

ABSTRACT

Title of Dissertation: FEELING PREPARED TO TEACH:
 RETHINKING THEORY THROUGH
 EXPERIENCED MATHEMATICS
 TEACHERS' PERSPECTIVES

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Researchers study teachers' feelings of preparedness to teach for various purposes; it can serve as an indicator of the effectiveness of initial teacher preparation and is often equated to teacher self-efficacy. Despite being an object of study for several decades, the theory on teachers' feelings of preparedness to teach is under-developed and the field lacks a shared understanding of what it should entail. This dissertation includes three stand-alone studies that highlight and address some gaps and assumptions in the literature on teachers' feelings of preparedness to teach. The first article draws on interviews with ten experienced mathematics teachers to examine their descriptions of preparedness and build toward a definition of feelings of preparedness. These descriptions suggest two layers of preparedness: a static/provisioning layer and a dynamic/ambitious layer. The second article uses episodic interviews with six of the ten experienced teachers to investigate their feelings of (un)preparedness when they abruptly transitioned to online teaching. It shows that the online context, and not necessarily web-based

technology, was the likely culprit for teachers feeling unprepared for online teaching. The third article builds a theoretical framework based on a review of 39 quantitative studies in the literature on teachers' feelings of preparedness to teach. This framework is mapped visually with three columns, constructs that are theorized to predict feelings of preparedness, the preparedness constructs themselves, and constructs that feelings of preparedness may predict.

These three studies come together to propose a reconceptualization of survey instruments and quantitative analysis for this topic. The static and dynamic layers of preparedness may help differentiate between the work and expectations of new teachers and experienced teachers and may have implications for both preparation programs and researchers. Contextual changes or disruptions, described in the second paper, can impact even experienced teachers, which may elevate the importance of school contexts in future analyses of teachers' feelings of preparedness. The framework maps out where the field has been and proposes update considerations to survey items specific to teachers' feelings of preparedness to teach.

Keywords: teachers' feelings of preparedness; technology; online teaching; teaching contexts

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EXPERIENCED MATHEMATICS TEACHERS' PERSPECTIVES

by

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Chapter 1: Introduction

Without a doubt, our schools must have teachers that are and feel prepared to teach. Barring that, they should be able to learn to be prepared to teach. What that preparedness looks like and where it comes from is less clear as there are many sources of preparedness for teachers and many purposes for evaluating it. Housego (1990) proposed that teachers who feel unprepared to enact a particular instructional practice may not even try it. In schools or districts with multiple teachers feeling similarly, this could lead to inaction that jeopardizes school-wide efforts or educational reform movements that require new actions or behaviors from teachers. This implies that teachers' feelings of preparedness to teach (FOPT) should be an essential consideration for those who propose and prioritize educational reforms that require teachers to change their practice.

Background

Researchers study teachers' FOPT for various purposes, including, but not limited to, determining the difference between, or the relative "effectiveness" of, various teacher preparation programs (e.g., Darling-Hammond et al., 2002; Kee, 2012; Tamir, 2013) or using a FOPT construct to anticipate teacher retention (e.g., Fontaine et al., 2012; Redding & Smith, 2016; Viviani, Brantlinger, & Grant, 2023). Preparation program characteristics and requirements (e.g., the length of student teaching) show some consistency in predicting or explaining novice teachers' FOPT. However, using FOPT to predict outcomes like teacher effectiveness and retention has not always shown promise or consistency. What we, as a field, know about

teachers' FOPT is arguably unclear; there does not even appear to be a common definition of teacher FOPT or dominant theory that might guide research on the topic (Moses et al., 2021). The lack of a clear definition or shared theory may be one reason researchers so often relate teacher FOPT with teacher self-efficacy in some way (e.g., Darling-Hammond et al., 2002; Faez, 2012; Kee, 2012) as there is an agreed upon definition and theory of the latter construct.

Statement of the Problem

To approach the problem of an underdeveloped theory, I looked to experienced teachers to help identify what aspects of teaching that all teachers need to be and feel prepared to do to be effective in the classroom. Rather than study new or early-career teachers, I emphasize experienced teachers' expertise and knowledge in helping build a framework for teachers' FOPT. Experienced teachers, an understudied group in the FOPT literature, provide insight into the work of teaching necessary to be and feel prepared to teach.

Experienced teachers may be understudied because we expect them to feel adequately, if not very well, prepared to do the various activities required for the job. At first blush, studying their conceptions of FOPT may seem unproductive, if not pointless. However, as I will demonstrate in Chapter 2 of this study, getting insights about the construct from experienced teachers provides an opportunity to uncover specific aspects of the job of teaching not already focused on in the FOPT literature. Questions that I explore in Chapter 3 of this dissertation are: What if experienced teachers feel unprepared when the job changes abruptly or drastically? Do they feel like novices again, or does it reduce their FOPT? If so, how long does it take for them

to find their stride again? What supports are helpful? An understanding of how feelings of preparedness change under unfamiliar circumstances may help teacher educators, professional development instructors, and induction specialists identify key areas to help new and novice teachers feel comfortable in *their* new roles as educators; because teaching is likely different from anything they have done before, even from approximations of practicing teaching.

Through building toward a definition, exploring a disruption to teaching, and analyzing the quantitative literature, this dissertation investigates the construct of teachers' FOPT. An overarching theme in this dissertation study, and a particular focus of Chapter 4, is pushing the field to rethink approaches to studying FOPT. For the purposes of Chapters 2 and 3, I posit that experienced teachers are more aware of the extent of the work of teaching than preservice, new, or novice teachers are. Such awareness allows for multi-layered or contained expectations for what skills teachers have at different stages. Cuddapah and Stanford (2015) found that career changers (i.e., people who started in another field and then changed to teaching) found the work different than they anticipated (their "ideals"). They specifically stated that, "thinking about the work of teaching in the abstract, such as what occurs during preservice coursework, is entirely different from when one is actually teaching" (p. 34). Here, Cuddapah and Stanford (2015) are referring to the likelihood that inexperienced teachers and those operating from educational experiences and approximations of the teaching practice (e.g., their own learning experience or student-teaching) without a complete understanding of the realities of teaching have perspectives that differ from that of experienced teachers. Preservice teachers, for

example, may be unable to provide a complete picture of being and feeling prepared for the work of teaching. Therefore, because they understand the work best, examining experienced teachers' feelings of preparedness for experienced teachers in familiar and unfamiliar contexts may provide some insights into FOPT that the field has not adequately considered or concentrated on.

Summary of the Three Articles

This dissertation includes three stand-alone studies that make up Chapters 2, 3, and 4. In the fifth and final chapter, reflecting on three stand-alone studies, I discuss ideas for future research.

Chapter 2 summary

Chapter 2 addresses the need for an explicit definition in the literature. This study collected descriptions from ten experienced mathematics teachers about what FOPT meant to them. Asking participants to define or describe FOPT was not only a prescribed element of the interview method I selected for the overall project, *episodic narrative interviews*, it was also something valuable for the field. I viewed participants' conception of FOPT important in moving forward to identify commonalities or differences between how participants and researchers might think of this construct. In truth, I expected a brief definition such as, "FOPT means a readiness to teach." Instead, the descriptions provided by the participants yielded quite detailed descriptions of the actions, knowledge, and work of teaching. These behaviors and knowledge, in general, fit into two layers, static elements of teaching, and dynamic elements of teaching. Primarily, the static layer includes efforts that may

be more relevant to new or novice teachers' FOPT. The static layer includes teaching events one can plan in advance. In contrast, the dynamic layer may be useful in describing the work of more advanced teaching maneuvers, like ambitious instruction (see What is ambitious teaching? n.d.). The dynamic layer implies events one cannot anticipate because teaching is complex, or teachers did not know to anticipate something. This may help make clear when a teacher is “experienced;” rather than merely counting their years of teaching.

Chapter 3 summary

Chapter 3 highlights a specific disruption in teaching, the shift to online instruction for the Pandemic during 2020 and 2021. Six participants shared their online teaching stories and talked about what they did and did not feel prepared to do. The study finds that this shift in context impacted teachers' FOPT in that online context; they felt unprepared for aspects of online teaching. Not all participants felt unprepared in the same way but generally fell into two categories, those that felt unprepared to connect with students on a socio-emotional level, and those who felt unprepared for instructional obstacles associated with online teaching. These teachers varied in their level of technological savviness but generally did not feel prepared to teach online, suggesting it was more the unfamiliar context than the web-based technology. This study has implications for considering how context plays a role in teachers' FOPT, whether experienced teachers or not. There are also implications for how computational technology is implemented in the classroom to account for future online teaching and similarly disruptive events.

Chapter 4 summary

Chapter 4 is a review of the quantitative FOPT literature and finds patterns in the relationships between FOPT and other theoretical constructs. This article begins with an investigation of 39 quantitative studies of teachers' FOPT and builds toward a framework. The constructs from these studies are organized into three large categories, constructs that predict FOPT, FOPT constructs, and constructs that FOPT theoretically predict. This chapter finds the quantitative literature reviewed focuses on a narrow band of these constructs. Additionally, researchers who study preservice teachers' FOPT and those that study in-service teachers' FOPT tend to have differing goals. The paper concludes by looking at some qualitative research on teachers' FOPT to address some findings and gaps in the quantitative work. FOPT is not a well-defined construct in the literature, and the intention for Chapter 4 is to help move towards a common or shared framework so that future work can better build upon relevant studies and theories.

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Chapter 2: Experienced Teachers' Descriptions for Feelings of Preparedness: "You're Going to Learn Really Quickly That You're Going to be Unprepared."

Abstract

This paper addresses the literature's lack of an explicit definition of the theoretical construct for *feelings of preparedness to teach*. The data was from a larger study and was collected through semi-structured episodic narrative interviews with experienced teachers. Teachers were directly asked how they would define or describe feelings of preparedness, and the episodes supported these descriptions. The interview analysis found two clear layers formed based on their responses, one layer is the *static* elements of teaching. The second layer refers to preparedness for the *dynamic* elements of teaching. These layers have implications for how researchers studying feelings of preparedness can structure their data collection and analysis, including quantitative modeling or condensing survey responses into factors. It may also provide a structure for preparation programs to consider when developing protocols for readying preservice teachers for the realities of the classroom.

Introduction

Feeling prepared for teaching requires an individual's sense of readiness and familiarity with teaching practices, content and pedagogical knowledge, and more (e.g., emotional preparedness, understanding professional expectations). The work of teaching is complex, and thus a challenge to reduce it or teacher preparedness for teaching to summary measures. Further, the challenge is exacerbated without an

agreed upon definition to reference; which seems absent for *feelings of preparedness to teach* (FOPT). Speer, King, and Howell (2015) said, "a definition that does not discriminate well is not useful or usable" (p115), emphasizing the importance of having a definition that discerns between different concepts.

While this study is qualitative, a long-term goal for this research project is to contribute to quantitative data collection and analysis on teachers' FOPT. Qualitative studies, such as this one, can investigate the meaning of practices like teaching and sometimes can be more explicit about the how and why of outcomes than quantitative studies. To varying degrees, quantitative models are informed by theory and even if this theory is not made explicit is often implied, for example, through the survey items researchers use, the measures they develop, and the models they build that incorporate those measures. However, there seems to be limited intention regarding how particular survey items come together to represent FOPT and measures of FOPT vary from one study to the next. Additionally, how teachers interpret FOPT survey items or measures derived from them (e.g., using averages across items or factor analyses) is valuable to consider as well, given that they, or a subset of them, are completing the surveys. I argue that research that draws on survey data of teachers' FOPT can be improved by developing a common meaning of FOPT; that is, via the development of a shared theorization of FOPT as a construct to ground the development of survey inventories of FOPT. A shared theorization or definition of FOPT can be especially valuable for quantitative work where *what* is expressed more clearly than the *how* or *why* that qualitative data can shed light on. As Moses and

colleagues (2021) found from reviewing nine studies on preservice teachers, the lack of common measures and understanding of FOPT can yield inconclusive results.

A further complication is in measuring new or novice teachers' FOPT versus that of preservice or experienced teachers. Without a definition or explicit theory of preparedness to contain or organize the different levels of experience, the term might be used interchangeably and with the same intended meaning among all levels. Casey and Childs (2007) pose a question drawing on a similar issue, namely: would a definition for a good teacher be the same for novice and experienced teachers? Researchers have speculated that the locations or contexts in which they teach might influence first-year teachers' feelings of preparedness (e.g., Darling-Hamond et al., 2002; Ronfeldt, Schwartz, & Jacob, 2014) whereas experienced teachers will draw from a longer and more varied experience and those limited, first-year experiences become data noise. Though not FOPT, Tschannen-Moran and Hoy (2007) posit that novice teachers in their study may have been "more idealistic than their more experienced peers" (p.953). These differences suggest experienced teachers are more grounded in the realities of the work of teaching.

This study seeks to leverage experienced (mathematics) teacher descriptions of FOPT to begin working toward a theoretical definition for the construct. In this way, other researchers can weigh the study results with how they interpret the term and how it compares with its use in their or other studies of FOPT.

Research Question: How do experienced teachers define or describe feelings of preparedness to teach (FOPT)? And what does that mean for future research on teachers' FOPT?

While the study uses data from experienced teachers, the second part of the question is relevant to novice and preservice teachers as well, as these groups are most often studied for FOPT. As such, the literature review includes a section on the preparedness and FOPT of preservice teachers (PSTs), new and novice teachers, and experienced teachers. Further, the literature review focuses mainly on quantitative research because ultimately, the study is meant to inform future quantitative research on teachers' FOPT; that is, ideally quantitative researchers will be able to apply the qualitative results of this study as a way to improve their measures of and models incorporating teachers' FOPT. The discussion includes a reflection about what the findings may mean for FOPT research regarding PSTs and new or novice teachers.

Literature Review

The literature review focuses on the range of ways that FOPT have been conceptualized in the quantitative literature. I also include a short discussion about teacher preparedness (i.e., not “feelings” but outside perspectives). Overall, the relevant literature identifies discord and disagreement regarding what FOPT and preparedness encompass and mean. While the literature on preparedness to teach (“objectively”) is broached, the vast majority of studies either skate over what is meant by FOPT or liken it to self-efficacy. I will focus on the comparisons to self-efficacy because it is well defined, and even when researchers focus on a nuanced and targeted element of self-efficacy, there is general agreement on what it means. To connect experienced teachers' FOPT with other experience levels, I conclude the literature review with contrasting studies for preservice, new and novice, and experienced teachers' FOPT.

Teacher Preparedness

Teacher preparedness refers to ways in which stakeholders define or determine preparedness to teach outside of a teachers' own self-reflection or self-reflection about it (e.g., FOPT). These stakeholders may be state agencies, researchers, teacher preparation program entities, schools and districts, and even teachers. In the case of teachers, their FOPT or their self-reflections on their preparedness to teach for particular aspects of teaching. For example, Boston (2012) described the use of a tool to quantitatively measure instruction, called the Instructional Quality Assessment. This observation assessment tool quantifies what elements of ambitious teaching are observed in a lesson. Ambitious teaching "is teaching that aims to teach all kinds of students to not only to know academic subjects, but also to be able to use what they know in working on authentic problems in academic domains" (Lampert, Boerst, & Graziani, 2011, p. 1362). Lampert and colleagues discuss how challenging ambitious teaching can be to implement, which include, but are not limited to, being responsive to student knowledge and thinking in that particular classroom, and fostering an environment where students feel safe (socially) to share their ideas and thinking. In a similar way, Stein, Smith, and Silver (1999) said, "effective teachers have both a principled knowledge base and the ability to access and use this knowledge base in the very noisy, interactive, moment-by-moment decisions that constitute teaching" (p. 265). Here, noisy is used in the statistical sense to describe how teachers are inundated with all kinds of information in the classroom, and must identify important information to determine student understanding and move the class forward. Similarly, FOPT may have implications

for whether ambitious practices are attempted. Eidi et al. (2011) found that teachers spent less time on topics they did not feel prepared to teach, this may also suggest that teachers unprepared to teach in particular ways will avoid ambitious practices.

Some researchers have tried to link externally-rated preparedness (rated by someone other than the teacher, not self-rated) values with FOPT (i.e., self-assessed by the teacher). For example, Casey and Childs (2007) identified a framework that includes knowledge and skills (externally-rated preparedness), and attitudes (includes FOPT) of beginning teachers to do the work of teaching. Casey and Childs (2007) depict preparedness for teaching as the time between completing a teacher preparation program and the in-service teaching work. However, they explicitly differentiate between a teacher's internal reflection on their preparedness to teach and an outside perspective on that same person's preparedness to teach. In a second study, Casey and Childs (2011) showed that there was a meaningful and statistically significant difference in ratings between preparation program course instructors and teacher candidates. Though only 21 mentor teachers (mentored teacher candidates) participated, were significantly different from the course instructors and consistently rated the teacher candidates the lowest. Casey and Childs posited that the mentors may have been rating candidates as they would rate expert teachers, which arguably differed from the perspective of the instructor and candidate. Their findings suggest different stakeholders interpret preparedness differently, while rubrics exist for external evaluation, little has been created regarding internal evaluation.

Definition Elements of FOPT

While research that collects data and reports on teachers' FOPT generally fail to include a formal definition of FOPT, a few studies include descriptions and/or what approaches a definition of the construct. Mason (2002), though not studying FOPT, suggests considering the roots of preparedness, specifically, "paration or 'readiness', stresses something done in advance" (p. 84). Emphasizing the advance work of teaching resonates with Parsad, Lewis, and Farris' (2001) description of preparedness to teach as "what the teacher brings to the classroom from preservice training and on-the-job learning" (p. 9). Parsad and colleagues' use of the term "what" brings to mind things, either tangible or not, that contribute to feeling prepared, but still, we do not get a sense of the specifics. These descriptions suggest in some ways that preparedness may be a result of relevant grounding and experiences in education theory, content knowledge, and practice that allows one to do the job or approximate the job of teaching (approximate because preservice teachers are included in some FOPT studies).

Self-efficacy, a related construct that has received much more attention, is more developed, and seems to have a shared meaning, is often included in FOPT studies. Sometimes researchers allude to a connection between self-efficacy and FOPT (e.g., Miller, McKenna, & McKenna, 1998), other times researchers indicate that the constructs are essentially the same by citing other researchers who have made the same claim (e.g., Tamir, 2013). Again, there is no explicit and agreed upon definition for FOPT to anchor these claims. Yet, the process of connecting self-efficacy and FOPT, in many cases, suggests that researchers acknowledge a

difference between the two, otherwise, they would just reference *self-efficacy*. Other researchers use *self-efficacy* and *FOPT* interchangeably (e.g., Faez, 2012; Kee, 2012; Jamile, Downer, & Pianta, 2012). All this adds to the confusion about how to conceptualize and measure FOPT.

Stites et al. (2018), perhaps provide the closest structure to a definition of FOPT. Stites and colleagues said, “preservice teachers’ perceptions of preparedness are associated with their beliefs about their abilities as well as their responsibilities as both a pre-service and in-service teacher” (p. 23). Stites and colleagues’ definition is similar to Bandura’s (1997) definition of the self-efficacy construct; that is, “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). According to Bandura, the word attainment—which may be one significant difference between FOPT and self-efficacy—is in reference to “desired effects by [one’s] actions” (p. 3). Self-efficacy survey items for teachers are often very specific and implicate a measurable outcome for students, or “effect” for the action in question (e.g., “when I really try, I can get through to most difficult students,” from Ronfeldt, Reininger & Kwok, 2013). In contrast, in general, FOPT survey questions are relatively broad (e.g., “How prepared do you feel to manage student behavior,” from Ronfeldt, Reininger & Kwok, 2013).

Teacher Experience and FOPT

This section briefly reviews studies that include a focus on the FOPT of new, novice, or experienced teachers. Considering these studies together provide insights about the relationship between levels of teaching experience and teachers’ FOPT.

Intuitively, at least, it seems that experienced teachers are more aware or

knowledgeable about what it means to be and feel prepared to teach than new or novice teachers. Consider the proposed similarities between self-efficacy and teachers' FOPT. Tschannen-Moran, Hoy, and Hoy (1998) find that over time, teachers' self-efficacy first drops and then stabilizes, suggesting that more experienced teachers' sense of self-efficacy may better represent their beliefs.

Much of the literature on teachers' FOPT focuses on the early careers of teachers. The terms “new” or “novice” have various meanings.¹ Some of these studies about new or novice teachers capture differences in FOPT between traditional certification and alternative certification programs, for example, to make claims about differences between routes (e.g., Darling-Hammond et al., 2002, Cohen-Vogel & Smith, 2007; Kee, 2012; Miller, McKenna, & McKenna, 1998; Redding & Smith, 2016; Zientek, 2007). The findings of which are mixed. Darling-Hammond and colleagues, for example, found small but significant differences between FOPT of teachers from alternative certification programs and traditional ones, where traditionally certified teachers felt more prepared. On the other side, Cohen-Vogel and Smith found no significant difference between the two routes. This disagreement in conclusions could be due to how “novice” is defined, Cohen Vogel and Smith included fourth year teachers in their study, perhaps this additional year of teaching can make a difference.

¹ Some FOPT studies identifies new or novice teachers as those with one or fewer years of experience (e.g., Kee, 2012), two or fewer years (Desimone et al., 2006), three or fewer (Darling-Hammond et al., 2002; OECD, 2017), four or fewer (Cohen-Vogel & Smith, 2007), or five or fewer years (Boe et al., 2007; Schliecher, 2020). Therefore, identifying a group of teachers as “novice,” is inconsistent.

Studies about the FOPT of teachers with more teaching experience are fairly rare in the literature. That said, quantitative research often asks early-career or more experienced teachers to reflect back on their preparedness for their first year of teaching (e.g., Brantlinger et al., 2020; Redding & Smith, 2016; Viviani, Brantlinger, & Grant, 2023). Boe, Shin, and Cook (2007) used survey data on FOPT from teachers with five or fewer years of teaching experience, which some would argue flows into experienced teachers' realm. Ronfeldt, Schwartz and Jacob (2014) found that fifth year teachers, when reflecting back on their feelings of preparedness from their first year of teaching, had FOPT scores one third of a standard deviation lower than the first-year teachers taking the same survey. Ronfeldt and colleagues supposed that more experienced teachers were “better aware of the gaps in their initial preparation so perceive their initial preparedness less favorably over time” (p. 16). Lewis and colleagues (1999) used survey data that asked how prepared teachers felt in the moment, regardless of experience, and found that teachers do not always feel more prepared with more experience. They found that there were areas of teaching, during that time, where perhaps experienced teachers were not leveraging their resources to be better prepared to work with students with limited English proficiency.

