

## ABSTRACT

Title of Dissertation: INSTRUCTIONAL PARTNERSHIPS  
BETWEEN SCIENCE FACULTY AND  
UNDERGRADUATE TEACHING AND  
LEARNING ASSISTANTS: IMPLICATIONS  
FOR FORMATIVE ASSESSMENT

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In order to support more student-centered instruction in undergraduate science, as suggested by national reports over the last several decades, instructors may integrate undergraduate teaching and learning assistants (UTLAs) into their courses. A growing body of literature describes the beneficial outcomes of UTLA-faculty partnerships in teaching and learning, and opportunities for feedback, co-creation, and collaboration. However, scholars know little about what goes on during meetings between UTLAs and faculty to support feedback and collaboration, and have yet to investigate UTLA feedback in-depth. For this dissertation, I applied qualitative case study research methods to explore the nature of UTLA-faculty interactions and the quality and substance of the feedback provided to faculty by UTLAs. I studied the

UTLAs and faculty instructors for two biology courses over the course of the Fall 2018 semester, collecting multiple sources of data, which included observational field notes, audio recordings of meetings, interviews, e-mails, and written documents. To explore the nature of UTLA-faculty interactions, I drew on the guiding principles of respect, reciprocity, and responsibility (Cook-Sather, Bovill, & Felten, 2014) to study how UTLAs were positioned in interactions with faculty. I found that UTLAs may be positioned as students, informants, consultants, co-instructors, and co-creators, that these positions were fluid and could occur simultaneously, and that respect, reciprocity, and responsibility manifested in various ways across these different positions. Thus, UTLA-faculty partnerships are complex and dynamic; even if we rank or characterize partnerships more broadly, considering the variety and fluidity in positioning may help to understand the nuances behind different types of partnerships. In addition to studying UTLA positioning, I also analyzed the quality and substance of the feedback the UTLAs provided to instructors, to explore if and how the feedback might play a role in formative assessment of student learning. I presented a conceptualization of UTLA-faculty interactions as part of a formative assessment “system” comprised of multiple feedback loops between instructors, UTLAs, and students. After analyzing the UTLA feedback, I found that UTLAs provided evidence about what’s going on with students in the course, and often, in addition to that evidence, provided interpretations, suggestions, and predictions to the instructor. UTLAs regularly offered feedback related to course logistics, and instructional materials. They also provided instructors with feedback on student attitudes, behaviors, and perceptions as well as student conceptual understanding.

UTLA feedback was valuable for making adjustments to improve teaching and learning; however, UTLA feedback was not always related to or supported by evidence of student ideas. Thus, it was not always relevant for supporting deep formative assessment of student learning. Overall, this research helps to reveal new insights into the potential of UTLA-faculty partnerships for collaboration around instruction, formative assessment, and improving teaching and learning in undergraduate science, and how best to support those partnerships.

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UNDERGRADUATE TEACHING AND LEARNING ASSISTANTS:  
IMPLICATIONS FOR FORMATIVE ASSESSMENT

by

Hannah Elizabeth Jardine

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always held me to very high standards while still allowing me complete flexibility. Chandra, you have been my greatest resource when it comes to better understanding the literature and prior research done in the area of learning assistants. You have helped me to form valuable connections with scholars at other campuses doing similar work and your critical and thoughtful comments on my work have been immensely helpful. You care deeply about supporting students at all levels, and consistently put others before yourself. You are a rockstar, and I sincerely admire all of the work that you do. It is in your course, Dr. B, challenged by the NSF proposal assignment, that I first dug deeply into the idea of a formative assessment system and considered pursuing this research focus. You have always provided me with helpful critique and have played a crucial role in helping me to understand rigorous approaches to qualitative research.

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## Chapter 1: Introduction

*...we need to move away from the isolation fostered by our traditional roles as students and faculty. Instead, we can strive to act as partners, equally invested in the common goal of learning.*

*-Cook-Sather, Bovill, & Felton, 2014, p. 11*

For decades, national reports have focused on improving undergraduate science education by encouraging a shift from “traditional”, instructor-centered instruction, with a focus on teaching, to interactive, student-centered instruction, with a focus on learning (American Association of the Advancement of Science, 2011; National Research Council, 1996, 1999, 2003, 2009, 2012; National Science Foundation, 1996). These reports are aligned with a paradigm shift in undergraduate education proposed by Barr and Tagg (1995) decades ago and reinforced by more current scholarship (e.g., Kuh, Kinzie, Schuh, & Whitt, 2010). A student-centered, social-constructivist paradigm is more consistent with real-life practices of science, which value the application of knowledge, deep conceptual understanding, and collaborative work (Wood, 2009). Research on student-centered instructional approaches in undergraduate STEM classrooms demonstrates that social interaction and collaborative learning foster greater academic achievement, more positive attitudes towards learning, and improved persistence through STEM courses and programs (Freeman et al., 2014; Springer, Stanne, & Donovan, 1999). However, successfully implementing more student-centered learning in undergraduate science courses requires more resources, especially human resources, than traditional lecturing.

In order to help support a shift towards more student-centered instruction, faculty teaching undergraduate science courses may appoint undergraduates as teaching and learning assistants (UTLAs<sup>1</sup>). Typically, course instructors recruit UTLAs from a pool of students that have recently taken, and done well in, their course. UTLAs may support student learning through various roles, including facilitating active engagement and student discussion in lecture and recitation sections (e.g., Jardine & Friedman, 2017; Otero, Pollock, & Finkelstein, 2010), evaluating students' work (e.g., Preszler, 2009), and assisting students outside of class in addition to in class (e.g., Close, Conn, & Close, 2016; Kopp, 2000). Undergraduate science courses that have UTLA support have demonstrated a variety of benefits, including greater student academic achievement (e.g. Preszler, 2009), increased student articulation of reasoning (e.g. Knight, Wise, Rentsch, & Furtak, 2015), and improved student understanding of core science concepts (e.g. Otero, Pollock, & Finkelstein, 2010).

Beyond aiding faculty in enacting increasingly student-centered instruction, UTLAs can also work with faculty to improve teaching and learning through UTLA-faculty instructional partnerships. UTLAs can be a valuable source of feedback for

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<sup>1</sup> I use the term “undergraduate teaching and learning assistants” (UTLAs) to refer to undergraduates who facilitate student-centered instruction in a lecture course or in mandatory recitation sections associated with a lecture course. The term “undergraduate teaching and learning assistants” and acronym UTLA are not common in the literature; I chose this term to cover the various terms that are used in the literature that fit my definition. The literature I review includes literature related to the “learning assistant” model (Otero, Pollock, & Finkelstein, 2010), the “peer led team learning” model (Gafney & Varma-Nelson, 2008), a “peer learning assistant” model (Groccia & Miller, 1996), and other literature that may use terms such as “undergraduate teaching assistants” or “peer facilitators.” I recognize that different terms may represent different UTLA roles and responsibilities; therefore, when describing specific UTLA models in the literature, I will use the term associated with that model. When synthesizing across models and terminology, I will use the overarching term UTLA.

the faculty they work with (Fingerson & Culley, 2001; Gosser & Roth, 1998; Hufford, 2011; Jardine & Friedman, 2017; Talbot, Hartley, Marzetta, & Wee, 2015), because they can gather information about student understanding, make suggestions for course improvements, and help faculty understand students' perspectives and ideas. According to Fingerson and Culley (2001), "Faculty members who wish to continue to improve and adapt their teaching to best help students learn can benefit greatly from the added perspective of an undergraduate assistant" (p. 310). UTLAs may help to support student-centered instruction in two related, yet distinct, ways: by facilitating student-centered activities and providing faculty with student-centered feedback and support.

