco.org/ark:/48223/pf0000374790

U.S. Department of Education. (n.d.). *School ambassador fellowship.* https://www2.ed.gov/programs/schoolfellowship/index.html

U.S. Department of Education. (n.d., b). *Transforming Teaching and Leading*. https://www.ed.gov/teaching

U.S. Department of Education. (2016). *Building STEM teacher leadership.* https://innovation.ed.gov/what-we-do/stem/building-stem-teacher-leadership/stemteacherleadership/

U.S. Department of Education. (2020). *Teacher Shortage Areas.* https://tsa.ed.gov/#/home/

U.S. Department of Education. (2021). *The conditions of education 2021*. https://nces.ed.gov/programs/coe/pdf/2021/cfa_508c.pdf

U.S. Department of Energy. (n.d.). *Albert Einstein distinguished educator fellowship (AEF) program: Program overview.* https://science.osti.gov/wdts/einstein

Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology, 87*(3), 506-515.

Van Driel, J. H., Beijaard, D., & Verloop, N. (2001). Professional development and reform in science education: The role of teachers' practical knowledge. *Journal of research in science teaching, 38*(2), 137-158.

Van Tuijl, C., & van der Molen, J. H. (2016). Study choice and career development in STEM fields: An overview and integration of the research. *International Journal of Technology and Design Education, 26*, 159-183.

Velasco, R. C. L., Hite, R., & Milbourne, J. (2021). Exploring advocacy self-efficacy among K-12 STEM teacher leaders. *International Journal of Science and Mathematics Education.* doi.org/10.1007/s10763-021-10176-z

Versland, T. M. (2105). Exploring self-efficacy in education leadership programs: What makes the difference? *Journal of Research on Leadership Education, 11*(3), 298-320.

Vieyra, R. & Edwards, S. (2021). Peace in science education: A literature review. *Journal of Peace Education, 18*(2), 121-142. DOI: 10.1080/17400201.2021.1919866

Villegas-Reimers, E. (2003). Ch. 2: Why is teachers' professional development important? In *Teacher professional development: An international review of the literature*, pp. 19-30. UNESCO.

Vroom, V. H., & Jago, A. G. (2007). The role of the situation in leadership. *American Psychologist, 62*(1), 17-24.

Wallace, C. S., & Priestley, M. R. (2017). Secondary science teachers as curriculum makers: Mapping and designing Scotland's new Curriculum for Excellence. *Journal of Research in Science Teaching*, *54*(3), 324-349.

Weiner, J. M. (2011). Finding common ground: Teacher leaders and principals speak out about teacher leadership. *Journal of School Leadership*, *21*(1), 7-41.

Weiner, J., & Woulfin, S. L. (2018). Sailing across the divide: Challenges to the transfer of teacher leadership. *Journal of Research on Leadership Education*, *13*(3), 210-234.

Wenner, J. A., & Campbell, T. (2017). The theoretical and empirical basis of teacher leadership: A review of the literature. *Review of Educational Research, 87*(1), 134-171.

White, S., & Tyler, J. (2014). *Who teaches high school physics? Results from the 2012-13 nationwide survey of high school physics teachers.* American Institute of Physics.

White, S., & Tyler, J. (2015). *High School Physics Teacher Preparation: Results from the 2012-13 Nationwide Survey of High School Physics Teachers.* American Institute of Physics.

White House. (17 July 2012). *President Obama Announces Plans for a New National Corps to Recognize and Reward Leading Educators in STEM.* https://obamawhitehouse.archives.gov/the-press-office/2012/07/17/president-obama-announces-plans-new-national-corps-recognize-and-reward-

White House. (2018). *Charting a Course for Success: America's Strategy for STEM Education.* https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Pla n-2018.pdf

WorldCat. (2019). *Library*. https://www.worldcat.org/

Yazan, B. (2015). Three approaches to case study methods in education: Yin, Merriam, and Stake. *The Qualitative Report, 20*(2), 134-152.

Yin, R. K. (2002). *Case study research: Design and methods.* SAGE Publications.

Yeotis, C. G., Klein, B. S., & Weaver, S. D. (2009). Enculturation into science education: Comparing pathways and dilemmas. In K. C. Wieseman & M. Weinburgh, (Eds.), *Women's Experiences in Leadership in K-16 Science Education Communities, Becoming and Being* (pp. 16-31). Springer.

Yin, R. K. (2002). *Case study research: Design and methods.* SAGE Publications.

York-Barr, J., & Duke, K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research, 74*(3), 255-316.

Young, H. (2005). Secondary education systemic issues: Addressing possible contributors to a leak in the science education pipeline and potential solutions. *Journal of science education and technology*, *14*(2), 205-216.

Zheng, X., Yin, H., & Li, Z. (2019). Exploring the relationships among instructional leadership, professional learning communities and teacher self-efficacy in China. *Educational Management Administration & Leadership, 47*(6), 843-859.

Zinn, L. F. (1997). *Supports and barriers to teacher leadership: Reports of teacher leaders* [Paper presentation]. Annual Meeting of the American Educational Research Association, Chicago, IL.