O'Toole and Friesen (2016) studied a range of experiences managing a severe and unexpected event. They studied teachers' feelings of preparedness to take charge of managing students and colleagues when a severe earthquake during the school day led to segments of the school collapsing. They found that teachers with more teaching experience felt better prepared to navigate the disaster. They also found that more teaching experience yielded a better emotional regulation, that is, kept calm for the

sake of the children and the parents when they arrived to pick up their children. The authors suppose this regulation might be because new teachers have had fewer opportunities to learn to manage negative emotions on a daily basis.

Methods

In pursuit of a definition of teachers' FOPT, I explicitly focused on the part of the interview where I asked teachers to define or describe FOPT. The development of the two layers that came out of that data is laid out in the first subsection of the findings section, all data, quotes, and analysis is from the direct question about participants' descriptions. Other parts of the findings section include data from other parts of the interview transcripts that support the found layers.

Participants

During the Fall of 2021, I interviewed ten experienced teachers.² The Zoom platform made it possible to interview participants virtually from all around the United States.³ I chose to focus on experienced teachers because they are more likely than inexperienced teachers to have a stronger sense of what teaching is. As the literature review suggested, the longer teachers are in the profession, the more opportunities they will have to get a better sense of the profession, and what it means to be prepared for it. Because I limited my sample to experienced teachers, I felt it was important to find a selection of teachers with diverse backgrounds, certification

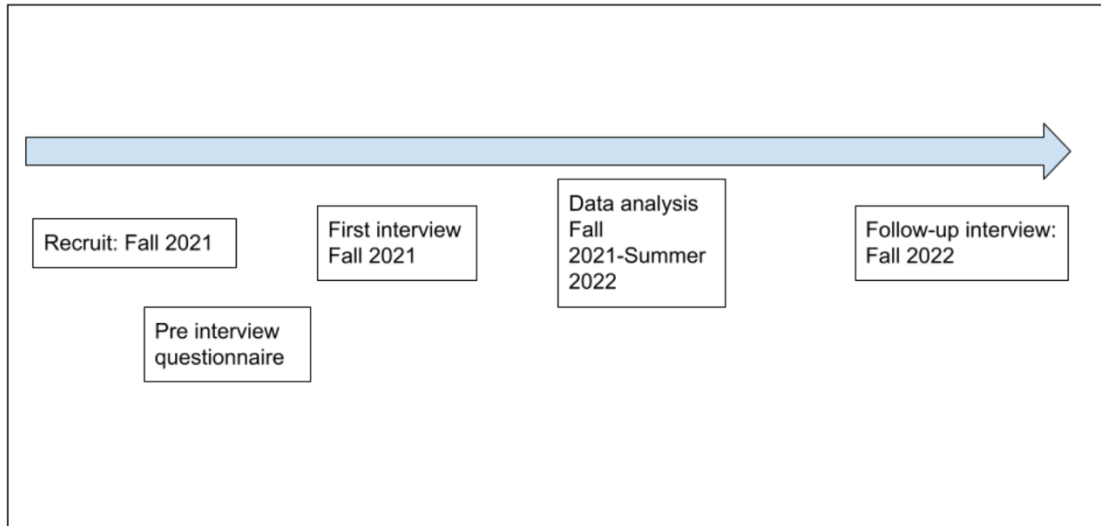
² Nine of the ten were math teachers at the time of the interview, the tenth taught science, but had taught math for 5 years.

³ California, Maryland, Massachusetts, Texas, and Virginia.

programs, and professional experiences, to mitigate a possible longevity factor that may not hold true for all teachers. Sourcing teachers from various places and from various, independent connections (I argue) would likely provide at least one experienced teacher different from the rest.

Participants were recruited through friends and colleagues who shared a recruitment email with teachers they knew or had worked with who fit the criteria of having taught mathematics in a public middle or high school for at least 5 years (see Figure 1). Ten teachers agreed to participate in this study and were provided no monetary compensation for their participation, I did not turn anyone away. However, two participants did not completely fulfill the recruitment requirements. The exceptions were Mike who, at the time of the interview, had nine years of teaching experience but only three in mathematics, and Janey who had five years of mathematics teaching experience, but was teaching science when interviewed. Again, given my desire to get a diverse range of perspectives on FOPT, I decided to include them in the data due to their overall teaching experience and experience of teaching math, as this contributes to the diversity of experiences. Each participant had the opportunity to choose their pseudonym, if they declined, I made up a name for them. Table 1 includes specific information regarding participants' pseudonyms, race, gender, school contexts, years of teaching experience, undergraduate major, and leadership positions.

Figure 1
Data Collection Timeline



Approximating Trust

Mueller (2019) indicated that building rapport with study participants early on in a single meeting interview is essential. Building this trust can take time, whether this time is during a single interview or over course of multiple interviews and interactions to build that trust, there is a time-component to it. What must be considered when deciding how to build trust is what is prohibitive for recruiting participants, that is, will something take too much of the participants' time to participate? Due to the pandemic and the potential stressors placed upon teachers in their work, I anticipated that developing a relationship of trust with participants over the course of several interactions for the purposes of collecting qualitative data seemed like it could have been a disincentive for busy teachers. I utilized the trust of my friends and colleagues and the established relationships between them and the teachers they recruited for me to approximate trust needed to conduct an interview-based study.

Data Sourcing and Procedures

I reached out to teachers who fit the criteria with an email that introduced me and the intentions of the study. For example, I wrote

I am studying secondary mathematics teachers' feelings of preparedness to teach. In this research, I seek to hear teachers' stories regarding how their readiness for various aspects of teaching may have been impacted by disruptions or changes. Most teachers were impacted by the recent pandemic and move to online teaching. I am looking for similar, although less wide-spread changes such as moving to a new school or district, changes in school leadership, changes in curriculum, or other changes. I hope to eventually create a theoretical framework and model to supplement current research in the field with regards to feelings of preparedness for teaching.

Teachers who signed and returned the waiver received a second email with a questionnaire that asked the teachers to list some personal characteristics, for example, their race/ethnicity, age, years of teaching experience, and education background, including their preparation route. The rest of the data came from the interviews (see Figure 1), conducted over zoom, which was then transcribed into a document for coding. Before beginning each interview, we talked about how the school year or semester was going, and similar topics as a way to connect before the interview started. I then shared details about the purpose of my study in trying to better develop a connection with the participants and provided opportunities for them to ask questions about my research or me at the beginning and end of the interview.

The Interview Procedure

I used episodic narrative interviews (Mueller, 2019) for a larger research project, which are semi-structured interviews that encourage participants to tell their

story bound within episodes.⁴ Mueller (2019) identifies one part of this process is asking participants for a definition of the phenomenon of interest and is important because “it directs the participant’s attention to the phenomenon of interest and becomes the foundation for him or her to engage in sense-making about the phenomenon later in the interview” (p. 7). For this study, FOPT was the phenomenon of interest.

The structure of the interview focused on different points in the teachers’ careers, starting with their first year. Each point in time included a question to frame the episode, a question to elicit their FOPT, and follow up questions to clarify or to encourage additional details, in some cases I would relate to what they said by connecting it with my experience or sharing my reaction to the emotion of the story (e.g., if some event sounded exciting, I shared my excitement about it). For example, I asked participants to think back to their first year of teaching and how they recall the work compared with their training program, then I asked them to share “some of those moments that stand out from your initial teaching experience.” This story framed the episode for the next question, I asked participants:

Now, think about a situation in which you felt particularly unprepared for the work of teaching during that first year, if you did feel that way. I also want to acknowledge that teaching is more than some general act, the work is complex. So, if you felt generally unprepared, talk about that. Or, feel free to elaborate on particular things that you felt unprepared for. Can you talk about that experience?

After participants shared their story about their first year I asked:

⁴ Mueller (2019) also clarifies that an episode is something that occurs during or over a specific period of time, so each segment of the interview was bound by these episodes.

1. As we talk about FOPT or just preparedness to teach, what does that mean to you?
2. How would you define or describe preparedness or FOP?

These descriptions provided a shared conception of FOPT for the larger study, as well as a basis for answering the question in the current study.

To gain an understanding of the school context and how it might impact their definitions of FOPT, I asked questions about the school environment. I asked them to describe the school demographics, interactions with and supports from other teachers and administration, and whether they had autonomy in the classroom.

Interview Analysis

During each interview, I took notes to both track what was said for follow up purposes, and as a document to help with creating an interview summary. I created memos and maps related to how different participants described FOPT. This process of linking data helps track ideas in a particular context so the ideas and decisions make sense when looking back in a different context or in the midst of analysis (Birks et al., 2008; Charmaz, 2006). Memoing was used throughout the research process to track my thoughts and ideas. With no agreed upon definition for FOPT, I used open coding techniques to make sense of how participants talked

Table 1*Characteristics of Participants and Their School Contexts.*

Pseudonym	Race & Ethnicity (self-reported)/Gender	School characteristics	Experience/major/certs	Leadership
Jane	Caucasian/female	Title 1, mostly white and Hispanic students	26/Mathematics/Masters Ed.	None described
Richard	white/male	Charter school (range of SES students), mostly Mexican and Hispanic students	15/Mathematics/Masters Ed.	None described
Juliet	Asian American/female	Title 1, mostly Latinx and African American students	11/Mathematics/Masters Ed.--admin certification	Staff development /team lead
Tony	Mexican/male	Charter/traditional, Mexican and Hispanic students	9/Math education/Masters Ed.	None described
Mike	African American/male	Initially: 90% African American and “students who have parents who were born in West African countries.” Currently: “more diverse”	9/Poly-sci, Hist, Lit./Alternative Certification (alt. cert)	None described
Jessica	Black/African American/female	“Almost Title 1”	9/Psychology/Masters Ed.	Department chair
Cesar	Hispanic (Peruvian)/male	Not Title 1, diverse student population	9/Math, Computer Science/Masters Ed.	None described
Gloria	Hispanic/female	Charter, mostly Hispanic student population	8/Human Resource development/Alt. cert.	None described
Emily	Multiracial/female	Various schools	7/Mathematics (Masters Ed.)--admin certification	Assistant principal
Janey	Asian American/ Korean American	“Almost Title 1”, mostly Black and Latinx students	5 (math)/Biology & American Studies/Alt. cert. (Masters Ed.)	Instructional Lead Teacher

about the concept. Codes were checked with memos and other notes taken during the interview. The initial analysis relied heavily on participants' responses to interview question 2 (above) and using those excerpts for the initial coding and theme development.

Using NVIVO, a qualitative coding program, I started with just the sections where the participants answered that question. I read through this section of the transcripts to get a sense of how similar or different the responses were. I used constant comparing techniques looking at incidence by incidence (Charmaz, 2006) to find similarities and differences between and within interviews. Out of this analytic approach, two main themes emerged. When these two themes were in their final form, I went back through the relevant segments of the transcripts to make sure that the descriptions matched the words of the participants. After that, I went through the full text of the ten transcripts in search of similar statements outside of the direct questioning about defining or describing FOPT. I sought additional information to support the presence of the two layers of FOPT. Coding examples are provided in Table 2 below.

Included in the following table are the application of the layer codes to the rest of the transcript to extract supporting examples from teachers' experiences.

Table 2
Code Book

Layer	Coding Example	Description	Supporting Examples	Comments
Static	"I wanted to make sure I had, obviously, my materials prepped and ready to go. But that's really not all it	A static sense of preparedness might be how much effort has gone into getting ready to	"My algebra mentor, she taught me how to solve equations with these cups...So there were some strategies that,	Emily describes encountering a new way to teach math and that it

	would take, you had to really think about, what did I want to present? And how do [I] want to present that. And at the same time, I had to think about where my students are at. Not just educationally but also in their social emotional side—coming back in...I'm always wondering, what was their summer like?" (Jane)	teach a lesson, which may include perceived socio-emotional elements about students. Also included in this interpretation is the set-up of the classroom in general, posters on the wall, the desk-setup, etc.	where I felt like, since it was my first time seeing it... I had to spend a little bit of extra time getting prepared, and really understanding that before I could teach it in that way." (Emily)	required her to practice on her own to prepare to use it in her own teaching.
Dynamic	"Being able to execute, which is sometimes difficult, but to be so prepared that if something pops up a fire drill, lack of technology, you're going to be able to overcome that in another way. Whether it's something else that you have planned, or you can think on your feet, so I think if you're really prepared, you're going to be able to think on your feet and spin it" (Jane)	acceptance of and readiness for the environment of teaching, which is changeable and unpredictable. This layer of preparedness seems to require more mental flexibility than the other because it requires decisions and planning in the moment to overcome obstacles or challenges.	"A lot of teachers, at least, our building, would say TAG [talented and gifted] kids are easier to handle or manage than comp kids. And there is some truth to that. But kids are kids overall. So I have seen tag kids act like total jerks to teachers who have absolutely no classroom management, and then they can actually be worse because... they're being a smartass about it, because they can argue, as if they're a lawyer." (Janey)	Janey indicates that TAG students are still kids, but they are used to arguing or undermining unprepared teachers in ways that are less common with nonTAG students. Knowing how to handle disruptions from TAG students is as valuable as knowing how to handle "comp" classes.

Note: Coding examples come from responses to direct questions about how teachers define FOPT, my description is in the next column. The Following column is a supporting example from the participants, and that is followed up by a comment from me.

Findings

The findings section will show how experienced (mathematics) teachers expressed FOPT as a concept. In general, the participants were in agreement about the complexity of the work of teaching, and the data suggests that they thought of preparedness and FOPT as fitting within at least one of two layers. With this in mind, the sections that follow start with how the teachers' conceptualized FOPT as a two-layer construct, followed by supporting examples that were extracted from the transcript where teachers were not explicitly asked about their definition, description, or conceptualization of FOPT.

Creating Two Layers of Preparedness

Although they talked about it in different ways, the teachers were in general agreement that FOPT consisted of a static and dynamic layer. The static layer suggests a provisioning (i.e., equipping) kind of preparedness for teaching, including lesson planning, materials, classroom protocols, and similar acts. The dynamic layer includes teaching skills that are improvisational, ambitious or responsive to students, for example, responding to student ideas or questions that were not previously planned for. Four participants, Emily, Jane, Jessica, and Juliet provided descriptions of FOPT that encompassed both layers. Mike and Tony strictly discuss static layer elements, whereas Richard only appeared to describe the dynamic layer. However, because of the terminology usage, Cesar, Gloria, and Janey's descriptions were less clear which layer(s) the descriptions belonged to.

Emily, Jane, Jessica, and Juliet explicitly separated two different parts of their description. These separators were roughly the same from one participant to the next, and provided the strongest agreement within the data. Juliet also included a third layer, but that more closely fits with how Emily and Jane described the dynamic layer.

Juliet said:

I think feelings of preparedness is like the physical, you know, is my room set up? Do I have enough chairs? Is my lesson prepared? Are the copies all made, you know, are the manipulatives there? So, there's like the physical aspect, those physical things, right, that you can see.⁵

Juliet describes both planning and organizing the physical aspects of the classroom and things needed for lessons. She indicates the preparation of the lesson, which could be anything from bullet-points to highly detailed structure for the delivery of a lesson. Juliet also mentions manipulatives, and this might suggest considering the needs of one's learners or the lesson topic and various ways to approach the learning of the content. In referring to this same layer, she said, "so I would say, preparedness is definitely the provisioning part of it, like the teacher—have you provisioned everything that you need?" In using the words *provisioning* and *provisioned*, Juliet suggests planning and supplying a lesson or unit with foresight and anticipation, but not reaction or correction as the next layer suggests.

And then it's mentally, have I taught this lesson before? Do I pretty much know or can anticipate where the students might get stuck? Am I ready to—am I- it's not just ready and confidence. You know, am I confident enough that, you know, I'm going to try this collaborative structure today? And if it doesn't go well, am I confident that, you know, I'm risking something, but I can come back from it...But then how confident are you that you can execute the lesson

⁵ I cut here to describe Juliet's first Layer, her next quote is immediately following this

that you plan? A third layer is how confident are you that you can adapt if something doesn't go your way?

Juliet talked about the second layer as something that could encompass both anticipating where students could have difficulties and being ready “mentally” to make adjustments on the fly. Here, she does not talk about planning for or thinking out, she asks a rhetorical question about readiness to act based on the moment. She uses an example of a “collaborative structure,” which suggests a classroom discussion or work where students will share things that may not be anticipated. She talks about taking risks and going off the plan when needed, which suggests an element of using one’s expertise and experience to reach the end goal anyway. Planning for and readiness to execute—without prior explicit or targeted planning—is one difference between the two layers.

Emily described the two layers similarly,

I guess the feeling of preparedness is when you plan for everything you can be prepared for *but* [emphasis added] you're also able to be flexible with everything that happens. Like you've seen everything that happens you've been in a lot of situations so that when something like this happens, you kind of have an idea of what you're supposed to do and how you're supposed to act.

The word “but” in the second line suggests a pivot in the direction of the comment.

Prior to the pivot, Emily’s description is congruent with the static layer. After the pivot, Emily matches Juliet’s second and third layer in describing flexibility and having had relevant experiences to draw from with a lesser emphasis on planned actions. Jane’s description is included in table 2 in the methods section.

Similarly, Jessica’s description included the two layers, however, Jessica’s quote provides no clear pivot:

If your lesson plan is ready, for at the very least the next day, and you have a direction of where you want it to go. You have anticipation of the misconception students may have, the befuddlement they're going to have, when you're like "oh okay." So those type of things. You're prepared to, you can switch on a dime and that's feelin prepared. You know your content knowing your content is extremely important.

Emily, Jane, Jessica, and Juliet provided descriptions that encompassed aspects of both layers and the descriptions, possibly subconsciously, progressed by layer.

Three participants (Cesar, Gloria, and Janey) provided responses that did not clearly fit into either layer. For Cesar, his description preempted my prompt, which explains his brevity. He said, "prepared is when you know what your students are going to ask you. You already know." Given the brevity of the description, it is not clear where in the process this knowledge presents itself, in the planning stage, or in teaching moments. In the cases of Janey and Gloria, the uncertainty of fitting of statements within each layer was due to the ambiguity of how they intended the meaning of particular terminology.⁶ For example, Janey explained,

You are confident in what you have in your arsenal, you're confident in what you have in your bag of tools and tricks and stuff. So, you're confident in that. *And then you also* [emphasis added] learn how to kind of be more flexible, like you just—as years have gone with teaching, you're going to learn really quickly that you're going to be unprepared. I don't know if that makes any sense. You learn how to deal with different changes that might happen in the last minute. And so, you learn how to have backups or, you know, different various ideas. If something happens during the day, or in the year, or what have you, you kind of learn how to prepare yourself for knowing that anything can be thrown your way. And you just have to learn how to deal and adapt to it quickly.

Janey mostly describes the dynamic layer, however, she starts off by talking about "tools and tricks" that may be useful for teaching. It is notable that "beginning

⁶ At the time of the interview, it was not clear that two layers would emerge from the data, and that the meaning of these words would be critical.

teachers consistently display an insatiable desire for ‘tool kits’, or ‘tricks of the trade’— things they can implement immediately" (Goodwin & Kosnik, 2013, p. 340), and this might suggest that the static layer contains many elements congruent with novice teacher skills and preparedness. Gloria also used the word “tool” to describe the benefits of her preparation program, “I think the program did give me a lot of tools to help me, but I just think I needed a lot of help at the beginning.” This suggests that these “tools and tricks” are geared toward new and novice teacher preparedness.

Janey’s comment about learning to be flexible is notable for two reasons with respect to the FOPT layers. First, it suggests that a “bag of tricks” provide teachers with something valuable, maybe something that can be used prescriptively for specific situations (i.e., static FOPT), but is not enough for unexpected changes throughout the day or year (dynamic FOPT). Janey suggests there is something needed beyond the bag of tricks. Second, in learning to be flexible, she inserts this critical need for experience. Four participants (Emily, Gloria, Janey, Richard) expressed the importance of experience in the work of teaching as contributing to FOPT. Identifying *experience* as something useful for the dynamic layer helps to differentiate elements of the two layers.

Gloria described FOPT as,

It would cover both delivering good content, without being stumped by a student where you're like, “oh, I hadn't thought of you know those misconceptions” or—so, I think that would be content wise, and then being prepared to teach as in learning, knowing how to handle different levels of need... knowing how to manage levels of scaffolding material and knowing that your higher students are ready to move on and just preparing a lesson in a way that allows them to have that freedom in that classroom at a certain point in the lesson so that students that still need more help can follow along.

Here, Gloria starts with “delivering good content,” which is ambiguous to me. This may be a different take on the static layer or an emphasis on the dynamic layer. It depends on the kind of instruction Gloria uses in her classroom. On the one hand, lecture-based instruction may very well fall into the static layer, it can be quite controlled, with fewer opportunities to go off the plan. If Gloria’s teaching is traditional, then perhaps delivering good content is lecturing facts, where it is less likely to be stumped by a student.

On the other hand, ambitious instruction might be another way to “deliver good content,” yet requires more responsive teaching than the static layer describes. Gloria also talks about being ready for how students might respond, like knowing the math well enough to be ready for and anticipate student responses, but also being able to know when students are ready to move on; that is, to read the room. This might suggest that Gloria is listening to and responding to student thinking, potentially a move away from lecture-based instruction, but it is not clear how far (this was beyond the scope of the study, but relevant in negotiating the extent of the first layer’s domain). Knowing about common misconceptions is something that one can look up ahead of time and do some advanced planning to overcome. However, eliciting misconceptions or navigating them in the moment may fit better into the dynamic layer description. Therefore, misconceptions might be static in the sense that they are something that can be prepared for ahead of teaching a particular lesson, but eliciting, recognizing, and responding to misconceptions may fall into the second layer.

Mike and Tony provided responses that matched most closely with the static layer. Tony, for example, emphasized “my thoughts never stop, you know, working.

So, if they did, I think that would mean that I'm pretty prepared for [teaching]." Tony explained that he was always thinking about students' needs, connecting with students or parents, planning lessons, and focusing on what things need to be completed. Tony went further, "if you've done that... have you tried to make a personal connection with so and so that's struggling in your class?" For Tony, the emphasis on feeling prepared is a list of pre-planned actions to be accomplished.

Mike described FOPT as "instructional techniques and planning, I think it's critical knowing how to plan. And what I mean by that, specifically, is that you have your standards, and you have your content, but you still have your learners. And so, learning how to integrate those two, I think is important." While Mike included a pivot here it is still within the subject of planning, a static layer component.⁷ Mike talked about planning and knowing instructional techniques, he also referenced the importance of linking that knowledge with learners. Mike went on to say, "understand the role that cultural identities play in instruction, and feedback," this suggests that one must make intentional decisions regarding instruction and feedback with respect to the learners' cultural identities in the classroom, and these are things that can be planned for once a teacher has become familiar with their students' background and cultural identities. The identification and understanding of cultural identities in the classroom is *not* a low-level skill. However, perhaps as teachers gain experience, particular practices that begin as static components of FOPT, become dynamic.