Given their roles supporting student-centered instruction and their interactions with both students and faculty, UTLAs may be able to enhance formative assessment in undergraduate science courses. Formative assessment is generally considered to be a process through which evidence related to student learning is gathered and teaching and learning is modified in response to that evidence (Black & Wiliam, 2009; Cauley & McMillan, 2010; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). Formative assessment is an integral part of teaching and learning (Bell & Cowie, 2001) and is highly beneficial for student achievement and motivation (Black & William, 1998). In higher education, formative assessment is still "critically important for student learning" (Yorke, 2003, p. 483), but several factors, including unfavorable student to instructor ratios, make it increasingly challenging for instructors to conduct formative assessment that considers the majority of their students' needs.

The formative assessment process can be conceived as a single feedback loop between instructor and student (Furtak, 2016), but UTLAs introduce the opportunity for two additional feedback channels: instructor-UTLA and UTLA-student (Jardine & Friedman, 2017). The introduction of UTLAs into a course may expand opportunities for formative assessment by creating what I refer to as a formative assessment “system,” which I will elaborate on in Chapter 2.

Thus, the literature suggests that UTLAs can help to implement more student-centered learning in undergraduate science courses (Groccia & Miller, 1996; Otero et al., 2010), and while fulfilling their roles, act as instructional partners who provide valuable feedback to improve teaching and learning (Hufford, 2011; Jardine & Friedman, 2017). A growing body of literature explores the potential of student-faculty partnerships in teaching and learning, or reciprocal relationships where students and faculty work together towards improving teaching and learning (Cook-Sather, Bovill, & Felten, 2014; Healey, Flint, & Harrington, 2014; Little, 2011; Mercer-Mapstone et al., 2017; Werder & Otis, 2010). Cook-Sather, et al. (2014) describe successful student-faculty partnerships as demonstrating three guiding principles: respect, responsibility, and reciprocity. Scholars have begun to explore partnerships between faculty and learning assistants (LAs), and emerging research demonstrates that partnerships may vary in terms of communication and collaboration (Sabella, Van Duzor, & Davenport, 2016). These scholars have begun to investigate what occurs during LA-faculty meetings (Davenport, Amezcua, Sabella, & Van Duzor, 2017), but additional research is necessary to better understand characteristics

of UTLA-faculty instructional partnerships and implications for formative assessment processes.

This dissertation aims to add to a largely understudied area in undergraduate science education research by exploring UTLA-faculty instructional partnerships more deeply and providing empirical examples of what occurs and what is discussed when UTLAs and faculty meet. I aim to better describe the potential UTLA role in a formative assessment “system” comprised of multiple feedback loops between instructors, UTLAs, and students, by focusing in on the interactions between UTLAs and faculty instructors. In this project, I accept Cook-Sather, Bovill and Felten's (2014) invitation to "adapt and extend the principles and models they offer" (p. xvi) and draw on the guiding principles of respect, reciprocity, and responsibility to study how UTLAs are positioned in interactions with faculty, in order to better understand UTLA-faculty interactions in instructional partnerships. I also analyze the quality and substance of the feedback UTLAs provide, to explore if and how the feedback plays a role in formative assessment of student learning. Thus, my dissertation will aim to address the following research questions:

1. In what ways are UTLAs positioned in UTLA-faculty interactions?
2. What feedback might UTLAs provide to instructors (and what implications does that feedback have for formative assessment of student learning)?

This research reveals new insights into establishing and supporting UTLA-faculty partnerships for collaboration around instruction, formative assessment, and improving teaching and learning in undergraduate science.

## **Researcher Narrative**

I begin this dissertation with a personal narrative of the different experiences and people that brought me to this work for several reasons: (1) to further legitimize the research by demonstrating my deep involvement with these ideas over a period of time (2) to be transparent about my relationship to some of the research settings and subjects, and potential biases that may result (3) to provide an account of a developing researcher's journey through this process that others might be able to learn from. I strongly believe continuous self-reflection and documentation of influences and changing ideas is a key part of the research process.

My interest in and involvement with understanding the role of UTLAs in supporting learner-centered science instruction goes back as far as when I was myself a UTA at the University of Maryland (UMD). While I pursued my degree in biochemistry, I served several undergraduate teaching roles. I volunteered as an organic chemistry tutor and then held several different positions as a general chemistry lab UTA where I was responsible for leading my own lab sections. I also served as a UTA for Dr. Todd Cooke, who was working to redesign an introductory biology course to include what he referred to as group active engagement exercises. I supported him and his graduate student, Kristi Hall, in designing and implementing the activities, as well as assessing student performance and attitudes in the new course. I was fascinated by their work and impressed by the time and effort they were putting into genuinely understanding the student experience and improving the course for the benefit of students. Through my experiences, I found a place where I felt

valued, talented, and motivated, and met instructors that were interested in engaging with students around teaching. At that point, I decided that I was interested in pursuing teaching as a career.

By the time I finished my degree in biochemistry, I was preparing to start training through an alternative certification program to teach science in a nearby high school. I then taught chemistry for three years at Parkdale High School in Prince George's County, Maryland, very close to UMD, which was a life changing experience for many reasons. Teaching led me to recognize my privilege, as a white middle-class second-generation college goer. Teaching also opened up my eyes to the diverse backgrounds and experiences of young people and the educational inequities experienced by students from lower socioeconomic status communities and/or with minority backgrounds. I felt compelled to return to graduate school, to further engage with others interested in working towards more equitable science education experiences for all students.

When I started graduate school at UMD, luck would have it that my advisor, Dr. Daniel Levin, was working with Dr. Cooke on assessment of the new Integrated Life Sciences (ILS) living-learning program that had been established in the fall after I finished my undergraduate degree. Dan proposed to Dr. Cooke that I work on assessment of the ILS program, as I would have more time and greater access to students than Dan would. Dr. Cooke enthusiastically invited me to work with him again and hired me as a graduate assistant for ILS.

Throughout my time working with ILS, Dr. Cooke's commitment to building community, concern for student success and sense of belonging, and openness to



gathering extensive feedback from students continuously impressed me. One feature of the ILS program that to me was particularly notable, and illustrative of the program's commitment to engaging students, was that all of the program's courses were supported by UTAs. The UTAs filled a number of important instructional roles, including supporting small group discussion during large lecture classes, running their own office hours and exam review sessions, teaching discussion sections, and even leading class on specific active learning days.

While I was working with Dr. Cooke and ILS, I also reconnected with another faculty member that I had worked closely with during my undergraduate years, Dr. Lee Friedman. Dr. Friedman, who was my undergraduate advisor, had reached out to the science education community in hopes of finding a graduate student to help him develop a seminar to prepare active learning "facilitators," or UTLAs, for problem solving sessions in his Organic Chemistry course. Just like with Dr. Cooke, Dr. Friedman enthusiastically brought me in to work with him. Together, during the Spring 2016 semester, we developed and taught a one-credit seminar to support his UTLAs. While working with Dr. Friedman, I was impressed by his openness to feedback from the UTLAs during the weekly meetings. I recall the final day of our meetings with the UTLAs, when Dr. Friedman told them how much he learned from them and thanked them for the invaluable feedback that they provided to him over the course of the semester.

In Fall 2016, I officially began pursuing my doctoral degree. I was no longer working as a graduate assistant for ILS, but I stayed involved with the program through designing and leading a one-credit seminar for their UTAs, a version of

which is still being used currently. I researched models of other UTA pedagogy seminars (some even already happening on campus), considered what had worked well in the Organic Chemistry context, applied what I was learning about teacher education in my coursework, and took into account my insider understanding of the unique features of the ILS program, to create a seminar specific to their needs. In this seminar, I was incredibly impressed by what the UTAs noticed about both student understanding and student attitudes, especially when they were provided opportunities and vocabulary to talk about interactions with students. The more we read from the science education literature, the more they were able to articulate what they were seeing through their teaching experiences.

I spent the following winter analyzing recordings of our meetings and the UTAs' written assignments in order to better describe the various types of feedback that the UTAs were able to provide. At this point I began to consider this a concrete research path. A variety of questions came to mind, including what important role do UTAs play in bridging the gap between students and faculty? What unique insights can UTAs provide? How do instructors create opportunities for UTA feedback and collaboration?

In Spring 2017, I further considered and explored the UTLA role in feedback and instruction in several courses. I took a class on discourse analysis, with the hopes of learning more about potential research methods and approaches for studying UTLA-instructor interactions. To expand my exposure to a variety of UTLA-faculty contexts, I was interested in observing a case of UTLA-instructor meetings where I wasn't playing a role in designing or facilitating the meetings, as I had for the Organic

Chemistry and ILS settings. For a semester, I sat in on the pedagogy and preparation meetings that a biology instructor held for her LAs. I video recorded the sessions and analyzed the discourse using an interactional sociolinguistics framework. This experience helped me to think more about structures and discourse patterns that support or constrain UTLA sharing of feedback, and helped me to practice data collection and analysis approaches that I applied in this dissertation.

At the end of my first academic year in the doctoral program, I took a step back to consider all that I had done across my courses and research experiences. I looked for trends and patterns and considered potential future research directions. I had conducted research on UTLAs across settings, including in ILS, in Organic Chemistry, and in Biology. For courses and through independent study, I wrote a literature review on UTLA roles in formative assessment, wrote a hypothetical NSF proposal on a professional development program to help faculty understand the role of UTLAs in formative assessment, conducted a discourse analysis study on positioning of UTLAs in meetings with faculty, and unpacked various types of UTLA feedback from the seminar that I had led for the UTAs in ILS. My interests were clearly aligned and converging, and at the same time, I was constantly revising the framework through which I thought about the UTLA role in formative assessment.

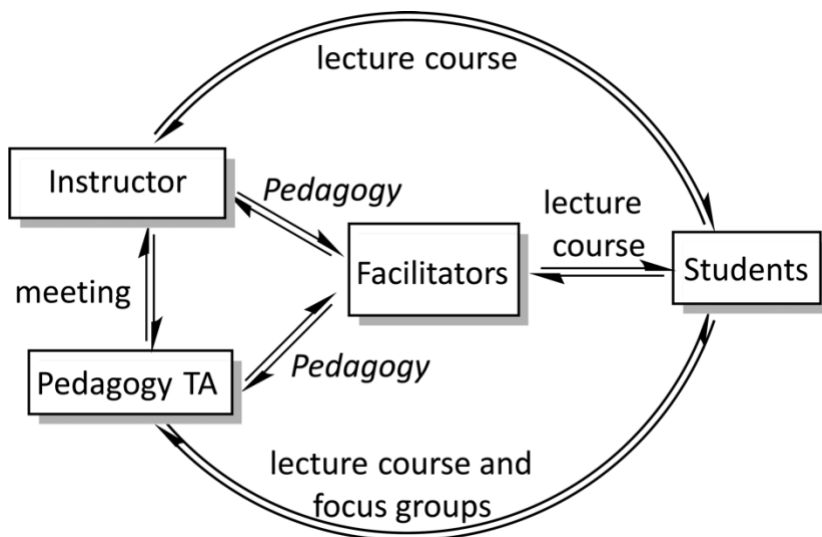
### **Development and Refinement of the Formative Assessment System Framework**

In the introductory paragraphs, I briefly described my conceptualization of UTLAs playing a role in a formative assessment system. My conceptualization and

the accompanying diagrams have been revised repeatedly over the course of my years thinking about UTLA feedback and UTLA-instructor interactions. Here, I reflect on when and how the ideas began to emerge and describe how and why my ideas changed over time. I also present various versions of the visual representation of the formative assessment system, including the most recent version that I applied to the current study. As mentioned previously, I will elaborate more on the current conceptualization of the formative assessment system in Chapter 2.

I first diagrammed the interactions between UTLAs, instructors, and students in Summer 2016, when working with Dr. Friedman on a manuscript about the preparation course that we had designed and the outcomes of the experience for the facilitators (Jardine & Friedman, 2017). I can vividly remember the moment when Dr. Friedman opened up Chem Draw to turn my scribbled notes and arrows into a formal visual representation. We called the diagram a feedback system (Figure 1.1) created through the pedagogy course and involvement of facilitators in problem solving sessions. We credited the facilitators with forming the "nexus" of the feedback system, illustrating how facilitators allowed for more interactions with students and therefore more feedback for both the instructor and students. The double-ended arrows in the diagram demonstrated back and forth communication between each of the members of the feedback system, and they were labeled according to the location where that communication occurred. It is notable that this early diagram included a representation of the impact of a pedagogy seminar as well as the role of the pedagogy seminar TA (me) on the system. We did not ground the diagram in any theoretical or empirical literature; rather, we created the diagram to

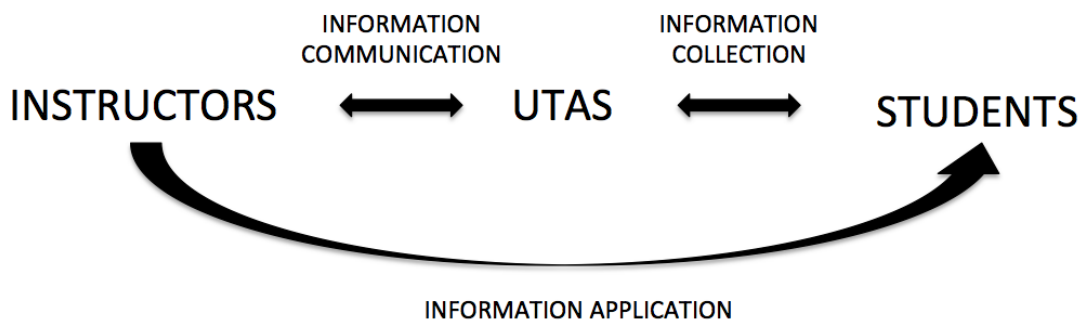
help readers visualize our description of potential feedback loops in this specific context.