⁷ Mike also spoke with purpose and usually paused briefly before responding to my questions, so I believe he intended this sentence to be the same thought.

In contrast, Richard’s response exclusively described reacting to “how to deal with moments.” These moments were described as events that one learns how to manage over time. Richard described early teaching as “so hard to feel prepared when you're starting, because like, there are so many variables... the job is impossible.” The existence of so many variables suggests there is relatively little one can do to prepare for teaching because it is so complex, one just has to experience it. Richard’s use of the word “impossible” stems from the intent to “meet all the emotional and intellectual needs of all your kids,” he says it cannot be done. Richard suggests with more experience, additional student needs will be met more fluidly than a new teacher can.

Table 3
Summaries of the two FOPT layers

	Static Layer	Dynamic Layer
Description	Elements of teaching that can be specifically planned for or scripted	Elements of teaching that are unpredictable and teachers must rely on past experiences to navigate and respond

FOPT Description Supporting Examples

The first description layer includes things that are likely most congruent with information and training provided in a preparation program or can be pre-planned for or scripted to some degree. The second layer appears more congruent with how one learns to react to various moments, given one’s experience level. This segment provides supporting examples of participants’ descriptions of the static and dynamic layers of FOPT.

Gloria talked a lot about her initial challenges with classroom management and how supporting groups tried to help. She was provided the opportunity to observe

more experienced teachers employing classroom management techniques and found them to be effective. Her description of the veteran teacher employing management moves show Gloria's impression of how an experienced teacher notices and acts in the moment.

I would go sit in her class and do work in the back. And I would just watch her and see how she carried herself around the kids and addressed misbehavior and was calm in a firm way. And that was very inspiring to me, because I was like, "oh, you know how to handle this perfectly"... I was like, "oh, I love the way they're just like, addressing someone who has their head down." They would just go talk to them privately, or tap on their desk, or wait for all silence, you know, before you move on.

Gloria described subtle moves that experienced teachers make to keep the class engaged and moving along, perhaps knowing how or if to escalate management moves to keep the lesson moving forward. This contrasts with a story Gloria shared about pressure she received to improve her classroom management in her first year.

they [said], "you're being too nice." And I was like, "okay, let me be more strict." And I think I went—I remember the sweetest kid—I went all out on her. And I was like, "well, you didn't show work for every problem, that's gonna be detention, because those are the rules." And she just started crying. And it just made me think, "what am I doing?" This is an angel student and I decided to pick the one kid that messed up on this one day. I felt like I needed to prove my authority in the classroom, because I did struggle with classroom management.

As she narrated it, Gloria's attempt to assert her authority did not go well. This is an example of how a first-year teacher trying to navigate dynamic elements of teaching requires experience and practice. Emily also described a scenario in her first year for which she felt unprepared:

I was bawling in tears, because of the way that [the students] were treating me. My content specialist, who's the head of the math department, saw me about to break out in tears, and she actually stepped in my class, and I stepped out.

Emily could not recall the specifics of that scenario, but just recalled the feelings. Emily and the content specialist worked together on a plan to manage that class by focusing on student assets and building trust with them and, “eventually, that class, we were fine.” Emily learned new strategies for working with that class and ended up having with a good rapport with them by the end of the year.

Jane and Jessica talked about the ability of a teacher to “spin it” when something unexpected occurs; because you cannot have enough contingency plans to cover all circumstances. Cesar described it as “if something happened here, let's go to plan B, or let's go to plan C. But I can honestly say, today, I don't have that as an option. That I use a Plan B, or Plan C, but it has happened. I just kind of go with the flow.” Experts spinning it is different from a novice “winging it.” Gloria, when talking about her first year of teaching said, “I was winging it half the time. I was staying up all night. It's not like I wasn't putting in the effort. But I would get to parts of my day where I was like, ‘I don't know what to do. We're just gonna go with it.’” Experienced teachers who spin the situation to fit with the lesson likely have a higher impact on students’ learning than novice or new teachers who “just go with it.”

Discussion

Summary of Findings

The purpose of this study was to understand teachers’ definitions or descriptions of FOPT to move the field towards a definition for teachers’ FOPT. The analysis shows that the teachers thought of FOPT as being layered and, in particular, consisting of a static/provisional layer of FOPT and a dynamic/improvisational layer

of FOPT. Given this, to the extent these teachers are representative or “got FOPT right,” it seems clear that any definition should distinguish between static and dynamic preparedness. There are some important implications from these two layers of preparedness. These Layers, an amalgam of participant responses, match Hammerness and colleagues’ (2005) description of teaching, “although some aspects of teaching can be made somewhat routine...many other decisions in teaching cannot be routinized because they are contingent upon student responses and the particular objectives sought at a given moment” (p. 359). Hammerness and colleagues distinguish between routines and being responsive to students’ needs, they add that both are necessary for instruction. The static layer describes those elements that can be planned for, though not exactly what the participants said, some things could be routinized. By contrast, the second layer, more closely aligns with responding in the moment to student inputs. The dynamic layer may be well connected with ambitious instruction.

Implications

The following subsections lay out implications for how preparation programs might use the two-layer description of FOPT in thinking about how to prepare teachers, and how researchers might use these layers to design their theoretical frameworks and analyses.

For Preparation Programs

I propose that FOPT research for PSTs, new and novice teachers, and experienced teachers should all be able to use the proposed two-layer description of FOPT. It may be that many survey items related to the static layer of teachers’ FOPT

fit well for research on PSTs, new, novice, and experienced teachers' FOPT.

However, the dynamic layer FOPT survey items may not be as immediately relevant to PSTs' experiences, and these measures I expect to be lower. More research to specifically identify this hypothesis is needed.

Much of the static layer appears to be fairly straightforward in terms of preparation program training. Preparation programs can provide opportunities to lesson plan, which may include efforts to envision what materials will be needed for a particular lesson. Preparation programs can share with teacher candidates some general ways to set up classrooms, and structure lessons.

Preparation programs could also help prepare PSTs for the work of teaching by emphasizing *critical reflection*. Allen, Hancock, and Starker-Glass (2017) created a framework for disrupting the status quo of not fully addressing issues of social justice and education reform with respect to race and included critical reflection as a fundamental component. These critical reflections can help teachers of privileged backgrounds learn more about their students, and how to better teach them (D'Ambrosio, 2001). Critical reflections also are intended for preparation programs to participate in and identify ways in which they perpetuate the status quo.

For the dynamic layer, some references in the findings suggest connections to ambitious teaching practices and other teaching practices that center student learning and development. Borko and Livingston (1989) suggest that novice teachers are limited "in their ability to improvise" (p. 491), whereas experienced teachers have a multitude of experiences in which to draw from to navigate the unexpected.

Therefore, there are multiple directions preparation programs can follow to prepare

PSTs for the dynamic layer teaching skills. Teacher preparation programs can instill theoretical grounding for ambitious and similar practices, as well as model them in teaching methods courses and encourage practicing these techniques in student-teaching environments.

Further, while not explicit in the data, the dynamic layer of FOPT may even require an ability to fluidly understand student work and verbal or written descriptions to make decisions in the moment, Hammerness and colleagues (2005) used the terms *adaptive experts* and *disciplined improvisation* to describe the work of experienced teachers who can spin the situation to solve many problems that may arise throughout a lesson and still keeping the quality of teaching high. Ambitious teaching may well be a big ask for PSTs and new teachers to grapple with, still, some practices can be implemented such as the learning of questioning techniques that emphasize student thinking (Hallman-Thrasher & Spangler, 2020) rather than leading questions. These experiences can help normalize practices that give voice to students grappling with mathematics, and still allow new and novice teachers comfort in a fairly rigid classroom structure where they can plan most aspects of how the lesson will proceed, while still stepping into the dynamic layer preparedness elements. For example, selecting and sequencing student work or ideas in the moment that will build towards the purpose of that lesson (Smith et al., 2009). Smith and colleagues identify five practices for conducting discussions that include selecting and sequencing student work, and say, “these practices give teachers control over what is likely to happen in a discussion... much of the decision making has been shifted to

the planning phase” (p. 550). This is to say that a new teacher can anticipate student work and have a plan on how they might sort and sequence student work.

Further research can identify additional topics that preparation programs can do to prepare preservice teachers for dynamic layer conditions, like learning how to make decisions in the moment, or using reflections to help teachers expedite their learning in the early years of their career. This is not to say that the dynamic layer is more important or structurally higher, but that it seems to track more with experience.

For Researchers

As described by participants, FOPT as a theoretical construct misses out on the “attainment” element associated with self-efficacy. This does not necessarily mean that FOPT and self-efficacy are distinct, perhaps an overlap exists between the two constructs. However, this is important to note for quantitative studies as they can lack the explanatory nature of outcomes.

One challenge that has so far limited quantitative researchers’ use of factor analysis on FOPT is that most surveys include limited questions on FOPT (e.g., surveys from SASS) and, therefore, factor analysis leads to either a single factor or researchers decide to use individual items, which make interpretation of regressions more challenging due to their ordinal nature. One suggestion is to include more variety of questions, especially those that engage with reform efforts. For example, asking questions regarding connecting with students’ cultural and racial identities, and engaging with the class around issues of race and other social justice topics (especially in regard to events reported on the news that will be impactful to students).

Additionally, researchers could consider the two Layers to help structure the types of questions they ask in surveys when measuring FOPT. For example, what kinds of teaching actions are plannable and which ones need to be engaged with on the fly? The static layer types of questions may pertain to questions such as FOPT for planning, finding and adapting materials, and similar items. The dynamic layer may include questions of FOPT the content and conducting whole class discussions. This, in some ways, builds on the work of Viviani and colleagues (2023) who found value in separating FOPT survey questions into subject-general and content-specific groupings. Lumping FOPT into a single measure may be counterproductive for quantitative work if those items offset each other. That is, if there are some actions teachers feel prepared for but not others, then an overall sense of preparedness may yield significant but small effect size at best. However, if a novice or PST feels prepared for the static layer items and less so for the dynamic layer items, it makes sense for researchers to use items based on layers to predict outcomes, it may say more about FOPT than lumping the static layer and the dynamic layer items together.

Future research could include asking PSTs, new, and novice teachers what it means to feel or be prepared to teach and identify differences from the findings in this paper to identify different interpretations of the work by different experience levels. Including data from other experience groups may help clarify teaching actions that fall into one layer or the other, or if other layers exist, or if some actions are transition from one layer to another as one gains experience, as this was not clear from the current data.

Limitations

This study, a piece of a larger study, was exploratory and used interview questions to draw out descriptions from participants in direct ways, but statements were fully left to the discretion of the participants. In hindsight some follow-up questions would have been prudent to clarify particular meanings or to ask for examples. However, because these two layers became apparent after the interviews, the importance of them at the time of the interviews was not clear. Perhaps the findings of this study can help provide specific questions that are less direct and open up opportunities for participants to share specific examples from their practice when appropriate. Another limitation has to do with investigating teachers' experiences in various contexts relating to their FOPT. An addition to the interview protocol could have included more direct questions about the teachers' personal background and characteristics and how that may impact their FOPT in various contexts.

This study also is limited by the selection process. It is not clear if these teachers have a particular and fairly common perspective to each other, because I used my network to find these participants. This means that care should be taken in assuming that the Layers provided are universal. Furthermore, these teachers were all experienced, what then does that mean for teachers with less experience? More research could be done to identify how PSTs and novice teachers think about defining or describing FOPT.

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Chapter 3: Education Disrupted: Mathematics Teachers' Feelings of Unpreparedness to Teach Online

Abstract

This study investigates experienced teachers' feelings of preparedness to teach in a new and different context. It includes interview data from six veteran mathematics teachers and their experiences using web-based technology, and their feelings of preparedness to teach during the 2020-2021 time-period of the COVID pandemic. Overall, the teachers did not feel prepared to teach online. They found their work challenged by changes to their familiar ways of teaching mathematics. However, teachers' feelings of preparedness to teach online was not associated with their sense of preparedness to use technology. The change in feelings of preparedness likely comes from the change in context, specifically to online teaching from in-person teaching. This change from in-person to online teaching has implications for why context may matter with respect to teachers' feelings of preparedness to teach.

Introduction

In March of 2020, a novel coronavirus caused societal systems in the United States to close for over a year because of the virus' highly contagious and potentially deadly nature (Cruickshank, 2020). The unusual step of closing physical school facilities for an extended period meant that school and district leaders would need to make decisions about teaching, learning, access to materials, and grading policies (see USC Rossier School of Education, 2020). Schools and districts also needed to make decisions about how school could be conducted at a distance, that is, virtually.

The complex nature of teaching makes disruptions inevitable, however, the Covid-era transition to virtual teaching was a disruption for teachers nationally. To clarify, I consider educational disruptions as any change within the context of teaching that impacts a teacher's teaching or mindset. These disruptions may be as simple and minimally impeding as an announcement from the office or a student

walking in late to the class. However, disruptions can also include incidents that have larger impacts, such as, a sudden relocation of in-person teaching to an online platform for remote instruction.

Traditionally, most teachers have little training or experience in online teaching (see Archambault et al., 2014). This has implications for *teachers' feelings of preparedness to teach* (FOPT). Experienced teachers, who we expect to be prepared in most relevant teaching skills, actions, or other competencies, may be and feel un- or under-prepared to teach in an online environment.

Given the technology-intensive nature of online teaching, it is also worth exploring teachers' FOPT to teach online and to teach with web-based technology. In the early 2000s, researchers asked U.S. teachers how prepared they felt to use computational technology in the classroom, and most reported that they were not (e.g., Darling-Hammond et al., 2002; Parsad et al., 2001; Watzke, 2005). One recent study (Schleicher, 2020), however, found that, on average, teachers in the US and other nations feel better prepared to use “instructional technology” than they did in the early 2000s. While not surprising, because computers in schools were still relatively new in the early 2000s, it speaks to a changing landscape and familiarity with technology. Schleicher's (2020) findings were in the context of in-person teaching and does not suggest FOPT for online teaching. The pandemic has provided an opportunity to explore events where teacher knowledge and skills may not transfer from in-person to online teaching - one medium to another. This paper will address the following research questions:

- a. What do experienced secondary mathematics teachers emphasize about their preparedness to teach online during the pandemic? What experiences or supports did they use to navigate the disruption?
- b. How prepared did teachers feel they were to use online teaching-specific technology when teaching online full-time during the pandemic?

This study focuses on experienced teachers' FOPT virtually or remotely. As indicated, the pandemic-induced transition to online teaching was not just a significant disruption, but also a change in teaching context; from in-person to online teaching. Experienced teachers may not have felt unprepared for most teaching tasks since their early years of teaching, though we do not know for sure. Much of the FOPT literature focuses on new and novice teachers and therefore, has not covered disruptions to teaching, of any level of seriousness, and how experienced teachers experience and understand them.

Conceptual Framework

In a prior project, a relevant literature review showed that teachers' FOPT lacks a common theoretical definition (Viviani, 2023). Also, teachers' FOPT seems to lack a general, explicit and agreed-upon framework in the literature. Therefore, I developed a conceptual framework by drawing upon literature, existing frameworks, and the way I think about feelings of preparedness, which is consistent with Maxwell's (2013) description of conceptual frameworks and how they can be developed and used. This framework (see Figure 1) draws from the work of Johnson and colleagues (2005), which aligns with new teachers' FOPT to teach. For example, Johnson and colleagues focus on three main contributors to FOPT, *person*, *program*, and *school*. *Person* refers to personal characteristics, experiences, and other skills an

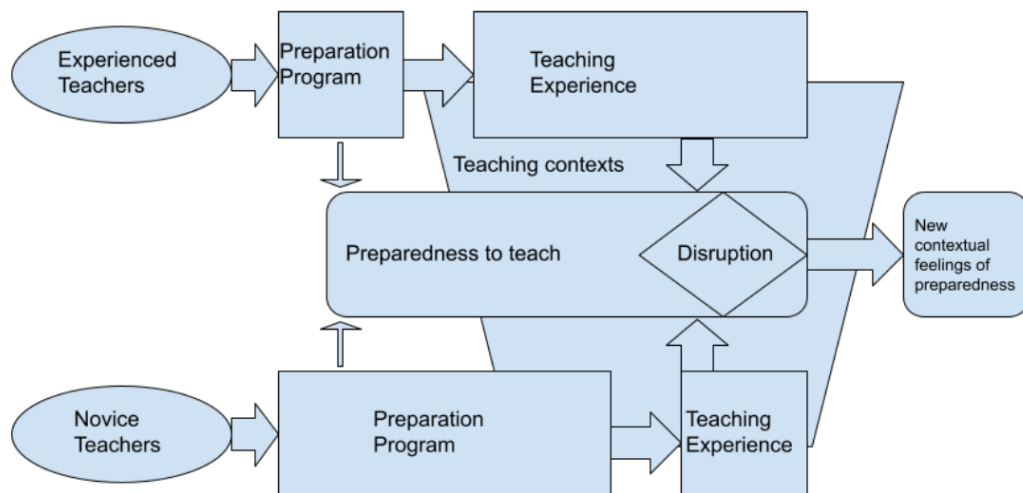
individual brings with them to teaching. *Program* means the supports they received within the preparation program that readied teachers for the work. Finally, *school* refers to not just the context, but the induction, and collegial supports received within the teachers' first school as well as the school environment. I include Johnson and colleagues' three sources of preparedness in my framework (see Figure 1) and add in teaching *experience*, and *disruptions* as I conceptualize them fitting within FOPT.

As represented with ovals for experienced, and novice teachers on the left side of Figure 1, I envision two starting points based on teachers' level of teaching experience because I think that issues around FOPT do not end when a teacher is no longer a novice, however, currently, definitions for novice are fairly fluid.

Preparation program and *teaching experience* are depicted as two rectangles of different sizes depending on the experience of the individual teacher. The dimensions of the rectangles are symbolic representations of how I conceptualize the amount of

Figure 1

Conceptual Framework of preparedness to teach based on contexts and disruptions.



experience one will draw from for their sense of preparedness. Particularly, I assume that novice teachers will rely more heavily on ideas and techniques they learned in their preparation program than a veteran teacher would. Consistent with this, Goodson and colleagues (2019) posited that novice teachers were more likely to recall their preservice experiences than experienced teachers. Tamir (2013) indicated a position “that over the years, preparation and school conditions get tightly interwoven with each other” (p. 28), suggesting that over time, it is harder to distinguish between the influence of initial teacher preparation and what happens on the job, experienced teachers may condense their professional understandings and skills into *teaching experience*.

Teaching contexts happens in relation with teaching experiences, FOPT, disruptions. Further, as a trapezoid, it suggests experienced teachers have more experiences in various contextual situations (within teaching broadly or within specific schools, for example).

The combination of preparation and experience, filtered through the specific teaching contexts, leads to the preparedness to teach. This FOTP can be upset by a disruption, which leads to a different FOTP in the new context. This new contextual FOPT, initially, is not part of the teaching context trapezoid, though will eventually be absorbed into it.

Literature Review

This literature review covers teachers’ FOPT with computational technology (e.g., technology that is computer, tablet, phone, web-based) in the classroom, as well as literature regarding online teaching. A great deal of the literature on teacher FOPT

to teach with technology is based in the late 1990s and early 2000s, and many findings at that time suggested that new teachers were more likely to feel prepared to use technology than more experienced teachers (e.g., Imbimbo & Silvernail, 1999; Russel et al., 2003). The heavy emphasis from multiple decades ago is problematic because technology has changed so much since the 1990s and early 2000s, and may suggest a need for more current FOPT with technology samples.

The reviewed literature suggests that often the supposition was that exposure to computational technology prior to teaching helped teachers feel more prepared to use it as teachers. The literature also suggests that moving to online instruction was chaotic for teachers due to lack of experience of teaching online, though there were few articles that were explicitly about FOPT online. Support systems seem to help teachers in the ways they feel about online teaching.

Technology and FOPT

Technology is a broad term and context-dependent and could include mundane tools like pencils and pens to advanced machines that make powerful displays or calculations. This literature review includes teachers' FOPT with computational technology. This focus on computational technology is relevant for the change in context when teachers abruptly moved to online teaching.

It is important to understand why issues around computational technology in school are valuable to study for FOPT. Zhao and Frank (2003) noted the slow uptake of new technologies at schools. They argued that due to the unreliable nature of computational technology (e.g., when it does not work), teachers need compelling reasons to include such a potential liability in their classroom. Artigue (2002) talks

about technology tools using different techniques by the user than doing something by hand, so a teacher needs to know how to leverage both so the students can learn. Rethinking techniques could be problematic for feeling prepared to teach and for student outcomes, at least in the short-term, because such shifts may not be immediately obvious to all teachers. Related, Dick and Hollebrands (2011) indicate that teachers should evaluate the contributions that new computational technologies bring to the classroom. They include 4 considerations for whether technology benefits mathematics teachers (or students) enough to use it in their classroom. This list includes: 1) presenting mathematical ideas, 2) presenting problems, 3) providing space for students to engage with the mathematics, and 4) opportunities to gather evidence of student understanding through their work. Dick and Hollebrands also distinguish two kinds of computational technologies for mathematics classes, conveyance and mathematical action technologies. Conveyance technologies are general teaching technologies that include presenting, sharing, and assessment. Mathematical action technologies are specific to mathematics classes and include interactive platforms where students click and drag manipulatives or graphs, and calculators for computation or display purposes.

Ertmer and Ottenbreit-Leftwich (2010) conducted a review of the literature on teacher technology use and indicated that the literature finds that both novice and experienced teachers' use of new technology is impacted by their self-efficacy, beliefs, school culture, and the peer pressure they feel to teach with new technologies in those schools. While not preparedness, per se, they indicated that novice teachers seem to be more influenced by school culture in whether or how they use technology

than experienced teachers. It makes sense that novice teachers are heavily impacted by the culture of the school and the teachers they look up to for support and advice. Ertmer and Ottenbreit-Leftwich also suggest that novice teachers may have had opportunities to develop experience and knowledge of more recent computational technology through their preparation program that their experienced colleagues may not have had. Consistent with this, Russell and colleagues (2003) found that teachers with less teaching experience tend to feel significantly more confident with technology than teachers with more teaching experience (e.g., more than 15 years). Similarly, Imbimbo and Silvernail (1999) found that teachers with fewer than four years of experience felt significantly better prepared than teachers with four years of teaching experience. And certified teachers with one year of teaching experience felt significantly better prepared for technology than the uncertified teachers, indicating potentially the inclusion of computational technology exposure in their preparation programs.