**Figure 1.1.** The feedback system created by the Organic Chemistry Pedagogy course and incorporation of facilitators for problem solving sessions (Summer 2016)

In order to ground the feedback system in educational literature, in Fall 2016, I applied definitions of formative assessment to the diagram and began to use the phrase “formative assessment system.” Exploring various definitions of formative assessment helped me to develop descriptions of the “action” represented by each arrow in the system, but also led me to simplify the diagram to a single feedback loop. In the earliest iteration of the formative assessment system diagram (Figure 1.2), I envisioned one feedback loop between instructors and students, with UTAs playing a role in the middle. The differentiation between UTAs collecting and communicating information helped to highlight the importance of open communication between instructors and their UTAs. However, this diagram was missing an arrow from students to instructors, so it did not represent the possibility of

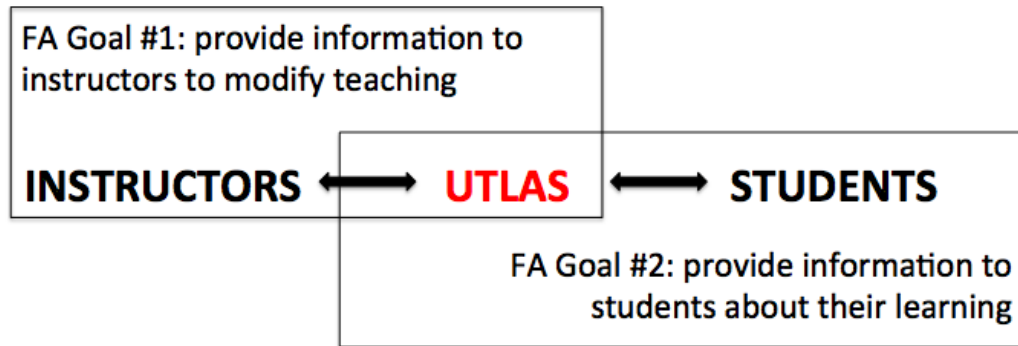
instructors gathering information directly from students, something that does, or at least should, happen in the classroom.



**Figure 1.2. Formative assessment system as presented in NSF proposal course paper (Fall 2016)**

In Spring 2017, I chose to further explore the idea of UTLA roles in formative assessment through a systematic literature review assignment. I reviewed literature on a variety of UTLA programs and undergraduate science courses supported by UTLAs and found that UTLAs may fill various roles in terms of interacting with students and faculty that may allow for formative assessment. I organized my analysis of UTLA roles under two different “goals” of formative assessment: (1) provide information to instructors to modify teaching and (2) provide information to students about their learning (Figure 1.3). This differentiation of the purposes of formative assessment was helpful because it demonstrated that UTLAs can support formative assessment in multiple ways, but differentiation did not demonstrate the overlap between the two purposes. I also began to get caught up in semantics and defining formative assessment. Was it formative assessment of teaching? For teaching? Was it feedback to instructors on their teaching, or on student learning, or both? I felt that I needed to

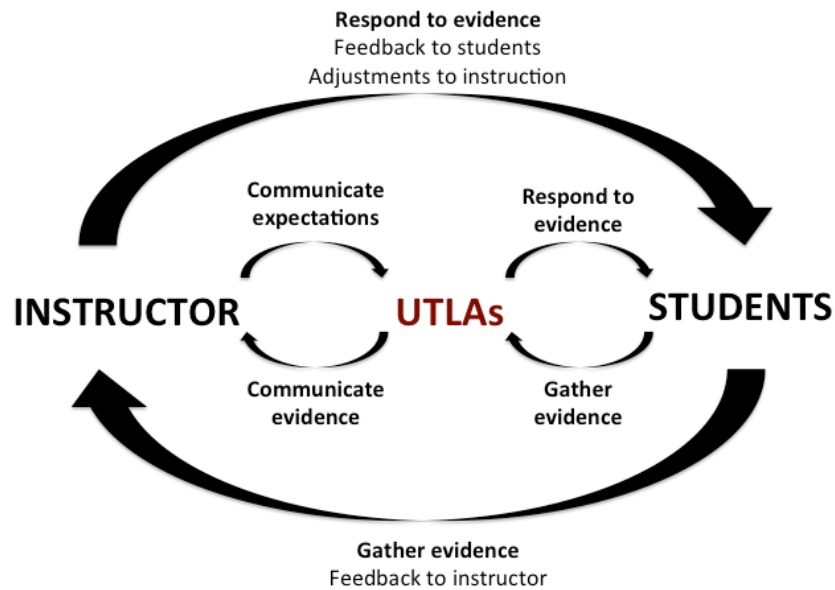
develop a diagram that represented all of the complex connections and feedback loops.



**Figure 1.3. Two purposes of formative assessment as presented in literature review (Spring 2017)**

In the time between Spring 2017 and Spring 2018, when I submitted my first comprehensive examination paper, I continued to explore the literature on formative assessment and reconsidered my visual representation of the formative assessment system (Figure 1.4). By applying well-respected definitions of formative assessment (Black & Wiliam, 1998, 2009), I moved from using the term information to using the term evidence. I made sure to maintain a complete feedback loop between instructor and student, to communicate that UTLAs don't interfere with a feedback loop directly between instructor and student (as in Figure 1.2), but that their presence creates additional feedback loops. The language I used in the instructor-student feedback loop parallels the language in the UTLA-student feedback loop, demonstrating that both instructors and UTLAs can engage in the formative assessment process of providing information to students about their learning in similar ways (related to Goal #2 in Figure 1.3). I also created a bi-directional instructor-UTLA feedback loop, demonstrating the impact instructor might have on UTLA behavior by

communicating expectations as well as the communication of evidence about students from UTLA to instructor (related to Goal #1 in Figure 1.3).

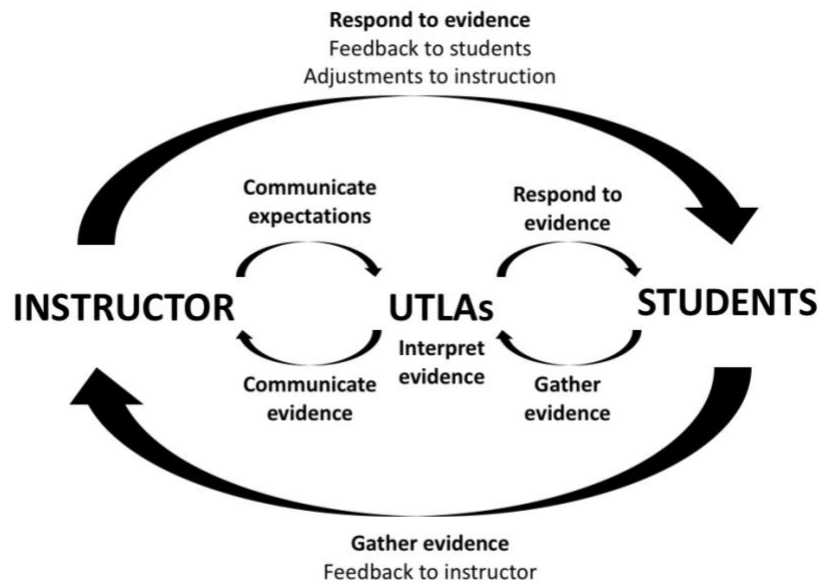


**Figure 1.4. Formative assessment system as presented in my first comprehensive examination (May 2018)**

For my second comprehensive examination paper, I re-analyzed data collected for former projects to try out my proposed framework. One of the data sources was a set of interviews with instructors about the potential role of UTLAs in formative assessment in their courses. After this analysis, I decided to add the term “interpret evidence” in the formative assessment system diagram (Figure 1.5) because an instructor used the terms “collect and interpret” to describe the UTLA role in formative assessment in her interview. I considered the word “gather” to represent the same action as “collect”, but thought it was important to explicitly highlight the “interpretation” that UTLAs might do in the diagram. I found it important to distinguish between evidence that UTLAs communicate directly (e.g., Most students



were not able to answer question number four) and evidence that UTLAs interpret before sharing with instructors (e.g., I think students are confused about the wording in question number four).



**Figure 1.5. Formative assessment system as presented at the end of my second comprehensive examination paper (June 2018)**

## **Organization of the Dissertation**

In this first chapter, I introduced my topic and research questions, described the experiences that have led me to this work, and outlined my changing conceptualization of the UTLA-mediated formative assessment system. In Chapter 2, I review the literature on student-faculty partnerships and UTLAs in undergraduate science and propose a conceptual framework for analyzing UTLA-faculty instructional partnerships. I further elaborate on the formative assessment system, and

describe the guiding principles of respect, reciprocity, and responsibility in the context of UTLA-faculty interactions that I used as a lens throughout this research. In Chapter 3, I describe my qualitative multiple-case study research design, data sources, and general analysis methods, including how I accounted for validity and reliability. Chapters 4 and 5 are written as complete stand-alone papers, addressing the two research questions sequentially. Therefore, in those Chapters, I include some repeated and summarized information from Chapters 1-3 before presenting findings. In Chapter 4, I address the question of how UTLAs are positioned in interactions with faculty, in order to better understand the interactional norms and discourse patterns present in UTLA instructional partnerships. In Chapter 5, I analyze the quality and substance of the feedback UTLAs provide, to explore if and how the feedback might be useful for formative assessment of student learning. In Chapter 6, I close by summarizing the research and its implications, providing practical suggestions for faculty, educational developers, and UTLAs, and future directions in research and practice.

## **Chapter 2: UTLA-Faculty Instructional Partnerships in Science**

I draw on two bodies of literature to examine UTLA-faculty instructional partnerships in science courses: literature on student-faculty partnerships as well as literature on UTLAs in undergraduate science courses. I start this chapter by presenting an overview of the literature on student-faculty partnerships. I describe the theoretical perspectives and principles that have informed the work on student-faculty partnerships, present various forms of partnerships described in the literature, and elucidate some of the empirically supported benefits and challenges. Then, I present a review of what we already know about UTLA-faculty partnerships in science from the literature and highlight implications for formative assessment. Lastly, I pull from both literature reviews to propose a conceptual framework for analyzing UTLA-faculty instructional partnerships as part of a formative assessment system. I describe respect, reciprocity, and responsibility, the guiding principles of student-faculty partnerships (Cook-Sather, et al., 2014), as a lens to guide my exploration of UTLA-faculty interactions. Applying the growing body of work on student-faculty partnerships to the unique context of UTLA-faculty partnerships may help to reveal new insights into the potential of UTLA-faculty partnerships for improving teaching and learning in undergraduate science.

I am choosing to refer to the partnerships as instructional partnerships because I am interested in how UTLA-faculty partnerships may impact teaching and learning. The literature documents a variety of outcomes of student-faculty partnerships (Cook-Sather et al., 2014; Mercer-Mapstone et al., 2017), and often focuses on personal and

professional outcomes for students and faculty in the partnership. I recognize that individual outcomes for students and faculty related to identity, knowledge, and skills will affect teaching and learning, but I am not focusing on understanding outcomes of the partnership on an individual level. Rather, I aim to better understand UTLA-faculty partnerships as part of a formative assessment system by exploring the interactions and structures that may impact communication of evidence that has outcomes for student learning.

### **Literature Review: Student-Faculty Partnerships in Teaching and Learning**

Cook-Sather, et al. (2014) define student-faculty partnerships in teaching and learning as “a collaborative, reciprocal process through which all participants have the opportunity to contribute equally, although not necessarily in the same ways, to curricular or pedagogical conceptualization, decision making, implementation, investigation, or analysis” (p. 6-7). Partnerships provide opportunities for both students and faculty to utilize their differing expertise, identities, experiences, and perspectives to improve teaching and learning. Student-faculty partnerships reconsider the typical divide between teacher and learner in order to provide opportunities for both faculty and students to better understand and engage in effective, student-centered educational practices (Bovill, Cook-Sather, & Felten, 2011; Cook-Sather, 2008, 2009, 2010, 2011a, 2011b; Sorenson, 2001). By attempting to disrupt traditional hierarchies in teaching and learning, student-faculty partnerships

create a community of shared knowledge and combined strengths that may benefit both parties.