More recent surveys indicate that teachers are using computational technology in the classroom more frequently than before (Schleicher, 2020). However, Schleicher found that only 43% of teachers from 48 countries felt well prepared to use information and communication technology (ICT). Unfortunately, it is not clear what Schleicher's data summary meant by ICT use, such generic usage of commentary around technology is identified by Russell et al. (2003) as problematic. Russell and colleagues used factor analysis of 44 survey items to create six technology uses by teachers: 1) technology to prepare for teaching, 2) technology to deliver a lesson, 3) teacher-imposed technology for student use, 4) to support special

education and other accommodations, 5) teacher use of email, 6) for recording and tracking grades. Some survey questions regarding ICT suggest using technology for learning (rather than for communication or grading, for example) based on the context. Regardless of what was meant by ICT, according to Schleicher, ICT use is the second highest professional development topic desired by participants in their study, which suggests that teachers are hoping for more meaningful professional development to help them prepare to use technology in their classrooms.

Several studies that investigate preparedness to use technology suggest that teachers in general feel unprepared for computational technology in the classroom (Carter & Cowan, 2013; Cochran-Smith et al., 2012; Darling-Hammond et al., 2002; Parsad et al., 2001; Watzke, 2005). Cochran-Smith and colleagues reviewed the literature on teacher preparation and found that most studies indicated that PSTs are willing to use computational technology when they feel comfortable with it, which might suggest simply providing PSTs with plenty of opportunities to use unfamiliar technology may help in preparing them for using it. On the other hand, Koehler and Mishra's (2005) paper on the development of technological pedagogical content knowledge indicates that "good teaching is not simply adding technology to the existing teaching and content domain" (p. 134), it requires an intimate knowledge of the interplay between content, pedagogy, and technology (Koehler & Mishra, 2005/2009), which is relevant in terms of transitioning from in-person to online teaching and preparedness because online teaching is clearly technology heavy.

Online FOPT

Teachers are not typically trained to teach online classes (Archambault et al., 2014). A gap in this teaching skill would suggest generally low FOPT to teach online, partly because teaching in-person and online are different (Garrison, Anderson, & Archer, 2000), possibly impacting teachers' FOPT. Teachers of all in-person experience levels but with no online teaching experience may find the differences difficult to navigate as they grapple with developing protocols and behaviors for the new environment. However, the National Assessment for Educational Progress (NAEP, 2021) found that overall, teachers felt confident to teach students online. The NAEP write-up indicates that 8th grade reading and mathematics teachers' confidence to teach online ranged from 84% to 99% in 30 states. The NAEP study appears to suggest that from a broad question of confidence, online teaching may not be a problem. On the other hand, consider more specific challenges. Horn and McGuan (2020) worked with teachers on ambitious instruction and observed in a preprint paper that as a result of the 2020 pandemic and schools moving to remote instruction, that "while the teachers maintained commitments to ambitious and equitable teaching, new dilemmas arose around time management, centering student thinking, and building and maintaining relationships" (p. 2). This suggests that the very nature of moving online meant that teaching changed, and it was not immediately clear how to get things back on track.

Online teaching and learning require access to technology, which also seemed to be a problem that teachers may not have been prepared to deal with. In a study in the United Kingdom about using online platforms for mathematics, Nesta (2020)

found that prior to the pandemic, teachers in schools with a higher percentage of low-income students were less likely to use online mathematics resources than those with a lower percentage. Nesta also found that, during online instruction, this gap dropped, however, that students from lower income families continued to be less active online than their wealthier counterparts, and when they were using the platforms, they tended to use phones or tablets, rather than desktop or laptop computers. This could create an inequitable access to education, potentially adding another challenge for teachers where they may feel unprepared to correct in the unfamiliar terrain of high technology use in online teaching.

In a teacher survey study, Kraft, Simon, and Lyon (2020) found that experienced teachers struggled with technology use during online teaching stretches. Of particular salience to FOPT, Kraft and colleagues reported that overall, the move to online teaching corresponded with “a sudden and steep drop in teachers’ sense of success” (p. 22). Kraft and colleagues linked a *sense of success* with *self-efficacy*, which many researchers have indicated is similar to FOPT (e.g., Faez, 2012; Jamile, Downer, & Pianta, 2012; Kee, 2012). According to Kraft and colleagues, the support (i.e., a supportive school culture) that teachers received during the pandemic may have impacted a sense of success. Collegial support and its positive effects in navigating unfamiliar terrain has been cited in the literature before. In developing a framework for online course development, Dunlap, Verma, and Johnson (2016) indicate that in the absence of support, those teaching online for the first time may have difficulty translating vague descriptions of what online classes should look like

into their real online classrooms, suggesting that even unpreparedness for unfamiliar contexts can be mitigated by collegial support.

The burden on teachers to transition from their familiar in-person teaching to an online platform in the middle of the year posed some problems for the public school system and inflicted an educational preparedness crisis. These issues may be similar to beginning teachers entering the profession for the first time, a lot of confusion and unfamiliarity with execution and fulfillment of goals.

Methods

This study used *episodic narrative interviews* (see Mueller, 2019), which encourage participant contributions through storytelling or rich descriptions of particular remembered episodes (see below) to bound participant responses. An *episode* is something that occurs during or over a specific period of time (Mueller, 2019), so each segment of the interview was framed in episodes by way of asking participants to share a brief story or description. For example, in this study, teachers were asked to talk about their first year teaching. This brief story is open for participants to share anything about that experience they feel is important to them, which is then followed up with a prompt regarding the phenomenon of interest (FOPT) that takes place within that episode. Mueller defines a phenomenon as a “process, behavior, emotion, relationship, idea, event, factor, concept, or unit of study--anything that a researcher is interested in learning more about” (p. 2). My interest in the concept of *feelings of preparedness to teach* fits within the phenomenon definition. The objective was to encourage stories about teachers’ FOPT

based on particular episodes to elicit descriptions about how FOPT changed based on the context of the situation.

Selecting and Establishing Relationships with Participants

I interviewed a subset of six experienced teachers from a larger study of ten participants. The ten participants had choices in which disruptions to talk about, six talked extensively about teaching online. One of the participants not included in the data for this study was an assistant principal during the pandemic, so was not teaching. Another participant chose not to share details about her experience. Two other participants focused exclusively on challenges after teachers and students had returned to in-person school, though related, moving back to in-person teaching is distinctly a different disruption than moving to online instruction. Table 1 provides information about teachers included in this study, which includes their pseudonym, race and gender, their in-person teaching context, years of teaching experience and undergraduate major, as well as leadership positions. Each participant had the opportunity to choose their pseudonym, if they declined, I made up a name for them.

Friends and colleagues sent a recruitment email to peers and colleagues who fit the criteria of having taught in a public middle or high school for at least five years. While all six teachers had taught for five or more years, two participants in this study had a history of teaching multiple subject areas, which also included mathematics. Mike was an experienced teacher, but only had three years of teaching math. Mike did teach math classes during online instruction switch. Janey, a teacher with five years of math teaching experience, was teaching science during the pandemic.

Utilizing the trust of my friends and colleagues and the established relationship between them and the participants may have allowed for some level of openness by these teachers. I further attempted to build trust with participants by sharing research goals with them prior to the interview and building an engaging and friendly environment at the beginning and during the interviews.

Teachers in this study were sent a consent form that provided information about the study, their rights as participants, efforts to protect their identity, and approximate time commitment. I then coordinated with the participants for individual zoom calls, creating unique rooms for each call so that someone did not unexpectedly show up and risk identifying participants. Along with the email link for the zoom call, I included a brief questionnaire for participants to fill out ahead of time at their leisure to collect information about their age, years of teaching experience, the race they identified with, their preparation program, and potential disruptions they may have faced to prepare them for telling their story.

The Interview

This study investigates experienced teachers' experiences during the pandemic to make sense of FOPT in unfamiliar scenarios or contexts. There is no existing theory on teachers' FOPT, and references to contextual factors are thin in the literature, a paradigm such as *interpretivism* helps navigate the lack of theory by relying on participants' experiences (Arghode, 2012; Kivunja & Kuyini, 2017; Mackenzie & Knipe, 2006) to understand teachers' FOPT might change through a disruption in teaching, in this particular case, suddenly shifting to online teaching during the COVID Pandemic. Utilizing a method like semi-structured *episodic*

Table 1*Characteristics of participants and their school contexts*

Pseudonym	Race & ethnicity (self-reported)/ Gender	School characteristics	Experience/major/ certs.	Leadership
Richard	white/ male	Charter school (range of SES students), mostly Mexican and Hispanic students	15/Mathematics/ Masters Ed.	None described
Juliet	Asian American/ female	Title 1, mostly Latinx and African American students	11/Mathematics/ Masters Ed.— admin certification	Staff development/ team lead
Tony	Mexican/ male	Charter/traditional, Mexican and Hispanic students	9/Math education/Masters Ed.	None described
Mike	African American/ male	Initially: 90% African American and “students who have parents who were born in West African countries.” Currently: “more diverse”	9/Poly-sci, Hist, Lit./Alternative Certification (alt. cert)	None described
Jessica	Black/ African American/ female	“Almost Title 1”	9/Psychology/ Masters Ed.	Department chair
Janey	Asian American/ Korean American	“Almost Title 1”, mostly Black and Latinx students	5/Biology & American Studies/Alt. cert. (Masters Ed.)	Instructional Lead Teacher

narrative interviews (see Mueller, 2019) allows teachers to draw on their own detailed experiences to provide an interpretation of a phenomenon (e.g., FOPT to teach with computational tech during a societal emergency). Mueller developed episodic narrative interviews because she found that, in many instances, participants in conventional interview studies would refrain from elaborating on their stories and experiences. Based on her subsequent experience with episodic interviews, she reports that these interviews better position the participants to be inspired to talk about particular moments and still have the freedom to tell their own, participant-driven stories.

To gather information about teachers' FOPT after a major disruption (e.g., shift to full-time online teaching during Covid), I used episodic narrative interviews. According to Mueller (2019), episodic narrative interviews consist of 6 steps: the participant is guided by the interviewer to (1) determine a phenomenon of interest (in conversation with interviewer), (2) explain the interview process to participants, (3) defines the phenomenon, (4) tell a story about an episode, (5) tell a story about the phenomenon in the context of the episode, and (6) finish with an opportunity to add or amend any parts of their stories. The episodic interview protocol I used included questions for teachers to reflect on their FOPT at multiple points in time. In particular, the episodes were segments of time, for example, just prior to the disruption, early in their transition, after some time in the new context.

A brief follow-up interview was conducted to clarify and verify statements participants made and conclusions the analysis suggested. The questions in the follow-up interview were more direct with an effort to keep the questions open and

non-leading to continue to hear the participants' stories, while also targeting specific uncertainties in the findings. These member checks are a way to ensure that I have not taken their words out of context and help keep the story theirs.

Interview Data and Analysis

Data sourcing and procedures

I collected data with an initial survey through email that collected some personal characteristics about the participants, for example, age, years of teaching experience, education background. Participants were also asked to think about different disruptions they have faced throughout their career, and I defined disruptions to participants as “a change within the school building, a move to a new school or district, changes in curriculum, or any other change in teaching context that impacted your readiness to teach in some way.” The rest of the data came from the interviews, conducted over zoom, which were transcribed into a document for coding in NVivo that assists in organizing and analysis of qualitative data.

The interview began with an episodic narrative interview about teachers' first year of teaching, then a prompt on disruptions, see Table 2 for relevant interview questions. I brought up COVID to participants who had identified it as a disruption in their questionnaire; however, some participants went straight into telling their story about their move to online teaching. Periodically, I would ask questions about FOPT or clarifying questions. Participants talked about the pandemic broadly and then I would ask questions to encourage more detail about the episode and then follow up with specific questions about things they said or asked about their FOPT for various

events within the episode. The typical question sequence about the online disruption is exemplified below:

You had a couple other disruptions that you listed. Is there—is there one you would like to talk about? Like, you said, “the new math curriculum... Covid, the move to online teaching, which sounded like “hybrid teaching,”
(Interviewer)

Juliet responded with, “it was virtual. So, we went all virtual...then, we called it ‘partial in person.’” Juliet replied that partial in person was also called hybrid teaching, where some

Table 2
Planned Disruptions Questions

Now I want you to think about disruptions to teaching you have faced. As a reminder, a disruption is a change in your beliefs about teaching or your work as a teacher, or change that is different from the teaching work you are familiar with. Such as a change within the school, at the district or state level, or some other change like moving schools, districts, or states that made your understanding of the work of teaching feel more challenging or significantly different.
Please tell me a story about this disruption.
Was there something (or as many things as you can think of) that you felt unprepared for in the new environment?
What did you feel prepared for in the new context? What stayed the same or what knowledge or skills could you transfer to the new situation?
How did you overcome the challenges or unpreparedness you faced? Did you have help or was it internal?
Can you tell me about the change in your routine in your move to the new context?
What were some challenges you faced in moving to the new context?

students were in the classroom and others were online.

Later I asked, “are there any stories from that event that you want to share?”

Juliet told her story. Later I followed up with, “was there anything you felt unprepared for in terms of the switch [to online teaching]?” Juliet responded to these

questions with robust responses about her experience during the episode of online teaching. This structure was typical across interviews.

Analysis

Coding was completed in three phases, however, this process started by reading the transcripts and memoing tentative ideas and actions (Maxwell, 2013) that stood out to me. The first phase identified elements of the presented framework (see Figure 1) within segments of conversations regarding the Pandemic. While the Pandemic itself was an episode, references to it arose during other episodes, either because there was overlap, or because something related was said and the participant switched to talking about the Pandemic. I looked sentence-by-sentence to pull relevant actions from segments within the Pandemic episode. I used memoing between the first and second phase to keep track of these codes and their patterns, understanding how they fit together within segments of the framework and how they might connect with others. The second phase narrowed these segments into specific themes that helped tell a story with the data from the first phase. The third phase took the follow-up interviews into account to verify the validity of themes.

I developed an initial coding scheme and codebook from the framework included in the introduction. Codes were identified by participants' views and actions about personal characteristics and experiences, preparation program experiences and knowledge, and teaching experiences as an instructor of record. Though I had a basic structure from the framework, it is conceptual rather than theoretical, so codes and themes were developed iteratively as more of the transcriptions were analyzed and other ideas surfaced or connected with claims and findings from the FOPT literature.

I used memos to help me track new connections between codes. My conceptual framework (Figure 1) posits that a disruption impacts FOPT, these conversations were mined for instances or comments regarding FOPT or references that might imply something about FOPT, for example, “tech savvy” may imply a preparedness to use technology depending on the context of the description. *Technology*, though not an explicit part of the framework, became an obvious tool necessary for the online teaching context because abruptly moving to online teaching impacted the teachers’ FOPT as it required learning to either leverage the affordances of new technology to teach in familiar ways or to use technology to teach in new ways. Therefore, I also included data about teachers’ use of and FOPT regarding new technology.

The final coding scheme is representative of the Pandemic disruption (see Table 3). These codes included supports, teaching experiences, how they were unprepared, and looking for references to technological challenges or successes. From that final coding scheme, I looked for pieces that were relevant to both teachers’ FOPT, and online teaching or technology use. *Computational technology* focuses on tools used in the classroom that are accessible on a computer or phone. As identified in the literature review, Russell et al. (2003) identified six technology uses by teachers, the coding for technology focused on the first three (technology to prepare for teaching, to deliver a lesson, technology for student use). I selected quotes that were representative of a group of participants, the quote clarified an event that one or more participants described, or a unique experience by a minority of participants.

Table 3
Codebook

Code	Definition	Example	Themes
Supports/ absence of supports/ contexts	Things that impacted teachers' success in their work. This includes district policies, administration feedback and school structuring, as well as peer collaboration practices and willingness to share and help	"In terms of really trying to teach each other how to use other tools, that really did not happen. I mean, we would [say things like] 'hey why don't you try Nearpod?' And then if we had time we could try to teach each other, but it's kind of hard to do that virtually" (Janey) "creating materials and sharing ideas with each other about using Google Classroom, or actually, we end up using Canvas, so I think it's that collaborative design. I think just working together, supporting each other, sharing resources, really was the reason that it was as successful as it was" (Richard)	Peer collaboration during online teaching was inconsistent between participants.
Experiences	How events, conversations, observations, etc. build to develop a teachers' FOPT for teaching or help them navigate new experiences and their work going forward	"[I was] already very familiar with how to use Google classroom before COVID even happened, it wasn't that hard of a transition in terms of that." (Janey)	Experience teaching with web-based technology impacts FOPT online.
Technology	Computational or web-based technology that is computer or phone accessible. These technology tools might be	"The difference between [this school] and [my first school] is I have way more resources at this school. It's like, I have online textbooks, online programs, I have all these different tech things that I have here I didn't have over there, once you start learning how to use them and	A variety of FOPT with computational technology, may be a correlation between FOPT and being self-

	used during the pandemic, before, or after	how to log into them, then I'm able to incorporate those with what I was doing before.” (Tony)	described “tech savvy.”
FOP	References to FOPT online, or how they have grown.	“[Online teaching] was the only thing that really jumped like, ‘Okay, I got hit!’ I felt disjointed a little bit. And so I had to figure out how to regroup in this set of circumstances that COVID put us in. And I didn't think I had enough in my background and training and preparation that helped me to manage that kind of stressful transition” (Mike)	Experienced teachers felt prepared to teach in person, felt unprepared to teach online, and felt mixed on preparedness for education technology

Note: the table is set to identify the coding word or phrase in the first column. The second column describes what I looked for within the text to find examples that fit that code. The third column is an example quote by a participant. The fourth column describes themes within the code.

Findings

There are two findings subsections. The first addresses the first research question concerning the teachers’ FOPT after in-person teaching was disrupted and they were asked to transition to online teaching irrespective of their preparedness to teach using computational and web-based technologies. The second subsection addresses the second research question regarding the participants’ FOPT using computational and web-based technologies.

Emphasis on Preparedness During Online Teaching

Participants who shared stories about their online teaching experiences found the work challenging and felt unprepared to teach online for various reasons. The teachers did not feel unprepared to teach online on the whole but rather for certain aspects of the work, particularly building relationships with students, and challenges

relating to instruction. Issues arose because of how different online teaching was from in-person teaching. These differences, coupled with an apparent inclination to continue to use in-person teaching practices may not have lined up well in the online context. For example, Mike said, “in the classroom, I can actually see when a student was getting it or not by nonverbals. And I couldn’t catch that in terms of technology, so I didn’t know what I needed to reteach,” which indicates data collection methods on student learning can be context-specific. Mike, Tony, Juliet, and Janey spoke about the challenges of distance learning that were not overcome through the available technology.

Feelings of unpreparedness to connect with students online

Teaching online was different and required a lot of computational or web-based technology use, and every teacher expressed that they were unprepared for online teaching in some way. The unpreparedness that teachers faced likely resulted from how the online teaching context was different from in-person teaching. For example, Tony said, “I felt unprepared for how to reach kids... everything [about my teaching] is about being able to connect to students,” distance learning made these connections difficult to build. Similarly, Juliet felt unprepared for situations where students appeared disengaged, and in-person strategies to re-engage them did not appear to be transferable to online teaching: “it just feels, –so, you know, that lack of control versus if I had them in class, there’s no way they wouldn’t have done no work. You know because I was an experienced teacher.” Juliet’s quote about control may have meant control of the situation, rather than control of students, as it came from a longer vignette in which she cited the loss of the personal and emotional connections

between teacher and students in the online environment; these relationships were hard to build online. This, in addition to comments made by Tony and Janey about the challenges of building relationships with students online, suggests teachers had few ways to build trust and inter-personal connections with students when starting the year virtually.

In follow-up interviews, Tony and Janey both shared examples of their attempts to provide students opportunities to build a community in the online classroom context; these attempts were not as fruitful as in-person community building. Tony described one attempt to help students get to know each other better,

I forced them to do homework on flip-grid in order to kind of see interaction. I like seeing who my kids are, seeing how they speak, seeing their body language. It was more for me, and I would make [their work] a little bit public for their classmates and give feedback to their classmates and that was a way for them to see who was in their class.

Tony described an assignment where students recorded themselves solving a problem and talking through their steps and thinking, and having another student critique or comment on that work. Tony and Janey both found that when starting the year online (compared to starting in-person and then shifting online), students did not interact as much as they did in person, even when provided opportunities for socialization.

Tony and Janey both tried to find ways around this issue by encouraging interactions in other ways, like through assignments.

Feelings of unpreparedness to instruct online

This subsection identifies ways teachers felt unprepared to instruct online. These feelings were not content-based, every participant emphasized that content knowledge was not the problem, for example, Tony said, “I felt unprepared [for

online teaching], not the math.” The content knowledge, apparently translated to the new context, suggesting some other teacher knowledge (e.g., pedagogical knowledge) or preparedness may not have.

In response to my question, “was there anything that you felt unprepared for in terms of the switch to online teaching?” Juliet said,

For math, in particular, the writing piece of it... you know how difficult is it to write on a computer? Not all the students had touchscreens. I think at our school that year, only some of the eighth graders had touchscreen Chromebooks at the time. And we had something called Nearpod, that students can write on if they had touchscreens. But if they didn't, then you're using a trackpad to try to write numbers. Everything takes forever to do.

Here, Juliet, prepared to use a particular software that allows students to write as if they were in person, finds that students lacked the appropriate hardware to use the technology as intended.⁸ Juliet and Richard both described an inequitable distribution of materials where some students could use their fingers to draw on their “touch-screens” and share something more readily than a keyboard could, and this brought challenges for keeping other students engaged. In response to my question about feeling prepared for online teaching, Richard expressed some elements of transferability regarding “the ones who were there and able to interact. I tried to do as best I could for the other ones and keep them engaged, but you know, it was just a very inequitable year.” Those who had touchscreens could more easily display what they wanted to share, which left challenges about what to do about those who could not easily share or became disengaged.

⁸ Mathematics sometimes requires special symbols to show work, which might include a series of steps, complex fractions, or graphical representations, making keyboards somewhat cumbersome for expressing thoughts and ideas in particular situations.