Although the literature on student-faculty partnerships is fairly new, the notion of involving students in their own learning experience is not novel. In the early 20<sup>th</sup> century, John Dewey (1916) argued for more democratic education where students played a central role in decisions about their own education. Many scholars since (e.g., Aronowitz, 1994; Rogers & Freiberg, 1969; Shor, 1992) have encouraged viewing the learner as a knowledgeable, critical partner. The principles behind student-faculty partnerships also draw from the “student voice” movement in the early 1990s (Kozol, 1991; B. Levin, 1994; Weis & Fine, 1993) and a second wave of student voice scholarship in the early 2000s (Cook-Sather, 2002, 2006; Fielding, 2004; Lodge, 2005; Mitra, 2001). The term “student voice” implies student presence, power, and agency (Cook-Sather, 2006); students take part in “decisions about and implementation of educational policies and practice” (Holdsworth, 2000, p. 355). Repositioning students in educational research and reform is “premised on the following convictions: that young people have unique perspectives on learning, teaching, and schooling; that their insights warrant not only the attention but also the responses of adults; and that they should be afforded opportunities to actively shape their education” (Cook-Sather, 2006, p. 359). Literature on student-faculty partnerships applies these central ideas about democratic education and student voice to undergraduate education.

The value of engaging students as partners is based on three foundational beliefs (Cook-Sather, et al., 2014, p. x): (1) Students have insights into teaching and

learning that can make instruction more engaging, effective and rigorous. (2) Faculty can draw on student insights not only through collecting student responses but also through collaborating with students to study and design teaching and learning together. (3) Partnerships between students and faculty change the understandings and capacities of both sets of partners—making faculty and students all better teachers and learners. All together, these assumptions suggest that collaborative partnerships between students and faculty can improve teaching and learning.

As I noted in the introduction, successful student-faculty partnerships demonstrate three guiding principles: respect, reciprocity, and responsibility (Cook-Sather et al., 2014). Respect is “taking seriously and valuing what someone else brings to an encounter (p. 2).” Faculty and students demonstrating respect for each other demonstrate trust, openness, and appreciation for different perspectives and experiences. Reciprocity is a “process of balanced give and take” (p. 3), which rests on an understanding of mutual exchange. In terms of responsibility, both students and faculty demonstrate investment in the common goal of supporting student learning and share a responsibility for pedagogy. Respect, reciprocity, and responsibility do not imply faculty give up power and authority, but that they share power in appropriate ways. Between students and faculty, the “roles, expertise, responsibilities, and status are different” (Cook-Sather et al., 2014, p. 7). These three guiding principles are meant to distinguish the critical features of student-faculty partnerships in teaching and learning. Later in this Chapter, I will define these principles in terms of UTLA-faculty partnerships.

## **Various Forms of Student-Faculty Partnerships**

Student-faculty partnerships may vary in structure, foci, and level of engagement. According to literature that summarizes various forms of student-faculty partnerships (Bovill, Cook-Sather, Felten, Millard, & Moore-Cherry, 2016; Bovill et al., 2011), students tend to fill three general roles as partners in teaching and learning: consultant, co-creator of course design or curricula, and co-researcher. These roles are not mutually exclusive, but certain partnerships or partnership programs may focus on one more than the others. Next, I provide examples from the literature that illustrate these roles.

**Students as consultants.** Students may share and discuss valuable perspectives on teaching and learning by working directly with faculty as consultants or in other faculty development roles (Cook-Sather et al., 2014; Cox & Sorenson, 2000; Sorenson, 2001; Sorenson, 1994). Students may consult with faculty one-on-one (Cook-Sather, 2008, 2010, 2011a, 2011b, 2013, 2014; Sorenson, 2001), assist in faculty learning communities or faculty development seminars (Cox, 2001), or work on student teams to provide feedback to faculty (Kinland, Lenze, Moore, & Spence, 2001). Student consultants or consultant teams can perform various tasks: recorder/observer, faux student, class video recorder, interviewer, primed student, or a combination (Sorenson, 1994, 2001). Student consultants may also design and implement surveys aimed to gather feedback from students in a course, analyze results, and make recommendations to faculty and students (Kinland et al., 2001). The way they are described in this literature, student consultants are not enrolled in the faculty member's class, and they are differentiated from teaching assistants or peer

mentors. Student consultants are often trained in pedagogy, course observation, and communication by teaching and learning center staff that are experts in undergraduate education (Cook-Sather, et al., 2014). Sorenson (2001) argues that student consultant programs are mutually beneficial for students and faculty because they “honor both the student voice and faculty desire to improve teaching” (p. 183).

**Students as co-creators of course design or curricula.** Moving student-faculty partnerships to a higher level, students and faculty may partner to co-create or co-design courses and curricula. Research demonstrates that students are interested in supporting decisions about curriculum (Little & Williams, 2010) and are often altruistically motivated to support course redesign as a way to improve the experience for future students (Carey, 2013; Moore, Altvater, Mattera, & Regan, 2010). There are a range of forms and levels of curricular co-creation in different contexts (Bovill & Bulley, 2011). Partnerships focused on co-creation may be one-on-one, but may also involve teams of faculty and students (Delpish et al., 2010; Mihans, Long, & Felten, 2008; Moore et al., 2010). Co-creation may only focus on one specific assignment or activity or build up to co-designing an entire course or program (Bovill, 2014a, 2014b; Delpish et al., 2010; Mihans et al., 2008; Moore et al., 2010). Partnerships can also be differentiated by whether they focus on design of content, course structure, or both. To co-design or co-create, faculty may partner with current students (Delpish, et al., 2010), UTLAs (Gutman, Sergison, Martin, & Bernstein, 2010), former students (Mihans, et al., 2008; Moore, et al., 2010), or even with students that are not associated with the course or program (Delpish, et al., 2010). In all cases, co-creation is meant to move beyond gathering and applying student



feedback and implies a “mutual process that is imaginative, inventive, and resourceful” (Bovill, 2014b, p. 463).

**Students as co-researchers.** Students and faculty may also partner to conduct research on teaching and learning (Werder & Otis, 2010). Typically, research partnerships are formed to study recommendations, approaches, or curricula developed through partnerships where students acted as consultants or co-designers. Students may play a role in all aspects of the research, including design, data collection and analysis, and reporting findings (McKinney, Jarvis, Creasey, & Herrmann, 2010; Sublett, Walsh, McKinney, & Faigao, 2010), and it is important that students are provided with meaningful tasks. Sublett, et al. (2010) warn “Student voices...will not emerge sufficiently if we only assign the students trivial and/or clerical tasks; rather, these partners must have the opportunity to engage in meaningful and challenging aspects of the project” (p. 160). Partnering with students on research can improve the project and study design and lead to more meaningful interpretation of data (McKinney, 2007). Felten (2013) recommends student-faculty collaboration as one of the five principles of good practice in the scholarship of teaching and learning.

### **Outcomes of Student-Faculty Partnerships**

Student-faculty partnerships in teaching and learning are beneficial on multiple levels (Bovill et al., 2011; Cook-Sather et al., 2014; Mercer-Mapstone et al., 2017). Since the overall goal of the student-faculty partnership is to work

collaboratively to improve teaching and learning, student-faculty partnerships may lead to more effective courses that result in deeper, more meaningful, and more equitable learning experiences for students enrolled in the courses. Additionally, the students and faculty involved in the partnerships reap various personal and professional benefits.