Juliet and Janey also found not all the technologies worked together in the same ways and this seemed to contribute to their feeling “disrupted” as teachers and being underprepared. About this, Juliet expressed the following:

There were certain characteristics and features that I could get on my computer that the Chromebooks could not. So even something like a virtual background, I could do that. But if you were using a school Chromebook, you couldn't. And the students were all also using Chromebooks. So, they couldn't do virtual backgrounds. Which, you know, could have been part of why a lot of students shut off their cameras and didn't really, you know, show their faces. (Juliet)

Here, Juliet identifies a possible reason students kept their cameras off. Without a virtual background, students' home-lives were broadcasted to the rest of the class. Screens off meant teachers, like Mike, were down a couple of senses. Mike found himself “walking away every day, when I closed down zoom, saying to myself, did I miss anyone? Did they really get there? I don't know.” These barriers meant that Mike lacked some familiar, in-person methods to gather information about his students. Mike discussed that he knows what to look for to see if students are following the lesson but had not developed or was not aware of comparable moves when teaching online, especially with cameras turned off.

Resourcing (or not) Peers for Unpreparedness to Teach Online

Juliet, Tony, and Janey all identified *trust* as an element of who they could reach out to when they were uncertain or needed help prior to the Pandemic. Interestingly, with near universal feelings of *unpreparedness* for elements of online teaching, few participants shared robust collaborative efforts to share resources and ideas online. Janey said, “we were a little bit lacking on the collaboration part.” This may suggest that reaching out to peers when feeling unprepared to teach in a new

context is not the first step for some experienced teachers. Janey found it challenging to teach peers how to use web-based technology virtually (see Table 3). All participants mentioned working with others online, but it tended to be limited with respect to managing online teaching difficulties.

Richard's description seemed the most collaborative by far for making sense of online teaching. Though Richard indicated he was unprepared because he had no prior training, he said the transition to online teaching was about as smooth as he could have hoped for. He considered the collaborative working community at his school as one reason.

When people had problems, they bring it up, and we work together to solve it. And our admins were very available, we definitely tried to be a team. We meet as a team and support each other and, you know, so all of that sense of shared resources and support for each other. I think that's why it worked and was as painless as [teaching online] could have been, I think it was a totally weird experience. No training in online teaching at all, but we did our best.

Richard described an environment rich with collaboration where the goal was to work together to solve problems, anticipated or realized, that teachers had not been intentionally prepared for. It is notable that they had no formal online training but leaned on each other and the administration to piece their work together. Richard described his school's collaborative efforts as a regular function of the school's ecosystem,

I think the things that really make the system work are that collaborative design, that we've worked together, that we support each other, that we have really big, audacious goals, but we're really flexible and collaborative, and we keep experimenting and trying to collect data and trying to improve.

Perhaps, this built-in structure enabled a more available structure when the teaching context changed. Juliet and Tony also described time set aside online to collaborate,

however, no mention of working through online teaching challenges together. Tony and Juliet's descriptions were not as descriptive or focused on collaboration in the schools they taught in during the pandemic. Tony and Richard worked together at Richard's current school years before the pandemic.

Having no teaching experience in online teaching, and thus unprepared to set up an online classroom, Janey found value in looking at exemplary online classroom models to adopt and try out.

A lot of stuff was just me looking online, like thank goodness for like Internet, but just looking online, and just honestly putting the teaching online and then looking at YouTube videos of what other teachers did, or there are suggestions and how they set up their online classroom like their bitmoji classroom and them offering different things that you can do to kind of, -or ideas of how to effectively teach online. So for me, I was doing a lot of that research on my own to prepare myself for as much as I could. (Janey)

In a follow-up interview, Janey admitted that even with a long-standing collaborative group, sharing with other teachers about online teaching did not happen much. She said, "we would just bounce ideas off one another... but, in terms of really trying to teach each other how to use other tools, that really did not happen." Janey indicated time and proximity were barriers to working together to help each other better use and learn technology for online teaching. An implication here might be that learning on the job and the development of increased FOPT can induce solitary practices for some teachers.

Technology FOPT

This section attends to the second research question about teachers' FOPT using computational technology. In brief, teachers with more extensive technology

backgrounds felt better prepared to use teaching-relevant technology for online instruction. For example, Jessica said,

if you're not a tech savvy person, you literally were just like spending hours trying to understand the technology that they want. And they're like, "okay, we'll use this, use this, use this, use this, use this, and we're gonna have training on this, this, this, and this." There are only so many trainings your brain is going to allow you to get. So, there was a feeling of overwhelm like, "for the love of God," that type of thing.

While Jessica did not explicitly rate her own savviness, her quote exemplifies the demand on teachers to learn new technology they were not prepared to use, in addition to their regular teaching responsibilities. The other participants did reference their level of savvy. Tony and Richard indicated that they were not technologically savvy prior to the pandemic. Richard described himself as "above average," but perhaps did not find that to be adequate for what was needed for online teaching. Juliet and Janey described having experience working with technology conducive for online teaching, and both described themselves as feeling "prepared," and "somewhat prepared" respectively for using technology to teach online. Mike also described himself as "about six and a half to seven [out of ten]," suggesting he also felt somewhat prepared for using technology for online instruction, and as "aspiring (laughing) to be savvy." Whether savvy or not, finding and learning new technology was time-consuming and additional work according to Mike and Janey. For example, Janey said, "I found some of the stuff intuitive after watching the tutorials, but I don't know about seamless, it was definitely a lot of work."

General technological savviness is one measure to rate FOPT with computational technology. Another measure might be experience with technology in the context of web-based technology or asynchronous assignments. Juliet and Janey,

both in leadership positions, found that some teachers were fortunate enough to have had relevant online technology experiences in their classes prior to the pandemic. To illustrate how prior experiences helped prepare some teachers for online teaching, Juliet described her observations as a staff development teacher, working to support other teachers with online instruction:

I felt like certain departments at our school were more prepared for the push to all virtual... if you were a teacher, though, who had very little familiarity with any of those platforms, you were really struggling when we switched to virtual. So that was a huge disruption for some teachers, and, for example, our PE department was like, “What? How do I design lessons for physical education online?” right? They had to work really hard... Any teacher who wasn't as tech savvy really had to learn these platforms. My math department we were a little bit luckier because we had been doing a few years of Canvas lessons, playing around with Canvas... of course, then everyone's learning Zoom, right?

Juliet indicated that some of her teacher colleagues were more prepared for online teaching than others because of their previous work using online platforms such as Canvas, an online classroom management platform where work and instruction can be disseminated to students from a distance. Juliet felt the mathematics and science teachers' experience using Canvas alleviated some challenges of teaching online, perhaps it was enough to get started in an unfamiliar terrain. She also noted that all teachers were learning Zoom on top of other technology needs.

Juliet indicated that the physical education teachers were baffled by creating their lessons for this new context. Perhaps relatedly, she also made the case that exposure to web-based technologies helped with online teaching preparedness. How do teachers find such exposure if no formal or equitable dissemination process is provided by the school or district? In Mike's first year of teaching, he identified a teacher at his school who “was tremendous in helping me to understand how to think

about integrating technology because he was using, like, dojo⁹ and some things that I didn't see across the school.” Through other episodes, Mike appears to be fluent in making connections with various people who will help him improve his teaching practice.

Tony, who described himself as “not the most techie,” talked about his foray into selecting unfamiliar online tools to use for virtual instruction, which left him feeling unprepared to navigate the large selection. Tony did not immediately know which platform or tool to select.

I never really had to worry about it that much besides email and google classroom and things, small things that are universal at this point. When it came to other platforms of online things, there were just so many out there that—and I wasn't prepared. I had never heard of most of these things we were trying to use. But what was more overwhelming, our district didn't choose necessarily what you had to use, they kind of left the door open of kind of like, “pick one and if you don't know what to pick come to this optional zoom meeting and learn about it.” And I'm like, “well how do you know what to pick?” I need to go to these 15- 20 different zoom meetings to try to figure out which to do, and they were, you know, pretty—they were good to explain what they are but now you have to go and mess around and see if you actually like it. It was a bit overwhelming. To be 100% honest, I kind of just picked two that seemed to be like the first two that came to me and once I learned it, I was like, I'm not messing with anything else.

Tony went on to explain his rationale for selecting the two he chose: Peardeck, and Flip-grid. Peardeck he was already familiar with because he used it as a student when getting his master's degree. Flip-grid on the other hand, “called to me because during distance learning, the kids didn't have to have their cameras on,” and Flip-grid allowed a substitute “interaction” for Tony. There was a familiarity there, something for him to leverage what he knew.

⁹ ClassDojo is an online tool for connecting schools, students, and families in various ways

Discussion

This study was designed to understand experienced teachers' FOPT amidst a disruption. The findings suggesting specific elements of FOPT may not continuously grow, and that contextual factors can impact them. Using episodic narrative interviews to gather stories from six experienced mathematics teachers, I found that, overall, the teachers in this study contrasted online and in-person teaching, their descriptions suggest that they looked to anchor online teaching with techniques that worked for in-person instruction. It is unclear whether the teachers felt unprepared due to familiar practices that did not transfer online, or they transferred the practices because they felt unprepared for online teaching. This study also reveals an opportunity to reflect and invest in development and training to rethink varying uses of computational and web-based technology in the classroom.

Changed Structures and Contexts

The experienced (mathematics) teachers in this interview study indicated they were unprepared for online teaching, that there were clearly changes to teaching structures that were different for online teaching than in-person. For example, not being able to see students' faces for tracking understanding or disengagement, were challenges where prior experiences did not provide clues for successful next steps. Participants shared that starting the school year online, compared to shifting to online teaching midyear, made building relationships and trust with students a challenge. Adams and Forsyth (2013) argued "in the absence of trust, teachers attempt to control student behavior with threats or incentives" (p. 7). Though participants in this study

did not share whether they used threats or incentives, Adams and Forsyth's quote suggests the importance of trust within a classroom to strengthen mutual respect among members of a classroom community to move toward a common goal. Computational technology was limiting in this respect. For example, some students lacked the ability to include a zoom background to obscure their home-setting, so they turned their screens off. Daneshmand and colleagues (2022), three community college instructors reflecting on their experience teaching online during the Pandemic, attributed limited collaborative classroom practices to some students' cameras being off, suggesting limits to building engaging classrooms.

Related to engagement, as pointed out in the interviews, some of the participating teachers' students were provided touch-screen devices, which was particularly useful for mathematics when numbers, representations, and symbols were required. Yet this poses challenges for students who must rely on a trackpad or mathematics-type from *Microsoft Word*. The teachers reported that, when students did not have touchscreens, it slowed the lessons down, potentially limiting student willingness to participate and further stretching teacher capabilities to teach online. This suggests that the technology was insufficient in making the online environment comparable to the in-person environment. Hindering teachers' normal formative assessment practices may also have contributed to teachers' lower FOPT online.

These challenges may indicate a need to reimagine mathematics classroom structures to help accommodate a variety of participation opportunities for students, or some other solution. Teachers could not change the fact students were online, they could change the kinds of tasks or other types of web-based technology they used, if

aware of them. Tony, for example, indicated that he selected a platform that he believed would connect members of his classroom, but only picked it because he had used it previously. This suggests a potential list of online platforms and applets that may have been more efficacious had he only known about them. For example, Wills (n.d.) created a website to support teachers entering online instruction that includes supports, examples, and tools to make online learning engaging. If Wills' work was known at the time, perhaps it would have helped teachers with their transition.

Perhaps, in addition to limited relationship building, being on a device or simply as a result of being at home was too distracting for some students. This may suggest a reimagining of the mathematics classroom to be more engaging, pulling in student-generated ideas to connect mathematics concepts. What if online tasks were more engaging and allowed students to explore or argue mathematics topics in small groups and then as a whole class? Leveraging modern computational technology capabilities, Olsher, Yerushalmy, and Chazan, (2016) proposed a conception for mathematics classrooms where using a platform that can gather, automatically assess, and sort by characteristics extracted from student submissions. Such capabilities exist (even if in early stages) and can be used to help teachers organize student work to save time, and structure opportunities to engage students in the validity of the work of their peers. Currently, it is not clear whether these kinds of platforms and relevant tasks are well-known, so an effort from institutions to produce more and share the existence and use with teachers may be valuable for both in-person and online instruction.

Preferences for prior experiences

Participants' descriptions of themselves and colleagues suggested a tendency to default to in-person teaching mechanisms while online. FOPT with computational technology for online instruction is not merely about familiarizing oneself with new technology, the deeper problem is that the technology affordances do not always match prior experiences.

Without a theory of online teaching to grasp onto, teachers had few choices but to rely on the experiences that had previously been successful. Participants felt that their content knowledge was sufficient, but I posit that they may have lacked an online-specific teaching pedagogy. Some would argue (e.g., Hill & Uribe-Florez, 2020; Koehler & Mishra, 2009) that the teachers needed more support with *technological pedagogical knowledge* (TPK), which describes a knowledge “of how teaching and learning can change when particular technologies are used in particular ways” (Koehler & Mishra, 2009, p. 65). TPK also includes considerations on the limits and benefits of the technology in a given context. There may also be a need to integrate different ways to use technology over time so teachers can experience different uses of computational technology for flexible use.

Notably, Daneshmand and colleagues (2022) indicate that some lessons translate well to online teaching, while others do not, and an awareness of the transmissibility is important for online teaching. Translating in-person lessons to online teaching, or finding and learning to use technology that can help that transition are time-consuming to develop, it may be that teachers in this study could not allocate enough time to such practices. Forgasz (2006) indicates time investment regarding

technology implementation and planning inhibits the use of technology. However, if online teaching continued for years, perhaps the participants would have refined their online teaching practices as necessary. Still, they lacked the support and head-start on reimagining the uses of particular technologies available to them in the mathematics classroom, and this put teachers in a tough spot.

It is also notable that teachers, for the most part, did not leverage their peer network to make sense of online teaching. Perhaps this too related to an unnecessary time investment. Alternatively, perhaps experienced teachers do not primarily reach out to peers for instructional support. Tschannen-Moran and Hoy (2007) found that contextual factors such as resources and "interpersonal support" were more important for novice teachers than experienced teachers. Tschannen-Moran and Hoy studied the context of urban vs suburban teaching and measured self-efficacy, still this may explain why experienced teachers did not immediately reach out to peers to find support for teaching online.

Implications

Technology use in classrooms is not new, teachers have been using it to simplify their work, or make the content more engaging for years. In years past, studies have identified that teachers felt unprepared to use technology in the classroom (e.g., Lewis et al, 1999). What appears different about using technology now than in the first decade of the 2000s is, though novel technology tools are now available, a familiarity with similar technologies may help teachers adapt. The results of this study suggest that teaching contexts (online verses in-person) matter, at least for pedagogy and computational technology.

If, for example, districts decide to implement some kind of online protocol for inclement weather or other events where schools close, this policy should be clear early on with opportunities to prepare and practice using relevant technology provided for teachers in these districts. However, focusing on the importance of teaching online for a prolonged period of time misses the point. I argue it is valuable to look at the technology we have and what is in development, and reimagine mathematics teaching when using computational technology in ways that leverage the power of the opportunities for exploration and assessment that technology provides (see Haddif & Yerushalmy, 2015). We may never face online teaching to this degree, but there may be situations in the future we cannot imagine and will disrupt the normal teaching routines. One imaginable example is, a significant teacher shortage (see Sutchter et al., 2016) might require a reimagined structure where the few certified teachers in a building teach courses with the assistance of uncertified adults to trouble-shoot and manage a large number of students (see Opportunity Culture, 2012). Branching out and diversifying in-person teaching styles and embracing technology for the purpose of varying and enhancing the skills and online TPK is a valuable takeaway from this study.

The rapid move to online instruction bared additional equity gaps in the education system. With no dissemination process in place, an element of time in teaching for maximum exposure to useful platforms, and an element of networking and luck to come across these technologies is necessary. Such limited structures leave teachers with fewer networks with fewer experiences with relevant computational or web-based technology. In order to prepare the system for severe disruptions in the

future, the US Department of Education, as well as local school systems should consider how resources are distributed even during normal times, a preparedness for the unexpected. If technology continues to grow in usage, schools would be wise to verify access to technology is equitable (e.g., touchscreens when appropriate). Additionally, it was clear that sharing of technological knowledge and experience among teachers prior to the pandemic was unequal. Some teachers were primed to switch to online teaching, and others were scrambling to find and learn technology that would be essential and beneficial.

While teaching online, students were given the option to keep their cameras off, which was valuable for students' privacy and perhaps emotional well-being. There are plenty of reasons to give students this privacy, and teachers in this study respected that. Regardless of that respect, this still made the work challenging. While most probably would prefer not to go back to online teaching, in the event of another virtual learning situation, a support might be investing in technology that allows all students to enjoy the same privacy giving abilities. Even when technology is distributed equally, students from lower income brackets are more likely to be limited in the spaces they have to work. This means they may have their cameras off during class and break out room sessions, potentially limiting their contribution through visual communication (e.g., nodding head, gesturing, etc.). This also places a burden on teachers in terms of visually checking students for understanding and engagement in the lesson.

Limitations

This study gathered a variety of data on a broad set of topics using interview techniques that give the participants voice. Valuable and unanticipated information may be gained about a relatively unknown topic, such as abruptly switching to online teaching, through hearing what was important to the participant who lived the experience. However, these are personal reflections on readiness, not measures of online teaching or computational technology use competencies. That said, the findings could have benefitted from explicit questions regarding technology use before, during, and after the shift to online teaching with the purpose of identifying how teachers' felt their use of technology changed between contexts and teachers' growth and interest in using and learning about technology.

This study also missed a potentially valuable group of experienced teachers who left the profession, I did not connect with for an initial interview, or did not want to revisit their online teaching experience with me. One participant declined to share her experience because she felt her experience would be “generic,” “we all had the same struggles at different times, I’m sure.” Maybe there was a “generic” aspect of online teaching challenges teachers faced, yet, the particular experiences appeared to vary.

Finally, I make claims about technology not leveraged well enough to overcome student disengagement and teachers' challenges in transferring in-person teaching and management techniques online. However, an alternative explanation as to why teachers found these challenges could be that students (as well as teachers) were facing their own crises and even with changed technological practices students

may have continued to not engage because learning mathematics was not a priority for them. Jones and colleagues (2022) found that students' mental health was poor during the pandemic, in fact, about 44% reported feeling down for long enough that they would stop doing typical day-to-day activities, suggesting a potential reason for disengagement in school. Social connectedness blunted the effects of mental health issues measured during online teaching due to the isolation requirements.

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Chapter 4: Toward A Framework for Teachers' Feelings of Preparedness

Abstract

This theoretical paper reviews the quantitative literature to build a framework for teachers' feelings of preparedness to teach (FOPT). Such a framework might help the field overcome current barriers such as limited predictive outcomes. Quantitative literature on teachers' FOPT is analyzed and mapped to share themes and topics that are commonly related to FOPT in research studies. A review of the quantitative literature suggests researchers 1) prioritize subject-general FOPT over subject-specific, 2) prioritize different research goals for PSTs and in-service teachers, 3) do not prioritize school contexts in contributing to FOPT, and 4) pay little attention to teachers' FOPT to use or implement computational technology. Select qualitative studies are included to highlight future areas of study for quantitative work such as feelings of preparedness to retain teachers in hard-to-staff schools and the need to update teachers' feelings of preparedness survey items that better reflect some modern educational practices, needs, and values.

Introduction

Teachers' feeling of preparedness to teach (FOPT) is a fairly accessible measure or set of measures, and researchers use these reported feelings for a variety of purposes. For example, some researchers use new teachers' FOPT to try to identify how teacher preparation programs differ (e.g., Darling-Hammond et al., 2002; Kee, 2012) while others hope that FOPT will predict outcomes like teacher retention (e.g., Viviani et al., 2023). Viviani and colleagues (2023), and Kee (2012) make valuable arguments that, in a way, caution against making assumptions about generalized constructs (e.g., overall FOPT, alternative certification) distinguishing specific elements of these general constructs may benefit prediction models for FOPT.

In the same way that Desimone (2009) argued that a common conceptual framework for studies on professional development would enhance research on (and

implementation of) teachers' professional development, the research field on teachers' *feelings of preparedness to teach* (FOPT) would benefit from a shared or common framework. This study is a first step toward such a framework by reviewing and analyzing relevant literature on FOPT. Such a process includes a review of theoretical assumptions in quantitative FOPT literature and includes findings and theory derived from qualitative studies to add depth to the quantitative work, which is an important next step in developing a common framework.

Mapping out the theoretical assumptions that guide quantitative studies on teacher FOPT is valuable in taking stock of where the field has been. Quantitative studies can cover a lot of ground and can provide glimpses into existing theories and theoretical assumptions. The next step is to find out what additional questions arise from the efforts of those in the field, as well as, weigh how the landscape in education may be different or may be changing to be responsive with updated variables or constructs. For example, as the education field strives for equity and inclusion, how, if at all, will these issues be reflected in FOPT surveys or other studies?

The purpose of this paper is to identify and organize the constructs in published quantitative studies on teachers' FOPT to construct a potential shared or common theoretical framework of teacher FOPT. These constructs include the different variables related to FOPT, as well as how the researchers frame teachers' FOPT in these studies. I then include recent qualitative studies within three themes to highlight some gaps in the quantitative work, this includes two of my own studies.

Toward a Framework

This framework section analyzes how quantitative studies about FOPT connect different constructs and variables with FOPT. A visual map (see Figure 1) is provided to help express what variable clusters are most valued, by occurrence and significance. The map in Figure 1 includes quantitative constructs or the quantitative portions of mixed-methods studies that link teacher FOPT with other construct measures using regression, correlation, analysis of variance tests, likelihood estimators, and other similar analyses. The data suggests that research is focused heavily on *overall FOPT* (e.g., general FOPT) to teach and the *act of teaching* (FOPT for specific tasks required for teaching, rather than socio-emotional FOPT or interacting with colleagues).

Process

I obtained the studies included in the framework through years of collecting empirical studies on both preservice teachers' (PSTs') and in-service teachers' FOPT through searches that included variations of "feelings/sense of preparedness," "self-reported preparedness," and following relevant citations found in those intentionally sought in a snowball data-collection manner. I only included papers that explicitly used the term "preparedness" and that preparedness was self-reported. This strictness was to avoid contaminating the framework with similar but potentially distinct constructs such as self-efficacy.¹⁰ Though the breadth of the literature review for this

¹⁰ In the literature review for prior research, I provide evidence that researchers sometimes use FOPT and self-efficacy interchangeably (Viviani, 2023a). Although self-efficacy does become part of the framework, it is conceptually distinct from FOPT for the purposes of this paper.

framework is not exhaustive, I have reached a theoretical saturation point, where no new information appears to significantly change the framework.

This review includes 39 quantitative studies that used surveys to gather data, where a FOPT measure is correlated with, a predictor of, or is predicted by other variables. I started by reading these studies to understand the implied framing and purpose of the research, including what and how variables were used to connect with FOPT. Some variables were not statistically significant, but I considered this an indication that such variables were part of the community framework on FOPT, and therefore theoretically or possibly even practically important. To the best that I could, data such as variables (e.g., construct measures) and their connection with FOPT, the type of analysis used, and effect and significance were recorded on a spreadsheet.

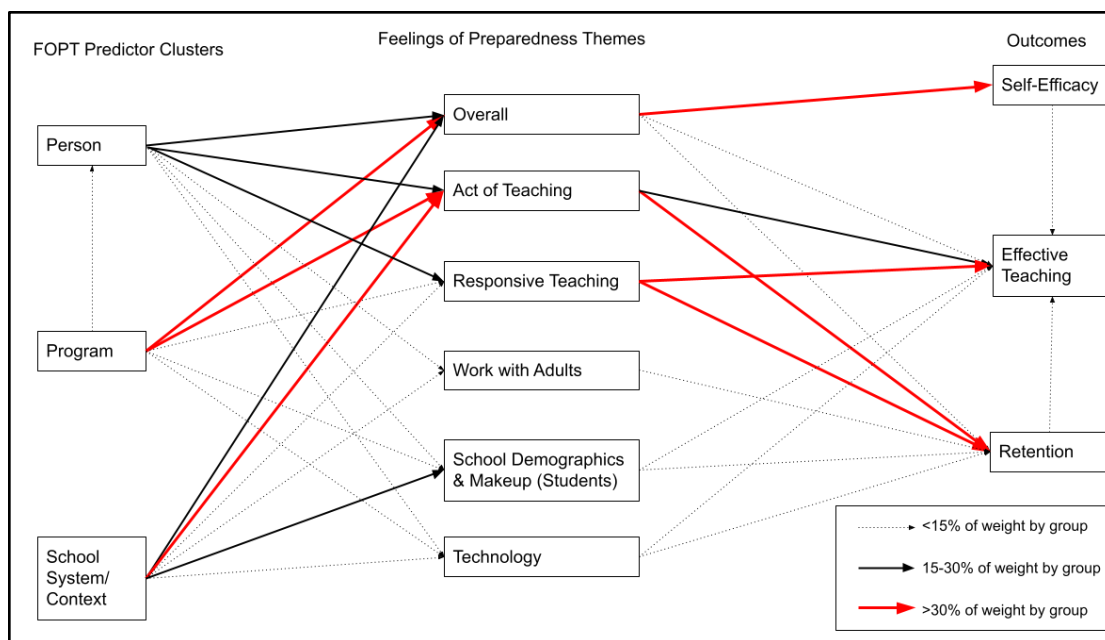
I organized the variables into three types, 1) those that were theorized to predict FOPT, 2) FOPT items and constructs themselves, 3) measures that FOPT hypothetically predicted. Categories in type 1 include: *person*, *Program and Education*, and *school system/context*. The categories in type 2 include: *overall FOPT*, *acts of teaching*, *responsive teaching*, *work with adults*, *school demographics and student makeup*, and *technology*. The categories in type 3 include: *self-efficacy*, *effective teaching*, and *retention*.

The construct measures that fit into the first large category were organized using Johnson and colleagues' (2005) conceptualization of predictors of FOPT (i.e., person, program, and school). The measures in the *FOPT themes* category were grouped in the following way. There was a clear general FOPT construct, which I labeled *overall FOPT* because it is a collection of different teaching activities. Then I

considered the explicit actors referenced in the survey items from the included studies. A construct where teacher and student interaction appeared to be or might be interpreted as one directional (teacher to student), I labeled the act *of teaching*. The next grouping considered bi-directional interactions between teachers and students, *responsive teaching*. The next grouping included bi-directional interactions between teachers and other adults (e.g., parents, administrators, colleagues), labeled *work with adults*, intending to include those in the school community. I considered technology use and school contexts to be distinct from the other groupings, and so created categories for each. The final large category (*Outcome constructs*) were straightforward in establishing because there were so few included in the literature, each one became its own distinct outcome group.

Once the categories were established, some articles were revisited to try to establish the intent of variables where fit in my framework was uncertain. For instance, Ronfeldt, Reininger, and Kwok (2013) had a factor that they called “Perceptions of Instructional Preparedness.” As titled, it would have fit within one particular category (*act of teaching*), however, the survey items included in that factor did not all align with the *act of teaching* category, and so I placed it in the *overall FOPT* category. In some cases, a reviewed study’s analysis used a correlational model, which is bi-directional and, as such, does not necessarily imply causality. However, I reasoned common directionality between constructs based on how other researchers established it.

Figure 1
Weight percent based on group



The first set of arrows' groups are *person*, *program* and *education*, and *school system/context*. The second set of arrows' groups are *self-efficacy*, *effective teaching*, and *retention*. The focus is on FOPT, which are themes that are members of various groups.

Once the categories were established, I used a value system (explained in the next paragraph) to help me organize and make sense of how the field values different variables. This effort was to both be inclusive of variables that were not significant, but also elevating those that were. I do not include the quantitative values because the point is not to assign numbers and values to pathways. The purpose of this exercise was not to develop a framework by which the values imply fruitful connections, but to establish where the field emphasizes elements and outputs of FOPT. This is to find patterns and look for places where the research appears to be robust or limited.

I tried to find unique constructs in different articles when researchers appeared to use the same dataset for a different analysis, though it was not always possible to discern, and I erred on the side of being inclusive. Non-significant items with low correlation or effect size earned a 0.1 value per occurrence, larger effect sizes earned

0.2.¹¹ Significant findings at $p < 0.1$ or 0.05 level and low effect/correlation sizes were given 0.3 value, and 0.5 value, respectively. Significant at $p < 0.01$ or 0.001 and low effect/correlation sizes have a 0.7 value and 0.9 value, respectively. Larger effect/correlation sizes increased the low effect sizes by 0.1. Significance was given a priority over effect size because some studies only posted values that were significant at a particular level (e.g., Tatto et al., 2020; Taylor & Frankenberg, 2009), giving priority to significant findings. Supposing that findings were reported with fidelity and “p-hacking” was not implemented, significant findings also suggest that the results are relatively unlikely to occur by chance. This weighting or scaling of variables raises questions about how or what to do with these values. These values might appear to be ordinal, given the differences between 0.2 and 0.3 may not be equivalent to the differences between 0.4 and 0.5, and therefore can only be analyzed by nonparametric methods. Velleman and Wilkinson (1993) argue that “scale types are not fundamental attributes of the data, but rather, derive from both how the data were measured and what we conclude from the data” (p. 15), arguing that ordinality does not necessarily imply nonparametric analyses, it depends on more nuanced elements of the data. As stated earlier, this value system is intended to be used for identifying areas of focus in the literature, a process that can be fairly imprecise. Therefore, I implemented some measures on the data that may violate ordinality rules, the result of these calculations help in pattern seeking.

¹¹ Correlation and effect size was determined based on the type of variable. For example, a binary variable that predicted more than half of a unit or standard deviation was large, but a continuous variable with a relatively wide range that predicted an increase by less than half a unit could be considered large if inflation of the variable could have a large impact on the outcome variable.

In a spreadsheet, the variables with their values were clustered to appropriately situate elements of the themes, and the scores were added together. I decided on using the percent weight of a variable group's relationship with FOPT variables because inherently, groups contained different numbers of variables. In this way, a within-group relative weight can highlight research efforts specific to that group and identify relatively large relationships between that group and FOPT thematic measures, rather than being ignored because Overall FOPT, for example, is heavily examined. These percent weights were graphed on a dot plot to (see Figure A.1 in Appendix A) find natural breakpoints in the data to distinguish between different levels of variable relationships. There was a large gap after 14% and another after 30%. Therefore, these percent weights are used to distinguish between different arrows in Figures 1 and 2.

Constructs Hypothesized as Causing Teachers' FOPT

This section presents my summary of the constructs that researchers believe cause or influence teachers' FOPT. It is organized into three subsections: (1) person or person-related constructs (e.g., race, GPA) assumed to influence teacher FOPT, (2) program or the influence of certain components of initial teacher preparation on teacher FOPT, and (3) school or district-school-classroom contextual constructs assumed to influence teacher FOPT.

Person

Johnson and colleagues (2005) identify "person" as one of three elements that develop FOPT for beginning teachers, which I also found to be a relevant cluster of variables in the literature. Variables that fit into the *person* category included

descriptors of the teachers in the studies, such as race/ethnicity (Brantlinger et al., 2020; Eckert, 2013; Ronfeldt, Reininger, & Kwok, 2013; Ronfeldt et al., 2014), gender (Brantlinger et al., 2020; Eckert, 2013; Kane & Fontaine, 2008; O'Neill & Stephenson, 2012; Ronfeldt, Reininger, & Kwok, 2013; Ronfeldt et al., 2014), and age (Brantlinger et al., 2020; Kane & Fontaine, 2008; Ronfeldt, Reininger, & Kwok, 2013). With each of these individual or personal characteristics brings experiences and perspectives that help shape what one knows, does, and feels. The *person* category also includes beliefs that individuals hold about education (Tatto, Rodriguez, & Reckase, 2020). Variables such as undergraduate GPA (Casey & Childs, 2011; Zientek, 2007), attending a “selective” or higher ranked universities (see Brantlinger et al., 2020; Kelly & Northrop, 2015; Ronfeldt et al., 2014) are also included in this category as may measure an element of a person’s character in the sense that perhaps they are driven for performance or they know how to navigate the education system adeptly. Finally, years of teaching experience (Bledsoe et al., 2016; Eckert, 2013; Lewis et al., 1999; OECD, 2017; Ronfeldt, Reininger, & Kwok, 2013; Russell et al., 2003; Tatto, Rodriguez, & Reckase, 2020) fit here because, I reasoned that years of teaching are an indication of experiences, and being a novice or experienced teacher may, in some ways, be part of one’s identity.

As can be seen in Figure 1, *person* is most heavily related to *overall FOPT*, *act of teaching*, and *responsive teaching*, which all have solid black lines associated with them. The majority of measures in this grouping were not significant nor of high effect size (or comparable measure), instead, it was the quantity of models that included teachers’ race, gender, GPA, and teaching experience.

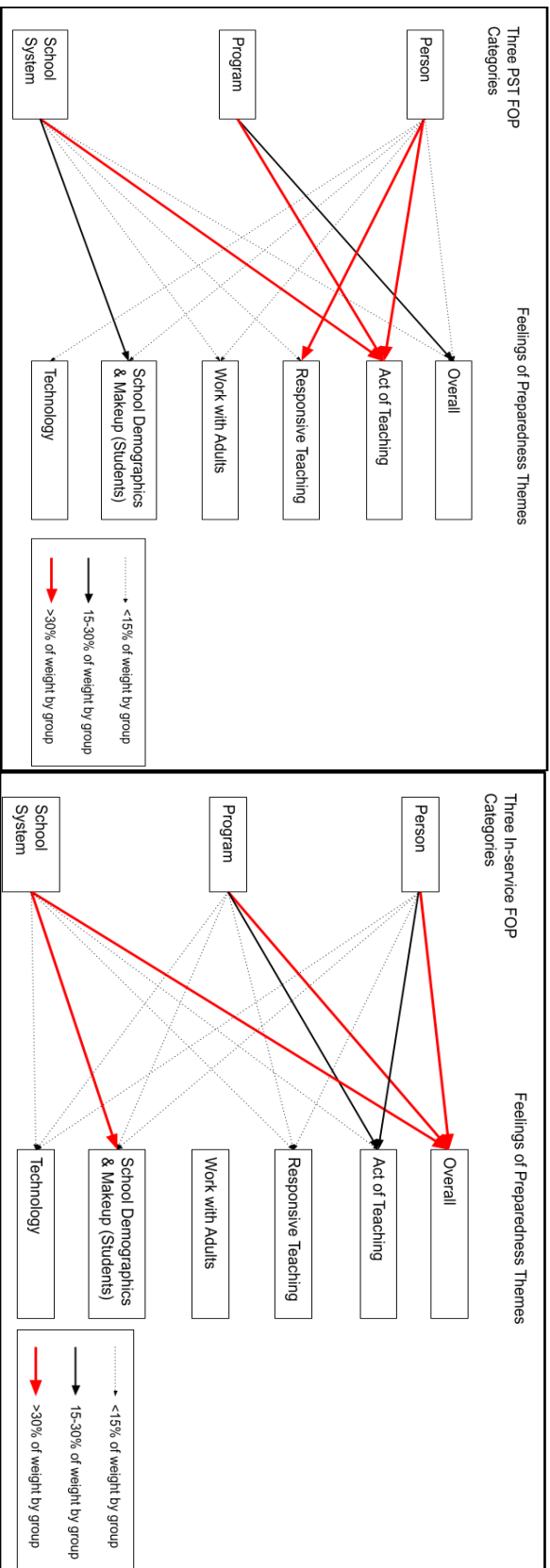
Figure 2 presents separate FOPT frameworks for PSTs and in-service teachers as studies typically focus on one or the other and tend to stress different themes. It shows that studies on PSTs focus on how their FOPT relate *person* to *act of teaching*, and *responsive teaching*. Research on in-service teachers tends to focus on their *overall FOPT* rather than a more specific aspect of teacher FOPT (e.g., preparedness to use formative assessment). Figure 2 shows the relationship for in-service teachers between *person* and *Overall FOPT* as red (the highest cluster of weight percent range) when it was not red before, a similar event occurred for PSTs with *act of teaching* and *responsive teaching*. Due to the limited significance and low effect sizes of the construct measures, these are indicators of frequency between constructs, which suggests differing priorities in the research on PSTs and in-service teachers.

Program and Education

Johnson and colleagues (2005) describe *program* as the initial training teachers received, and what experiences the teacher encountered that would contribute to various parts of the work of teaching. Following this, I included training teachers received in the framework but, unlike them, did not include teaching experiences beyond the student-teaching (practicum, internship, etc.) experience.

Preparation program titles, such as alternative certification or traditional certification programs, are often used in the literature when predicting teachers' FOPT. While some researchers have found that traditionally certified teachers feel more prepared than alternatively certified teachers (e.g., Darling-Hammond et al., 2002; Kee, 2012), many researchers observe

Figure 2
PSTs and In-Service Teacher Data Disaggregated



An analysis of the *Outcomes* is omitted because studies on PSTs' FOPT do not generate as many *Outcome* variables.

that variation in teachers' FOPT are larger within programs than between them (e.g., Bastian et al., 2021; Clark et al., 2015; Goodson et al., 2019; Ronfeldt, Schwartz, & Jacob, 2014). Therefore, as others have noted, the traditional and alternative certification labels do not always adequately distinguish between types of programs and the preparation provided within them. Instead, the individual features of initial certification programs seem more salient. Kee (2012), for example, found that FOPT measures were not necessarily different between traditional and alternative certification preparation routes. Instead, Kee emphasized a distinction between alternative certification programs that included extensive preparation requirements (e.g., multiple methods courses and longer student teaching experiences), and those that included minimal frontloading of theory and practice.

Aside from alternative versus traditional programs, constructs within the preparation program included some combination of quantity of courses or kinds of courses required by preparation programs or fulfilled by study participants (Brantlinger et al., 2020; Christofferson & Sullivan, 2015; Kee, 2012; O'Neill & Stephenson, 2012; Ronfeldt et al., 2021; Ronfeldt, Schwartz, & Jacob, 2014), length of internship (Clark et al., 2015; Kee, 2012; Ronfeldt, Reininger, & Kwok, 2013; Ronfeldt et al., 2021; Ronfeldt, Schwartz, & Jacob, 2014), or construct measures that combined internship¹² length and coursework (Boe et al., 2007; Eckert, 2013). Notably, while the duration of the internship (i.e., clinical fieldwork or student teaching) was a common topic that was often a significant predictor of FOPT (e.g.,

¹² "Internship" for the purposes of this paper are inclusive of any practicum work where a teacher candidate learns or practices to teach in a classroom with students as part of their certification requirements

Kee, 2012; Ronfeldt et al., 2014), there appeared to be little agreement on how to partition time. For reference, Boe, Shin, and Cook (2007) identified those who completed at least 10 weeks of fieldwork (in addition to other components) as extensively prepared teachers. Ronfeldt and Reininger (2012) had three tiers, (1) 1-12 weeks, (2) 13-15 weeks, and (3) 15 or more weeks. Kee (2012), on the other hand, found an interesting pattern in the length of time in the field. Kee had four categories of fieldwork distinguished by the length of time: (1) none, (2) 1-7 weeks, (3) 8-11 weeks, (4) 12+ weeks. Kee noticed a significant jump in preparedness between 1-7 weeks and 8-11 weeks, but not a large difference between categories (3) and (4). Kee suggested that length of internship may be beneficial up to a point and then diminishing returns tempers the benefit. This suggests a limit on how much each programmatic element may contribute to FOPT.

An additional construct measure related to *program* included degree type, for example, undergraduate or graduate mathematics (Brantlinger et al., 2020; Eckert, 2013; Ronfeldt et al., 2014; Smith, Desimone, & Ueno, 2005), also suggesting something about programmatic features or relatable coursework and other requirements one might fulfill before entering or in tandem with a preparation program. The implication here is a distinction between those who have stronger content knowledge and those who do not. For example, numerous researchers identified a group of teachers as “out-of-field” teachers (e.g., Boe et al., 2007; Cohen-Vogel & Smith, 2007; Darling-Hammond et al., 2002), meaning they were teaching a content area in which they did not have training. Generally, teachers with an

undergraduate or graduate degree that match the content they teach, feel more prepared to teach.

Ronfeldt, Reininger, and Kwok (2013) used a FOPT factor called “Perceptions of Instructional Preparedness,” which I included in *overall FOPT* because the survey items pertain to general FOPT or broadly, *overall FOPT*: “assess students’ work,” “target instruction to individual students,” “interact with school administration,” “interact with parents,” and “work with students with special needs,” as these items each belonged in different categories than “act of teaching.” I applied a similar reasoning to Ronfeldt, Schwartz, and Jacob (2014), though that study only included one out of five (i.e., “assess students”) that did not fit in the *act of teaching* category.

The literature suggests constructs in *program* (encompassing teaching-relevant educational experiences) most reliably and consistently were used to predict *overall FOPT* (see Figure 1) and *act of teaching FOPT*. I separated FOPT studies on PSTs from in-service teachers (see Figure 2) to see where the focus was for researchers looking at PSTs and those studying in-service teachers. This separation resulted in showing that studies on PSTs focused on *overall FOPT* less often and reduced the mapping to a solid black line, and that *act of teaching* relationship was the only red line remaining from *program*.

Schools and Contexts

Similar to Johnson and colleagues (2005), the construct measures concerning *school systems and context* sheds light on work that tries to capture the differences between or particulars of schools and districts. Of note, are labels that indicate

characteristics of the school such as whether it is urban or suburban (Ronfeldt, Schwartz, & Jacob, 2014; Siwatu, 2011), school conditions (Tatto et al., 2020), “at-risk” schools (Eckert, 2013)¹³, as well as student demographics (e.g., Brantlinger et al., 2020; Ronfeldt & Reininger, 2012; Ronfeldt, Reininger, & Kwok, 2013; Ronfeldt, Schwartz, & Jacob, 2014). In a study on elementary, middle, and high school PSTs from one teacher education program, Siwatu (2011) found PSTs felt more prepared to teach in suburban schools than urban schools, and felt more prepared to teach different student demographics within a suburban context than an urban one (e.g., they felt more prepared to teach African American students in a suburban school than an urban school). Siwatu (2011) measures the impact of school context on teacher FOPT. Similarly, free and reduced lunch percentages (e.g., Redding & Smith, 2016/2019; Ronfeldt & Reininger, 2012; Ronfeldt, Reininger, and Kwok, 2013), percentages of multilingual students (e.g., Imbimbo & Silvernail, 1999; Faez, 2012; Siwatu, 2011). Siwatu used a kind of experimental design by assigning half of the participants to an urban school first and then a suburban school, and vice-versa for the other half. These construct measures focus specifically on a concern that some researchers have about the generality of traditional preparation programs (e.g., Siwatu, 2011; Watzke, 2005), they argue that there is no such thing as a common student, and traditional programs do a disservice to teachers and school communities by not attending to the differences.

¹³ What is meant by “at-risk” is not made explicit so I did not condense it into another group, Eckert found this item to be negatively related to FOPT.

School contexts measures also included data on collaboration with peers or mentors (Brantlinger et al., 2020; Lewis et al., 1999; Matsko et al., 2020; Tatto et al., 2020; Zientek, 2007), cooperating teachers¹⁴ for PSTs (Matsko et al., 2020; Ronfeldt et al., 2013; Ronfeldt et al., 2020) and work with administration (Brantlinger et al., 2020; Kee, 2012; Ronfeldt & Reininger, 2012) as well as parents (Ronfeldt & Reininger, 2012). These variables convey the differing levels of trust and cooperation within a school among adults. For example, Brantlinger et al. (2020), in a study of alternatively certified teachers, found that both the frequency of interactions with mentor teachers and the frequency of interactions with other mathematics teacher colleagues increased mathematics teachers' initial FOPT in a statistically significant way ($p < 0.05$ and $p < 0.1$, respectively). Zientek (2007) also indicated that positive experiences with mentors could help make up for FOPT differences between alternatively certified teachers and traditionally certified teachers. There may be schools where relationships between adults are prioritized, and that could be a valuable consideration.

The lone solid red line from in *school system/context* constructs to *act of teaching* suggests heavy attention to this relationship. In disaggregating studies on PSTs from in-service teachers (see Figure 2), it is notable that *act of teaching* is a red line (the highest cluster of weight percent) for PSTs and a dotted line (the lowest) for in-service teachers. This suggests that researchers studying the FOPT of PSTs have different priorities for those studying that of in-service teachers. It may also be that there is a difference in significant outcomes because teachers in these groups have

¹⁴ Perhaps the quality of cooperating teacher is partly a result of the school context

different perspectives on their preparedness to teach. *Overall FOPT* and *school demographics and student makeup* are the next largest FOPT cluster. *Overall FOPT* is mostly predicted or related by conditions that can be changed or improved (e.g., school conditions, collegiality, administrative presence), and in a lesser way characteristics that cannot be changed (e.g., student demographics and location). Conditions that can be improved consist of two subgroups, adults working in the building, and conditions in the school. The adults in the building make up a larger share of the relationship (data not shown). Disaggregating PSTs and in-service teachers (Figure 2) shows few studies on PST teachers relate school contexts to *overall FOPT*. Constructs making up *school demographics and student makeup* almost exclusively have to do with urban schools.