On a fundamental level, student-faculty partnerships allow for more significant student-faculty contact. Frequent and meaningful student-faculty contact is an essential characteristic of high-impact practices in undergraduate education (Chickering & Gamson, 1987; Kuh, 2008). Decades of research demonstrate that student-faculty interactions are beneficial for student learning, development, engagement, and sense of belonging (Astin, 1993; Kuh, et al., 2010; Tinto, 1993). Since student-faculty partnerships involve establishing strong, collaborative relationships between faculty and students, they have the potential to amplify many of the empirically supported benefits of student-faculty contact.

Students that participate in student-faculty partnerships demonstrate an increase in confidence, motivation, engagement, and enthusiasm for learning (Bovill et al., 2011; Cook-Sather, 2010, 2011a). Students also gain ownership of their learning and are able to better engage in metacognitive reflection on their own learning process (Cook-Sather, 2011a). Through partnering with faculty on developments of novel instructional approaches, they gain a deeper understanding of the challenges and complexity of teaching (Cook-Sather, 2011a) as well as the scholarship of teaching and learning (Werder & Otis, 2010). Additionally, student partners report a greater sense of belonging and commitment to the university, their

discipline, and the academic community (Barnes, Goldring, Bestwick, & Wood, 2011; Sambell & Graham, 2011). They boast improvement in skills that will benefit their professional development and employability, such as communication and networking. All of these benefits reflect a positive impact on student identity, which higher education scholars have long considered to be important for student retention and success in college (Astin, 1993; Tinto, 1993).

Faculty that engage in student-faculty partnerships reap practical, emotional, and intellectual benefits (Cook-Sather, et al., 2014). On a practical level, faculty in partnerships can save time spent on teaching as students assume more responsibility in the instruction process. They also can improve their teaching practice and expand their understanding of effective teaching strategies (Sorenson, 2001; Werder & Otis, 2010). On an intellectual level, faculty in partnerships demonstrate transformed thinking about teaching, implement pedagogical advances informed by greater understanding of students' experiences and needs, and develop the ability to engage in continuous reflection and revision of teaching practices (Bovill, 2014b; Cook-Sather et al., 2014; Cook-Sather, 2008, 2011a, 2014; Felten et al., 2013). Dialogue between students and faculty helps faculty to gain a "new angle of vision and more dynamic exchange of views on classroom practice" (Cook-Sather, 2008, p. 476). Faculty develop values and beliefs more strongly associated with a teacher identity, and are better able to integrate teaching with other aspects of their professional identity (Cook-Sather, et al., 2014). Emotionally, faculty who partner with students report a renewed relationship with their students, as well as a new sense of excitement with teaching (Bovill, et al., 2011; Cook-Sather, 2014).

One of the most noteworthy outcomes of student-faculty partnerships is an increase in understanding of differences, for both students and faculty, and an engagement and empowerment of traditionally underrepresented perspectives (Cook-Sather, 2008, 2015; Cook-Sather & Agu, 2013; Mercer-Mapstone et al., 2017). Communication and collaboration across differences leads to critical reflection about difference and understanding of diversities in perspective, cultural identity and experience. Student-faculty partnerships may allow for conversations around differences in gender, socio-economic status, sexual orientation, religion, and other aspects of identity that impact teaching and learning. For these reasons, student-faculty partnerships may support the development of more equitable teaching practices as well as a greater sense of belonging for both students and faculty from traditionally underrepresented groups.

**Challenges associated with student-faculty partnerships.** Although student-faculty partnerships are beneficial in many ways, forming and maintaining successful student-faculty partnerships can be quite challenging. Establishing student-faculty partnerships is “highly dependent on motivations of the individuals involved” (Bovill, 2014b, p. 471). Both students and faculty must overcome resistance to collaboration that may be influenced by personal experiences and expectations as well as institutional structures, practices, and norms (Bovill et al., 2016). Student-faculty partnerships require students and faculty to alter traditional expectations for their roles and reimagine their relationships (Decyk, Murphy, Currier, & Long, 2010). Students may be resistant to collaboration with faculty because it deviates from the traditional divide between teacher and student (Shor, 1992). Faculty may

underestimate student ability to contribute meaningfully to teaching (Bovill, 2014b) or view student experiences from a deficit perspective (Felten & Bauman, 2013). Additionally, Cooke and Kothari (2001) note that, "...participatory ideals are often operationally constrained by institutional contexts that require formal and informal bureaucratic goals to be met" (p. 8). Thus, internal expectations and external constraints impacting student-faculty roles, responsibilities, and abilities may prevent faculty and students from pursuing partnerships.

Another challenge is that student-faculty partnerships require reconsideration of traditional ideas about student and faculty roles and power. Students and faculty both hold assumptions about power, and these assumptions can impact their behavior (Cook-Sather et al., 2014; Popovic & Green, 2012). As Cook-Sather et al. note (2014), "traditional understandings and conventions place faculty in the position of expert and therefore as holding more power than the learner. Students assume a low level of agency and are usually subordinate to the expert teacher" (p. 160). Traditional positioning may accustom students to take on a passive role and voice in the learning and curriculum development process (Delpish et al., 2010; Mann, 2008), which "constrains the student's autonomy and the capacity to take responsibility" (Mann, 2008, p. 61). Faculty are typically regarded as the "gatekeepers" of curriculum decisions (Bourner, 2004; Bovill, 2014b), so students may view curriculum as something that happens to them, not something they have control over (Gutman, et al., 2010). Faculty must empower students as collaborators, through establishing shared language and setting up a structure and setting where students feel that they have rights and responsibilities.

Student-faculty partnerships also require communication across differences in perspective, position, and identity (Cook-Sather, 2015; Cook-Sather & Agu, 2013); therefore, students may find difficulty in raising certain critiques and voicing their opinion. Faculty must be careful not to impose partnerships on students (Tabak, 2012), “use” students in disingenuous and manipulative ways (Fielding, 2004; Fine, Torre, Burns, & Payne, 2007; Lodge, 2005), or consider the partnership to be just for the faculty’s benefit. Also, faculty must be aware of power dynamics among students. Faculty must be careful not to privilege or marginalize specific voices (Mcintyre, Pedder, & Rudduck, 2005; Robinson & Taylor, 2007) or treat students as a homogenous group (Cook-Sather, et al., 2014). Developing a partnership that is “central to student empowerment and faculty learning” (Cook-Sather & Agu, 2013, p. 273) requires a consideration of factors that may foster or hamper respect, reciprocity, and responsibility.

### **Literature Review: UTLA-Faculty Partnerships**

Above, I have introduced the theoretical perspectives guiding student-faculty partnerships, described various roles student partners can play using examples from the literature, and highlighted both the benefits and challenges that result when faculty collaborate with students around teaching and learning. Now, I move to summarizing what the literature on UTLAs in undergraduate science courses reveals about the potential for UTLA-faculty partnerships. I argue for the need to further

investigate this unique type of student-faculty partnership with a focus on UTLA-faculty interactions as part of a formative assessment system.