FOPT Categories

The information in this subsection will focus on variables from the three *FOPT Predictor Clusters* that contribute to *Feelings of Preparedness Themes* from the left-hand column of the map (i.e., Figure 1) as well as *FOPT Themes* that contribute to *Outcomes* on the right-hand column of Figure 1.

In the reviewed studies, *overall FOPT* is either measured with a single Likert-scale survey item specifically identified as “overall feelings of preparedness” (e.g., Darling-Hammond et al., 2002) or a variable reduction measure that, using factor analysis or an averaging procedure, combined a number of survey items into one single *overall FOPT* measure. An overall FOPT measure is quite common, being used as an outcome or dependent variable in fourteen studies (e.g., Brantlinger et al., 2020; Cohen-Vogel & Smith, 2007; Darling-Hammond et al., 2002; Eckert, 2013;

Kee, 2012; Kelly & Northrop, 2015; Ronfeldt, Reininger, & Kwok, 2013; Ronfelt, Schwartz, & Jacob, 2014; Ronfeldt et al., 2020; Siwatu, 2011; Smith et al., 2005; Tatto et al., 2020; Watzke, 2005; Zientek, 2007) and used as an independent or predictor variable in seven studies (Darling-Hammond et al., 2002; Eckert, 2013; Giallo & Little, 2003; Redding & Smith, 2016; Ronfeldt et al., 2013; Ross et al., 1996; Smith et al., 2005).

The *act of teaching FOPT* theme represents construct measures that describe how a lay-person might conceptualize the typical activities involved in teaching such as planning lessons (Boe et al., 2007; Fontaine et al., 2012; Matsko et al., 2020), selecting and adapting curricular items (Boe et al., 2007; Lewis et al., 1999), classroom management (Boe et al., 2007; Christofferson & Sullivan, 2015; Fontaine et al., 2012; Lewis et al., 1999; O'Neill & Stephenson, 2012), teaching in particular ways (Boe et al., 2007; Lewis et al., 1999; Matsko et al., 2020; Viviani et al., 2023), as well as FOPT for specific subject matter or content (e.g., mathematics for mathematics teachers) (Kane & Fontaine, 2008; OECD, 2017), pedagogy FOPT (Kane & Fontaine, 2008; OECD, 2017), or both (Bastian et al., 2021). The *act of teaching* construct also includes active teaching behaviors such as asking conceptual questions (Ronfeldt et al., 2020). A note regarding putting classroom management in the *act of teaching* category rather than the next category (*responsive teaching*) needs to be expressed here. Classroom management is a broad term and needs more specific items, but it does not always provide such specificity. In many of the reviewed studies, classroom management is in reference to managing students who are off task (e.g., Christofferson & Sullivan, 2015; O'Neill & Stephenson, 2012; Lewis et al.,

1999), rather than focusing on keeping students engaged by more educationally progressive means. Some of these more progressive ways may include knowing students' interests and strengths and using those key pieces of knowledge in conjunction with upgrading tasks and activities to be more exploratory and less rote.

Responsive teaching includes constructs that either are or could be used for measuring teachers FOPT using student-centered instructional practices. For example, responsive teaching includes data collection and analysis of student learning, feedback, and performance for the purposes of improving student outcomes or one's teaching practices (e.g., Bledsoe et al., 2016; Boe et al., 2007; Fontaine et al., 2012; Foster et al., 2008; Kane & Fontaine, 2008; Lewis et al., 1999; Viviani et al., 2023). While assessments and data from those assessments are part of teaching, there is an opportunity for teacher reform and adjustment. These adjustments are not inherently progressive or student-centered, however, I leave open the possibility that teachers may be reflective in their analysis of student data and make changes to best support students. This theme also includes a particular variable called "positive learning environments" and other learner-centered spaces (Bastian et al., 2021; Kane & Fontaine, 2008), which more specifically addresses considerations of how to make a learner-friendly environment. This latter segment of the theme is not explicitly expressed in much of the literature, though I posit it does not fit with general acts of teaching because it describes a specific and progressive environment.

School and student demographics have to do with community structures or rules, and student demographics as well as other school characteristics. Specifically, are teachers prepared to work in rural, urban, or suburban communities (e.g., Matsko

et al., 2020; Siwatu, 2011)? It includes considerations of the racial and cultural makeup of the students in the school (Bastian et al., 2021; Kane & Fontaine, 2008; Lewis et al., 1999; Siwatu, 2011; Viviani et al., 2023). It also includes variables about multilingual learners (Faez, 2012; Lewis et al., 1999; Siwatu, 2011), special education students, and students with disabilities (Lewis et al., 1999). Viviani and colleagues include a factor variable called “Student Relations Preparedness,” which includes “building rapport with students” and “understanding students’ cultures and lived experiences,” as well as a classroom management measure. It matters whether Student Relations is in the *acts of teaching* or *school and student demographics* FOPT grouping because placing it in the latter category means that *school and student demographics* is a heavier predictor of retention. The decision to place Student Relations with *school and student demographics* is, in part, due to their theorizing of the construct as a non-subject specific. Additionally, the classroom management survey item (that was problematic) had the lowest loading on that factor.

Work with adults includes descriptions of working with peers (Fontaine et al., 2012; Kane & Fontaine, 2008), administrators (Ronfeldt & Reininger, 2012), and parents (Kane & Fontaine, 2008; Ronfeldt & Reininger, 2012). This theme is not a topic in the literature that is highly included. However, it is worth noting that teaching is not an individual act, that adults in the community interact with each other in some way.

Technology includes any variable that is described as “using” or “implementing” technology in the classroom (Darling-Hammond et al., 2002; Casey & Childs, 2011; Foster et al., 2008; Kane & Fontaine, 2008; Lewis et al., 1999;

Watzke, 2005). What technology means is not always well defined in the literature, which may be due to different uses of technology in different content areas.

Contextually, it may refer to computational technology, or technology to present or illustrate for the purposes of teaching. Fontaine and colleagues (2012) created a technology factor, “information and communication technologies” based on required competencies for PSTs. Additionally, preparedness to teach online was considered part of this category (Clark-Wilson et al., 2020). Like other survey items, some technology items were also included in *overall FOPT* constructs.

Outcomes

The outcomes column references work in which variables from the FOPT themes were used, or anticipated, to predict some variable.

Self-Efficacy

In the literature, *self-efficacy* and FOPT constructs are sometimes correlational, meaning the direction may not matter. However, there are researchers who use FOPT to predict variables in the *self-efficacy* group (and not the other way around), and that directionality is reflected in Figure 1. Ross, Cousins, and Gadalla (1996) used language to suggest they theorized that FOPT may “influence” teacher efficacy. Additionally, Eckert (2013) used two self-efficacy measures, *general teacher efficacy* (GTE), and *personal teacher efficacy* (PTE). said that PTE¹⁵ is a measure of “how prepared a teacher feels to engage in and construct learning for his

¹⁵ I used PTE as an Overall FOPT measure because I believe the major difference between self-efficacy and FOPT is that self-efficacy requires some kind of “attainment” component linked to a particular action, and FOPT may not require that “attainment” piece. Though, as Viviani (2023a) indicates, no agreed upon FOPT definition exists.

or her students. GET, on the other hand, represents a type of outcome expectancy” (p. 77). This distinction suggests that, given the similarity between FOPT and self-efficacy, if self-efficacy can be divided into different parts, FOPT may be one piece of the broader term *self-efficacy*. FOPT being a subset of overall self-efficacy suggests an increase in FOPT could predict an increase in self-efficacy but not necessarily the other way around.

The only predictor from this set of literature for *self-efficacy* was *overall FOPT*. Three studies (Darling-Hammond et al., 2002; Giallo & Little, 2003; Ross, Cousins, & Gadalla, 1996) found a relationship between overall preparedness and self-efficacy. Each of these studies’ findings were statistically significant with moderate to large effect sizes. This makes *overall FOPT* prediction of *self-efficacy* the most consistent relationship in the FOPT literature.

This framework shows there is a great deal of researchers’ focus on *overall FOPT* both as a predictor and as an outcome variable. The main outcome from *overall FOPT* is self-efficacy. Self-efficacy measures have been linked to student outcomes, in particular studies that include FOPT variables sometimes reference both the correlation between FOPT and self-efficacy, and the relationship between self-efficacy and student outcomes (e.g., Faez, 2012; Matsko et al., 2020; Ronfeldt, Reininger, & Kwok, 2013; Stites et al., 2018). Therefore, I connect *self-efficacy* and *effective teaching*, though no weight was calculated because this link is not directly studied in FOPT literature, though it theoretically aligns with some researchers’ position on FOPT and self-efficacy.

Retention

Retention refers to a broad description of keeping teachers in the profession and is either surveys asking about (preservice) teachers' intentions to stay (Fontaine et al., 2012; Keese et al., 2022; Ronfeldt, Reininger, & Kwok, 2013) or data that records teachers' actual leaving from the profession (Bastian et al., 2021; Eckert, 2013; Redding & Smith, 2016; Viviani et al., 2023). Seven studies (Bastian et al., 2021; Darling-Hammond et al., 2002; Eckert, 2013; Fontaine et al., 2012; Redding & Smith, 2016; Ronfeldt et al., 2013; Viviani et al., 2023) studied FOPT constructs to predict retention measures. Some researchers cite other studies that found a relationship between *retention* constructs measures and student outcomes (e.g., Fontaine et al., 2012; Ronfeldt, Reininger, & Kwok, 2013), suggesting that *retention* may be associated with *effective teaching*. This makes sense in theory, as the longer one teaches, the better they learn how to teach, and teachers who do a poor job are more likely to be fired. Again, I connected *retention* with *effective teaching* with no calculated weight.

Act of teaching measures represent the highest weight percentage (and the highest percent of variables) to predict *retention*. These variables include the classroom environment, classroom management, and interactions with students (Bastian et al., 2021; Fontaine et al., 2012; Viviani et al., 2023), as well as planning (Fontaine et al., 2012) and to a larger degree, feelings of preparedness related to instruction (Bastian et al., 2021; Viviani et al., 2023). The next highest weight percentage was responsive teaching, which included FOPT to use assessments on

students and other data to improve teaching (Fontaine et al., 2012; Viviani et al., 2023).

Effective Teaching

Retention refers to a broad description of keeping teachers in the profession and is either surveys asking about (preservice) teachers' intentions to stay (Fontaine et al., 2012; Keese et al., 2022; Ronfeldt, Reininger, & Kwok, 2013) or data that records teachers' actual leaving from the profession (Bastian et al., 2021; Eckert, 2013; Redding & Smith, 2016; Viviani et al., 2023). Seven studies (Bastian et al., 2021; Darling-Hammond et al., 2002; Eckert, 2013; Fontaine et al., 2012; Redding & Smith, 2016; Ronfeldt et al., 2013; Viviani et al., 2023) studied FOPT constructs to predict retention measures. Some researchers cite other studies that found a relationship between *retention* constructs measures and student outcomes (e.g., Fontaine et al., 2012; Ronfeldt, Reininger, & Kwok, 2013), suggesting that *retention* may be associated with *effective teaching*. This makes sense in theory, as the longer one teaches, the better they learn how to teach, and teachers who do a poor job are more likely to be fired. Again, I connected *retention* with *effective teaching* with no calculated weight.

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percentage was responsive teaching, which included FOPT to use assessments on students and other data to improve teaching (Fontaine et al., 2012; Viviani et al., 2023).

Summary of the Quantitative Literature

Using Figure 1 to visually display patterns, the quantitative literature reviewed for this framework suggests that *overall FOPT* and *act of teaching* constructs are frequently studied quantitatively. Additionally, *overall FOPT*, *act of teaching*, and *responsive teaching* provide the majority weight to outcome measures, suggesting these constructs are frequently the focus of researchers. For *Outcomes*, *self-efficacy* is only predicted by *overall FOPT*. This could be an over-reliance on the correlational effects between the two constructs. *Retention* is most heavily predicted by *act of teaching*, and *responsive teaching* constructs. Research on the *person* category predicts each of these three FOPT themes, fairly evenly. This might suggest that researchers theorize that personal characteristics and traits or teaching experience (an element of *person*) predicts these FOPT themes that ultimately heavily predict one or more of the following: *self-efficacy*, *effective teaching*, or *retention*. That personal characteristics are emphasized by researchers is supported visually in Figure 2, which depicts *person* heavily related to *act of teaching*, and *responsive teaching* for PSTs, and predicting *overall FOPT* for in-service teachers.

As much attention as *overall FOPT*, *act of teaching*, and *responsive teaching* constructs receive in the research literature, *work with adults*, *school demographics & student makeup*, and *technology*, are given much less attention. This may raise questions about whether these FOPT themes are necessary, or just under-studied.

Figure 2, illustrates trends in the literature showing a large focus on *act of teaching*, and *responsive teaching* for research on PSTs, and a large focus on *overall FOPT*, and *school demographics and student makeup* constructs for in-service teachers. These depictions illustrate various research goals or priorities of researchers that study these two experience groups.

Relevant FOPT Qualitative Studies

This subsection considers qualitative FOPT studies to illustrate opportunities to fill gaps in the quantitative framework and literature. I recognize that the interplay between quantitative and qualitative literature is not sufficient to address gaps in the literature. Another area of consideration is the theoretical arguments that take into account policy realities, as well as proposals that consider or expand concepts related to teachers' existence in the education system (e.g., teacher preparation programs or professional development). However, comparing some qualitative literature with the existing quantitative literature is a start.

With an emphasis on current education issues related to FOPT, this section contains recent (in the last ten years) qualitative studies on teachers' FOPT that confirm elements of the map in Figure 1. It identifies areas that might benefit from more quantitative attention. I selected these topics from the summary findings above. The difference between apparent research goals¹⁶ for studying PSTs' and in-service teachers' FOPT could be extended to developing a difference between new and moderately experienced teachers, for example. FOPT in different contexts is notable

¹⁶ Prior to developing this framework, I believed that researchers did not differentiate between FOPT for different experiences levels and was surprised by this finding.

for both the limited connection between *program* and preparation to work with students of varying backgrounds (e.g., multilingual students, varying cultural assets, students with disabilities), as well as working in different contexts that have physical and technical attributes that are different.

Experience Layers

Losano, Fiorentini, and Villarreal (2018) discussed the complexities of novice teachers' developing professional identities within "realms of interpretation and performance that are socially and culturally constructed" (p.291). Losano and colleagues described a first-year teacher's navigation between preservice teaching and first-year teaching and navigating those two different socially constructed spaces. This may explain quantitative findings from surveying in-service teachers' initial FOPT may decrease as teachers gain experience (e.g., Bledsoe et al., 2016; Ronfeldt, Schwartz, & Jacob, 2014) because new teachers must still make sense of what they do in their role. Asking teachers how prepared they feel to teach before they understand what the work is, rather than what they think it is, requires reconsidering the framing of survey questions. Individually, the quantitative field implicitly distinguishes between FOPT at various points in time, specifically PSTs and in-service teaching. Seeing the research goals together reveals more explicitly that a theoretical difference exists between different experience levels.

Given researchers' priorities for PSTs and in-service teachers, reconceptualizing FOPT at various teacher-developmental stages seems prudent. In a prior study, I (Viviani, 2023a) interviewed ten experienced math teachers from various parts of the United States who were explicitly asked how they described

feelings of preparedness to teach. The findings suggested that FOPT can be conceptualized as being two-layered. The first layer involves FOPT with respect to teacher actions that can be specifically planned for in advance; this is the static layer. The static layer elements may be more in line with newer teachers' FOPT. The second layer, the dynamic layer, involves FOPT for which teachers must react in the moment, without explicit prior planning. The dynamic layer may be more congruent with more advanced teaching behaviors. Likely, if these layers are adopted, the *act of teaching* theme would be separated into the two layers as subgroups. Using these layers would require rewriting and restructuring survey items to specifically address static versus dynamic elements of teaching to benefit from this reconceptualization, as many do not currently fit either category.

School Contexts

As an example of the importance of contexts, scholars have argued that the lack of high quality teachers in all urban schools is a serious problem (e.g., Gordon, Kane, & Staiger, 2006; Ingersoll, 2004). I contend that at some level, teachers choose where they want to work. As teachers decide which schools are compatible with them, they might consider their feelings of preparedness for particular contexts. For example, Olson and Rao (2016) interviewed preservice teachers (PSTs) during their practicum work in an urban school district. Some PSTs in the study did not feel comfortable in the urban context in which they were placed and would have preferred a different school, one that felt safer to them. Others also indicated, if given the choice, they would have chosen a different school, yet, they were glad they were put in that space to grow and understand the urban environment better. In a qualitative

study on preservice elementary and high school teachers and their supervising (mentor) teachers in an “urban” environment, Cavendish, Perez, and Mahotiere (2021) reported two of the student-teachers did not feel like their programs prepared them, but working in the school did help them learn how to work in urban schools. A mentor, reflecting on her early teaching experience, also suggested that the preparation program did not prepare her for urban school teaching. Another mentor suggested that preparation programs could emphasize some work in an urban environment because PSTs never know where they will end up teaching during their career. This suggests a practical component in preparation programs for readying PSTs to teach in a variety of contexts. Finally, another mentor felt that some colleagues were deficit-minded when it came to students. This last point may emphasize the importance of theory as well as practical components for preparation programs to consider. That is, a significant effort to dispel particular myths about students in urban environments, or students of Color, and other groups that are subject to negative stereotypes.

Figure 1 suggests that the *school demographics and student makeup* construct is most often predicted by *school system/context* constructs. Though not surprising, by design, many of these variables are intentionally linked. However, because of the analytic design, if school demographics and characteristics are important to teacher preparation programs, for example, I would anticipate a larger share of variables predicting variables in that theme.¹⁷ This suggests one potential gap in the

¹⁷ In another analysis, I measured percent of variables used, unweighted, and still *school demographics and makeup* do not make up a large share.

quantitative literature is neglecting to elevate the importance of diversity. Or it is a limitation of the programs themselves. Perhaps, as Siwatu (2011) and Watzke (2005) argue, traditional teacher preparation programs are too general in their approach to preparing teachers.

Technology

Prior work (Viviani, 2023b) has pointed out this was not the case during the 2020-2021 school year when schools moved to online learning platforms to help prevent the spread of Covid-19; teachers had to use technology for delivering instruction. In a timely review of the literature, Clark-Wilson and colleagues (2020) identified four computational technology uses related to instruction, 1) organization for teachers, 2) presenting mathematics, 3) connecting and communication, and 4) student-accessible platforms for independent work and practice with feedback. Such delineations are not regularly included in FOPT survey items for technology. While Viviani's study mainly focused on challenges in changing contexts, that particular context required a significant amount of technology use. Viviani (2023b), using a semi-structured interview format, analyzed data from six experienced math teachers. Viviani found that while teaching online, teachers were flooded with different kinds of technology to use for teaching. In many instances, teachers felt prepared to use computational technology but described situations in which familiar teaching strategies did not translate to online teaching.

The quantitative literature on technology heavily includes survey items such as "how prepared do you feel to use computers in classroom instruction?" (see SASS 2000/2004/2008/2012). As evident from the array of technology uses described by

Clark-Wilson and colleagues (2020), the realities of modern computational technology available for classrooms are that one generic technology question is no longer specific enough. That said, there already is a more specific set of questions shared by a series of researchers (i.e., “Use technology to increase student interest and learning”; “Use technology to support students’ research and analysis”; “Use technology to assess and track student achievement”; “Use technology to communicate with others”; “Use technology to enhance group collaboration and teamwork” in Darling-Hammond et al., 2002; Watzke, 2005; Zientek, 2007). These items are not new but better address Clark-Wilson and colleagues’ four uses of technology.

Future Work

Areas in need of research attention come from two sources, one is the limited relationships in some areas of the framework, and the other is from three cited qualitative topics referenced above.

Interestingly, only *overall FOPT* has been used to predict *self-efficacy*. Some self-efficacy researchers go to extensive lengths to differentiate between different kinds of self-efficacy (e.g., Tschannen-Moran, Hoy, & Hoy, 1998). The existence of a broad array of this construct suggests that there may be alternatives to *overall FOPT* when identifying correlations between the FOPT and *self-efficacy* constructs. Ross, Cousins, and Gadalla (1996) developed a theoretical framework of predictors of self-efficacy and pointed out that “although Bandura described self-efficacy as varying from one situation to another... almost all researchers represented [teacher efficacy] as a single score aggregated over a variety of teaching conditions” (p. 386), implying

that there is a tendency to overgeneralize self-efficacy. This may connect with Viviani, Brantlinger, and Grant (2023), who argued that researchers might reconsider overall FOPT and that more specific FOPT factor scales might make sense when using a variety of FOPT survey items to account for the complexity of the work. Indeed, other researchers used factor analysis-like techniques to separate sets of items into categories (e.g., Boe et al., 2007; Casey & Childs, 2011; Fontaine et al., 2012; Matsko et al., 2020), setting a precedent for using specific factor constructs. Fontaine and colleagues (2012) found that PSTs who felt less well-prepared in classroom management and student assessments significantly correlated with intentions to leave teaching. Understanding how more specific factors from one construct relate to another might help better understand the distant relationship between FOPT and student outcomes through self-efficacy. Perhaps, in time, researchers will find evidence that FOPT is aligned with additional constructs.

Additionally, the findings indicate that two construct groupings predict *overall FOPT* from the *school system and context* (conditions that can be changed and those that cannot). While there are construct measures that cannot be changed (e.g., students who attend the school), there are reasons to consider these characteristics when considering how to prepare teachers. This also connects with the limited finding that knowing how to build a positive learning environment in the classroom and knowing students may predict teaching effectiveness suggests an area to investigate.

Studies that address FOPT to work with various adults in their school community and those addressing FOPT to use computational technology are somewhat absent. It may be valuable to reconsider how we think about the necessary

components of teaching and whether working with adults, including collaboration and interacting with parents and administration, are essential skills. If so, these topics may require more attention. Similarly, research for technology is relatively thin in the quantitative literature and could be studied more thoroughly in terms of FOPT. It also seems like “technology” in FOPT studies needs a definition. Redeveloping survey questions about FOPT would be a good place to start.

Redeveloping survey questions also relates to both experience level of teaching and teaching contexts. The two layers of FOPT suggest a need to be intentional about survey item phrasing. Hundreds of FOPT survey items have been used, but only some appear to fit conceptually into one layer or the other. Perhaps that is a critique of the notion of layers or, a sign that the survey items are too general. Perhaps it is some combination, and defining the layers requires consideration of possible ways to rewrite the survey items. Teaching contexts survey questions are important considerations in the sense that being intentional about what kinds of information are valuable to the education community. This is also evident in Viviani, Brantlinger, and Grant (2023), who include a variable called Student Relations Preparedness that could have included more survey items along the lines of “understanding students’ cultures and lived experiences.” For example, future surveys might include an item such as valuing students’ linguistic or cultural assets in class,” researchers argue for recognizing and embracing the assets and knowledge that students bring to the classroom (e.g., Ullucci & Howard, 2015). This helps move toward student-centering schools, connecting the material with the knowledge and experiences that students bring with them. Furthermore, if teaching is intended to

become more student-centered or ambitious, survey questions should reflect that progression to capture relevant data about teaching practices and working with students who come from more varied cultural backgrounds. Similarly, if more classes are held online, studies that reveal conditions for increased FOPT online may also prove valuable in that respect.

Limitations

The provided framework mapping (Figure 1) is simple and could be reorganized to account for the complexity of teaching. Doing so requires valuing other research or theories to help guide what next steps to take. This framework is quite simple in the sense that it presents sets of linear progressions with minimal interaction between variables, which is not representative of studies that included regression analyses where control variables impact significance and effects. In particular, omitted is an explicit device to provide a potentially necessary iterative learning and development to FOPT. Such a structure is a mainstay in education frameworks and research in education literature. Goldsmith, Doerr, & Lewis (2013), for example, conducted a review of 106 peer-reviewed journal articles regarding teacher learning and said, “learning tends to occur incrementally and iteratively” (p. 20).

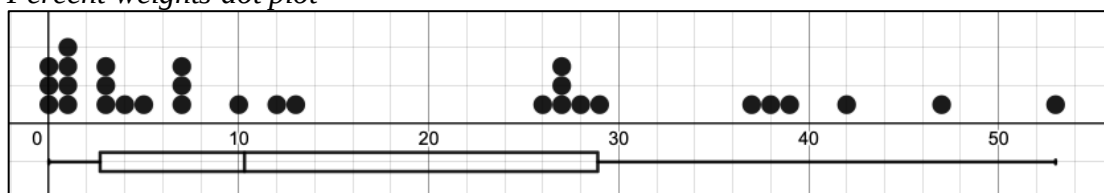
Another limitation is that the literature reviewed only represents some quantitative studies on teachers’ FOPT, and worse, it might be biased by limitations of the search criteria. However, this is another argument for clarifying a definition for FOPT (see Viviani, 2023a) and developing a framework as the current study proposes; it was a challenge to know what additional terms to use, given the lack of a

shared conceptual or theoretical understanding. One limitation is that the mapping (Figure 1) not only highlights variables that significantly contribute to FOPT but also includes how researchers conceived or hypothesized that particular variables would predict FOPT. In reality, it is not clear what variables may have been omitted from such publications, meaning it does not capture all the conceptualized relationships between variables.

Appendix A

Figure A.1

Percent weights dot plot



Gaps appear after approximately 14 and 29

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Chapter 5: Discussion

Article Summaries

This section provides an overview of the findings from each study.

Experienced Teachers' FOPT Descriptions

In the first article I share that the construct of teachers' feelings of preparedness to teach (FOPT) lacks a common or shared theoretical definition and I take a first step toward the development of a definition. I found through the data analysis that the ten experienced teachers in the study generally described preparedness to teach as one, or both of two related layers. The first was a static layer that participants described as things one can actively plan, which may also imply an opportunity to consider steps or actions to take if and when an anticipated event occurs. However, the interviewees indicated that there are limits to how many inevitabilities that a teacher can plan for, and this is where the second, "dynamic" layer comes in. Participants described the dynamic layer as a teacher being able to react in the moment to events. The dynamic layer closely matches Hammerness and colleagues' (2005) descriptions of experienced teachers' "innovation," which novice teachers were less fluid with. This may suggest that new and novice teachers feel more prepared for static FOPT layers than the dynamic ones.

Teaching Contexts and FOPT

In the second article I look at the effect on teachers' FOPT of an extraordinary contextual change and disruption to teaching, namely the 2020 and 2021 Pandemic, and the accompanying shift to online schooling. Such a drastic and abrupt change in the teaching context for experienced teachers yielded some examples of experienced teachers feeling unprepared for teaching online. More specifically, some of the six teachers interviewed indicated that they felt unprepared to connect with students on a personal level when starting the school year online (i.e., 2020-2021 school year), which was contrasted by the 2019-2020 school year where teachers had already built trust and relationships with students before transitioning to online teaching. Some participants described feeling unprepared for aspects of instruction at a distance and how the available and known technology could not overcome these issues. This study also found that teachers' FOPT with computational technology did not necessarily impact feelings of unpreparedness for teaching online. All the teachers indicated feeling unprepared to teach online, but had varying levels of preparedness to use computational technology.

Toward a FOPT Framework

The third article analyzes quantitative research on teachers' FOPT to develop a framework. This framework contains three columns to represent relationships between different construct measures prioritized (i.e., used often in studies) or were statistically significant in the quantitative FOPT literature. The first column included predictor measures of FOPT, the second column were FOPT constructs, and the third

column were construct measures that FOPT theoretically predicted (Figure A.1 in Appendix A). A secondary analysis disaggregated studies on preservice teachers from in-service teachers, however, only contained the first two columns (Figure A.2 in Appendix A).

This analysis finds that quantitative research on FOPT focuses on identifying constructs that predict general or overall FOPT, and items that may be characterized directionally as “teacher to student” actions (e.g., acts of instruction, planning). Areas of limited attention include attending to practices where students and teachers are perceived to engage in two- or multi-directional interactions (e.g., whole-class discussions). The literature is also limited in exploring FOPT with various technology platforms. The findings also suggest that though little distinction is expressed explicitly in the literature, researchers who study FOPT for preservice teachers tend to have different research goals than those that study in-service teachers.

Links Between Articles

This subsection briefly connects the three articles in terms of how they are theoretically related. Without further research, some of these connections are speculative. However, the overall connections with the framework could help redevelop survey instruments for quantitative survey items on FOPT.

Article 1 Related to Articles 2 and 3

The layer descriptions for teachers’ FOPT may be related to teachers’ preparedness in different contexts because, when the teaching context changes for teachers, some experiences likely carry over and others do not. A teacher who feels

prepared in one context (e.g., in-person) for particular dynamic FOPT behaviors (e.g., whole-class discussions) may find that familiar techniques do not transfer to a new context (e.g., remote instruction) and that that action may, for a time, become something that the teacher must plan for (static layer). For example, in Chapter 3, the teachers found that teaching on a computer challenged their FOPT because connecting with students was harder to do virtually than in person. The two layers may also connect with FOPT using computational technology when a teacher uses a new technology platform that does something different. Knowing how and when to use a platform's assets during instruction may take time and intentional planning until the process is more familiar.

The layer descriptions may help provide additional structure for the FOPT framework in Chapter 4. For example, the FOPT constructs could be grouped into either static or dynamic layers. This grouping is similar to Boe, Shin, and Cook (2007), who split their FOPT items into two groups: “content matter” and “pedagogical skills” as a way to address the research questions. Rather than content or pedagogy, the layers can provide a FOPT in the static sense, where things can be planned in advance, or in the dynamic sense. The two-layer groups could then be broken into smaller subsets, creating a clearer separator between various FOPT constructs. For example, feelings of preparedness for the *act of teaching* construct (see Figures A.1 and A.2) had a disproportionately large set of measures associated with it when compared to other measures. Inspired by my findings in Chapter 2, I explored reducing the *act of teaching* goliath of a construct by separating it by actions and planning. However, I struggled with a rationale for doing so beyond my Chapter

2 findings, which did not quite fit the constructs as written. One thing I wonder about is if using the layers to create and group FOPT survey items can better align with outcomes (like retention or teacher effectiveness). I think the specificity of the survey items will be less ambiguous about teaching behaviors of interest (i.e., ambitious instruction or not). Also, as such items in the layers align theoretically, they may not specifically be on the mind of teachers as they fill out the surveys, can this reduce noise or bias?

Article 2 Related to 3

Disruptions to school contexts that were addressed Chapter 3 may inform a future framework by considering whether school or classroom contexts influence teachers' FOPT. For example, the online teaching context showed how certain instructional practices do not necessarily translate from one school context to the next and this loss may impact FOPT. The framework suggests that teachers' FOPT with computational technology is limited, especially attending to specific components to computational technology, for example, considering the four uses of technology in education that Clark-Wilson and colleagues (2020) laid out. Neglecting specific technology categories (as well as computational technology on the whole) is related to speculations I made in Chapter 3 about teachers' limited exposure to a variety of computational technology platforms.

Future Work

This section describes future areas of research resulting from these studies.

FOPT Layer-Related

Future research on teachers' FOPT should test out the layers and then begin work defining teachers' FOPT. There are opportunities to study the layers in a few different ways. First, considering that I interviewed experienced teachers for their descriptions, contrasting those findings with how preservice teachers (PSTs) and new teachers describe FOPT may clarify the layers and help develop a definition. This clarification might certify that preparation program efforts contribute to the static layer FOPT, and create opportunities for preparation programs to focus on ways to better develop dynamic layer preparedness. It may also help researchers to understand the degree to which PSTs and novice teachers recognize dynamic layer elements and how prepared they feel to enact them. Finally, studying teachers early in their career and at various points in time thereafter, may help identify whether some elements of the static layer FOPT shifts to the dynamic layer (e.g., anticipating student responses) as a teacher gains experience. Hammerness and colleagues (2005) indicated that novel situations may become routine as a teacher experiences these situations. What then would that mean for studying these two layers?

School Context Studies

The shift to online teaching was a change in context for teachers. Future studies regarding teachers' FOPT should also consider different teaching contexts. Contexts may be school specific (e.g., changing schools, turn-over schools) and classroom contexts (e.g., course type or curriculum changes). If we learned anything from the experienced teachers' FOPT in an unfamiliar context, it is that contextual

changes might impact FOPT. This raises questions about what local school systems can do to support teachers when contexts change or shift. Similarly, considering how long it takes for experienced teachers to find their groove in a new environment versus new teachers, changing schools may be worth investigating as well to develop protocols to support teachers based on their experience level. Knowing how long teachers may be impacted by contextual changes may help determine how much, and how long to support teachers when particular changes occur.

Survey Item Redevelopment

I have pushed for the redevelopment of survey items regarding FOPT in this dissertation. One area to redevelop survey items included in the *act of teaching* construct in Chapter 4. For example, the *act of teaching* construct contained (among other measures): selecting and adapting curricular material, classroom management, or teaching in particular ways. Items in this group are vague in terms of how different actors will interpret them. This is not to say that all items must be highly specific and targeted to discrete actions. Instead, consider including specific language in some items to identify inclusive instruction. For example, Kang and colleagues (2019) said, “one strong predictor of the girls’ identification with STEM-related careers was their perception of self (PS) in relation to science” (p. 433). If research is attending to teachers being responsive to their students, especially those underrepresented in traditional (STEM) activities, then perhaps a question like “how prepared do you feel to adapt curricular material so (e.g., LGBTQ, multilingual students, students of Color) see themselves reflected in math?” These items will take additional work to develop because vetting is necessary. However, it seems worth doing, so the field will have a

more specific sense of teachers' FOPT. Additionally, by including a few questions that specifically address teaching methods of interest, there may be more that researchers can say about how prepared teachers are to teach in multiple ways.

Similarly, redeveloping questions related to computational technology (see Chapter 4) may be worth considering as more ways to use such technology are becoming available. Further, recent work has specified different purposes of technological tools (e.g., Clark-Wilson et al., 2020). For example, understanding what teachers feel prepared to do with this technology can help shed light on professional development or teacher training goals and learning opportunities. Thus, developing survey questions that target specific computational elements is warranted.

In addition to researchers' considerations of redeveloping FOPT survey items, school districts too may consider how surveys on teachers' FOPT (e.g., *act of teaching*, *responsive teaching*, *work with adults*, *school demographics & makeup*, and *technology*, see Figure A.1) can be used to identify community needs and offer relevant professional development. For example, identifying the proportion of teachers who feel less prepared with certain kinds of computational technology and hiring appropriate professionals or local teachers with expertise with those technologies to develop and implement multiple sessions for those who feel less prepared.

Limitations and Reflections

This section identifies reflections and some limitations for the overall dissertation, other limitations were included in Chapters 2, 3, and 4.

Methods Limitations and Reflections

This dissertation utilized episodic narrative interviews for the data collection process. This kind of interview was valuable in exploring experienced teachers' FOPT regarding disruptions because so little research has been done in this area, therefore, Chapters 2 and 3 were exploratory in terms of gaining an understanding of what specifics to focus on in future studies. As a researcher, I wanted to know what teachers expressed about disruptions, rather than preconceived notions about what I thought were important. Episodic narrative interviews provided participants space to describe and share details of situations that they felt were important to share. However, enhancements to the interview protocol could have improved the data collection and helped make a stronger case for results.

I found a tension between providing participants the freedom to talk about their experiences and my interest in pursuing additional questions (e.g., regarding school or students' characteristics) when not identified in their stories. In hindsight, reordering the protocol may have been beneficial. An alternative technique to consider for next time is to start the interview by talking about school contexts first, and get those details out in the open. *School contexts* is broad, but includes student backgrounds, collegiality between teachers, trust between administration and teachers, sufficient materials, safe environment, among other school-related factors. In short, these contexts describe various aspects of the environment in which teachers teach. Asking about participants' school context(s) first may prime them to also incorporate these contexts in the stories. If not, I could cite a particular aspect of a contextual attribute of interest and ask them how it may be relevant. Organizationally,

having all contexts in one place during the interview would provide one place in my notes to reference for follow-up questions regarding how contexts may have been important.

An additional limitation to my protocol was promising a relatively short interview. I worried that teachers may not be willing to participate in a 90-minute or more interview, so I promised an interview that would last about an hour. A longer interview could have reduced my sample size, but we may have had more detailed conversations about equity and issues of race and ethnicity, issues I believe can have implications for FOPT. As I conducted the interviews, I realized that I had to be careful about my interpretations regarding conversations about race, how did the participants interpret my intentions with these questions? I should have front-loaded some of these topics in the recruitment letter and spent more time talking with them about my positionality, so participants did not feel like I was springing these topics on them during the interview. This may have extended the time commitment yet may have been more fruitful in many ways. In the future, I will consider the order and emphasis of topics I am interested in discussing that require more of a lift to develop trust and understanding. I better understand how to provide participants ample time to consider and ask follow-up questions regarding these topics.

Participants and Data

The participants in the study were quite diverse. They resided in various places around the country, had various academic backgrounds, different racial and ethnic identities, various years of teaching experience (see Table B.1 in Appendix B). These diverse characteristics, I argue, provide a benefit to the results in Chapters 2

and 3 because they may better match the larger teacher population than a study on teachers with homogeneous backgrounds and personal characteristics.

While the teachers in this study were diverse, differences between these teachers did not appear to yield much in terms of responses about FOPT. It may be that there are socially acceptable elements of teaching where teachers can identify themselves as feeling unprepared. Whereas other aspects of teaching, especially for experienced teachers, teachers are expected to be and feel well prepared. These social expectations can hinder research regarding FOPT, and may be especially pronounced in interview settings, as opposed to anonymous surveys. This may mean that differences in participants' FOPT may have existed, but I was not privy to them due to perceived expectations.

The one factor these teachers shared was mathematics instruction. Though they were not all always mathematics teachers, at some point during their careers they were. To me, the mathematics focus was important because of the different tools mathematics teachers may use, and how the availability of those tools amidst disruptions (e.g., teaching online, or power outages) affect teachers' readiness to manage the changes. These would be valuable studies in other content areas as well, especially focused on those specific tools. That said, only researching mathematics teachers limited my ability to contrast and isolate the specific challenges and affordances of mathematics compared with other content areas. Additionally, as there is limited research in this area in general, there were few studies of other content areas or general teaching to compare these findings with. I wanted to say more about

how these findings impacted mathematics teachers' FOPT, but was challenged by an absence of examples to contrast with.

Appendix A

Figure A.1
Mapping of Quantitative Constructs

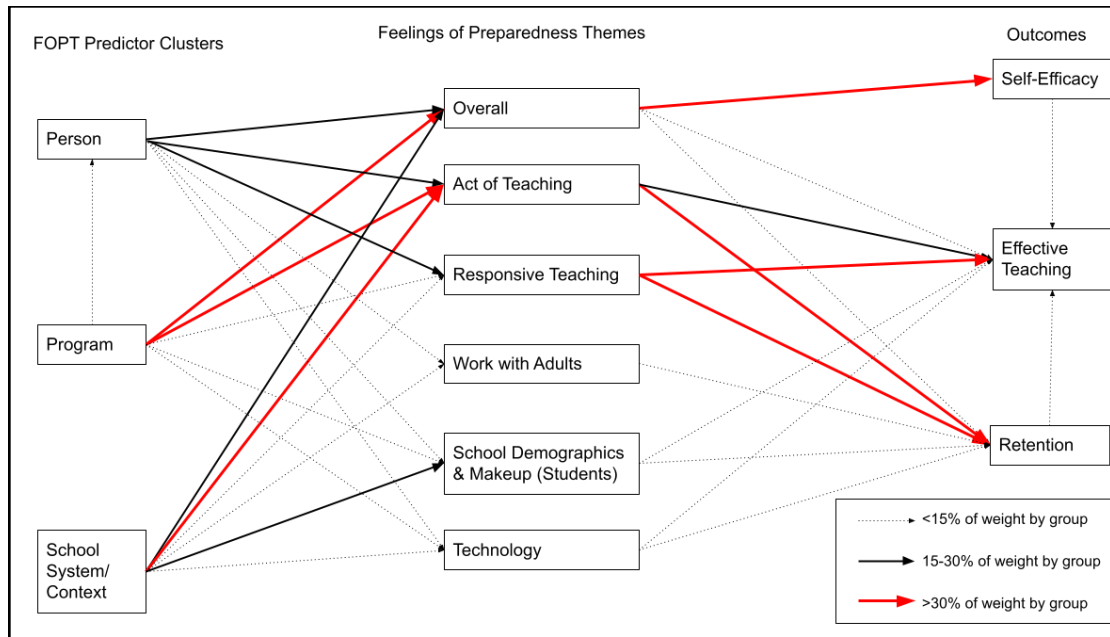
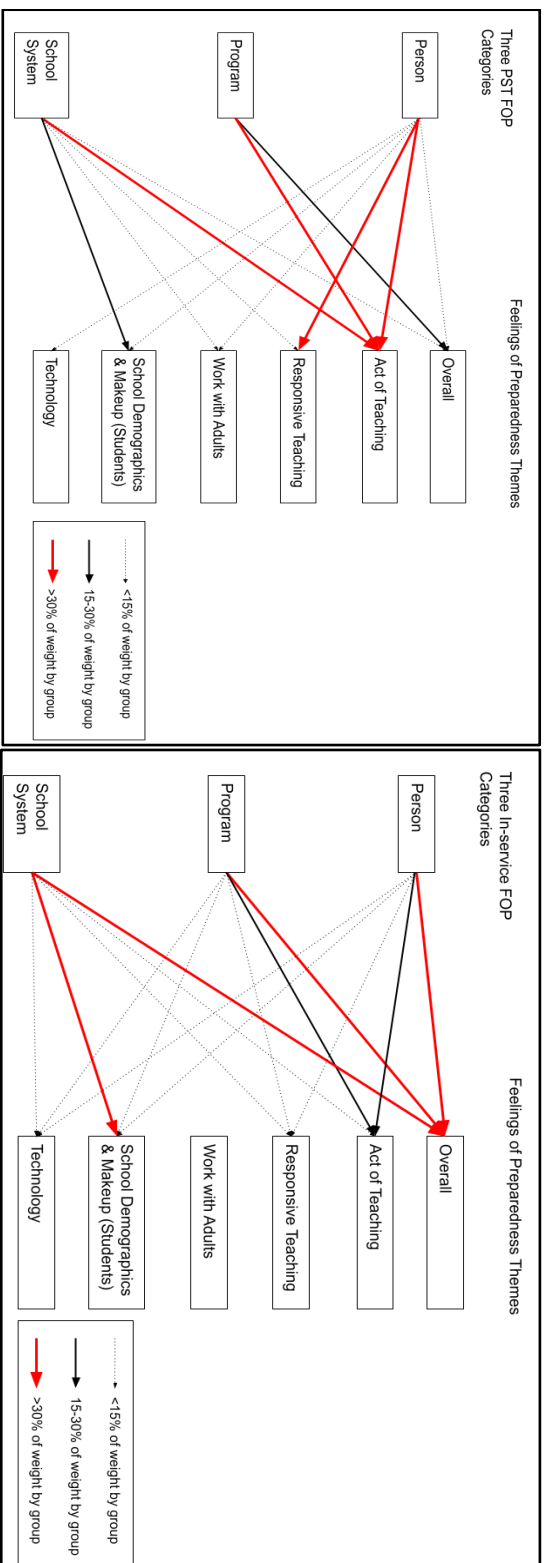


Figure A.2
PSTs and In-Service Teacher Data Disaggregated



An analysis of the *Outcomes* is omitted because studies on PSTs' FOPT do not generate as many *Outcome* variables.

Appendix B

Table B.1

Characteristics of Participants and Their School Contexts.

Pseudonym	Race & Ethnicity (self-reported)/ Gender	School characteristics	Experience/ major/ certs.	Leadership
Jane	Caucasian/ female	Title 1, mostly white and Hispanic students	26/Mathematics/ Masters Ed.	None described
Richard	white/male	Charter school (range of SES students), mostly Mexican and Hispanic students	15/Mathematics/ Masters Ed.	None described
Juliet	Asian American/ female	Title 1, mostly Latinx and African American students	11/Mathematics/ Masters Ed.-- admin certification	Staff development/ team lead
Tony	Mexican/male	Charter/traditional, Mexican and Hispanic students	9/Math education/Masters Ed.	None described
Mike	African American/ male	Initially: 90% African American and “students who have parents who were born in West African countries.” Currently: “more diverse”	9/Poly-sci, Hist, Lit./Alternative Certification (alt. cert)	None described
Jessica	Black/African American/ female	“Almost Title 1”	9/Psychology/ Masters Ed.	Department chair
Cesar	Hispanic (Peruvian)/ male	Not Title 1, diverse student population	9/Math, Computer Science/Masters Ed.	None described
Gloria	Hispanic/ female	Charter, mostly Hispanic student population	8/Human Resource development/Alt. cert.	None described
Emily	Multiracial/ female	Various schools	7/Mathematics (Masters Ed.)-- admin certification	Assistant principal
Janey	Asian American/ Korean American	“Almost Title 1”, mostly Black and Latinx students	5 (math)/Biology & American Studies/Alt. cert. (Masters Ed.)	Instructional Lead Teacher

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