The literature on UTLAs in science courses notes that UTLAs meet regularly with faculty to plan, cover content, and share concerns in addition to the variety of roles that they take on in and out of class to support student-centered learning. In the Colorado “learning assistant” (LA) model (Otero et al., 2010; Otero, Pollock, McCray, & Finkelstein, 2006), LAs meet weekly with the course instructor in order to plan for the upcoming week, reflect on the previous week, and examine student assessment data. Research that investigates aspects of the LA model (e.g., Chini, Straub, & Thomas, 2016; Close et al., 2016; Davenport et al., 2017; Gray, Webb, & Otero, 2016; Kiste, Scott, Bukenberger, Markmann, & Moore, 2017; Knight et al., 2015; Sabella et al., 2016; Talbot et al., 2015) noted that their LAs met weekly with the course instructor. The peer-led team learning (PLTL) model, in which undergraduate “peer leaders” lead weekly workshops where student groups work together to discuss and solve problems in a similar way to LAs, also recommends that peer leaders meet regularly with the course instructor and that course faculty remain closely involved with peer leaders (Gafney & Varma-Nelson, 2008; Gosser & Roth, 1998; Sarquis et al., 2001). Similar to the LA model, these meetings were meant to review upcoming activities, cover teaching and learning strategies, and discuss potential issues based on the content and activity. Other UTLA programs in the literature that do not necessarily follow the LA or PLTL model still mention weekly meetings between UTLAs and course instructors (e.g., Allen & White, 1999; Kopp, 2000; Philipp et al., 2016; Preszler, 2009). Weekly meetings with course instructors

are a key component of integrating practice, content, and pedagogy, which is necessary for UTLAs to develop the knowledge and skills to be effective peer educators (Otero, et al., 2010).

Although UTLAs in undergraduate science courses typically meet regularly with course instructors, meetings may vary in format depending on time and resources. Meetings may be run collaboratively by instructors and learning specialists (Jardine & Friedman, 2017; Sarquis et al., 2001; Tien, Roth, & Kampmeier, 2004) and they may range from one-on-one weekly meetings where UTLAs talk directly to the instructor of the course, to large group meetings where UTLAs meet with a faculty member who may not even be teaching the course (Davenport et al., 2017; Sabella et al., 2016). Sabella and colleagues (2016) noted “These meetings depend on the UTLA and faculty preparation in, and views on science content, pedagogy, and partnership, as well as time constraints for meeting” (p. 289).

UTLAs may also communicate with faculty through journals or e-mail. In Groccia and Miller (1996), faculty asked LAs to communicate time-sensitive student issues via e-mail and submit electronic journal entries to the course instructor that included a reflection on their experience. Other programs required UTLAs to keep a journal with their thoughts on specific activities or student issues (Otero et al., 2006; Sarquis et al., 2001; Tien et al., 2004).

Based on evidence from interviews with LAs and faculty at Chicago State University, Sabella et al. (2016) characterized three levels of LA-faculty partnerships: mentor-mentee, faculty-driven collaboration, and collaborative. They characterized mentor-mentee partnerships as one directional with limited LA input, where meetings



consisted mostly of faculty reviewing content and introducing future class activities. In faculty driven collaboration, faculty elicited feedback and insights from LAs, but faculty were still in control of LA involvement. Collaborative partnerships resulted when faculty members shared control and LAs were willing and able to make substantive suggestions and contributions to help improve the course. Sabella, et al. (2016) claimed, “While UTLAs can help instructors implement the type of learning environments that instructors strive for, they can also co-create these learning environments with instructors” (p. 289). Sabella et al. (2016) suggested that the nature of LA-faculty interactions might have depended on both the faculty members’ and the LAs’ views of their role as well as the LAs’ aspirations and abilities.

### **Implications for Formative Assessment**

All of the literature on UTLAs in undergraduate science courses that I reviewed for this study described that UTLAs met regularly with the course instructor; therefore, there was potential for UTLAs to regularly provide feedback to instructors to help them modify teaching to better address student needs. E-mail communication and electronic journal entries (Groccia & Miller, 1996; Sarquis et al., 2001; Tien et al., 2004) opened up additional opportunities for instructors to gather feedback from UTLAs. However, in practice, partnership dynamics varied (Davenport et al., 2017; Sabella et al., 2016). Regular meetings and communication provide opportunities for, but do not necessarily guarantee, exchange of feedback or collaboration necessary to support formative assessment.

Several studies mentioned explicitly that UTLAs provided feedback on instruction or instructional materials (Finn & Campisi, 2015; Gosser & Roth, 1998; Kopp, 2000; Popejoy & Asala, 2013; Talbot et al., 2015). Gosser and Roth (1998) included a vague statement about the value of feedback that peer leaders provided to instructors: “Feedback and suggestions from the leaders about the problems under actual workshop conditions have been very useful” (p. 186). Similarly, Finn and Campisi (2015) briefly mentioned, “course instructors received feedback from the mentors” (p. 39). Talbot et al. (2015) mentioned that their LAs helped to develop some of the activities used by the instructors in lecture and “suggest active learning strategies that they have researched or developed and provide instructors with insight about what concepts students are struggling with” (p. 25). Authors also noted that journal entries allowed instructors “to identify pedagogical issues and group concerns” (Sarquis, et al., 2001, p. 152) and “give the instructors a window into what is going on in each of the Workshop sections” (Tien, et al., 2004, p. 1314). UTLA feedback for instructors is valuable because UTLAs “view the teaching/learning process from very different eyes” (Allen & White, 1999, p. 300) and act as “allies who tell [instructors] what works and what does not” (p. 302). These examples from the literature suggested that UTLAs might provide useful feedback to instructors; however, the literature did not examine what the feedback included or the features that supported or constrained UTLA sharing of meaningful feedback.

Some of my recent work (Jardine & Friedman, 2017) has also emphasized the role that UTLAs might play in providing feedback to instructors. In our recent paper, Friedman and I described a one-credit course we developed to prepare UTLAs to

support small group problem solving sessions in a large, introductory organic chemistry course. Our study mainly focused on the outcomes of the experience for the UTLAs, but we also stressed that “the [UTLAs] were able to provide valuable input to the course instructor about where students were struggling and offer suggestions on what the course instructor could do to become more effective in the classroom” (p. 6). This work also drew attention to the importance of creating a formal space for UTLA-faculty conversations about teaching and learning and the benefits of having the faculty member facilitate these conversations.

Sabella et al.’s (2016) description and characterization of UTLA-faculty partnerships provided insight into the types of UTLA-faculty partnerships that may support formative assessment. In collaborative partnerships, LAs helped instructors to create learning environments, and these partnerships opened up space for LAs to contribute to formative assessment practices. The LA role of meeting and communicating with course instructors might offer opportunities for formative assessment that could help instructors improve their teaching, especially if these meetings are collaborative and faculty provide LAs with opportunities to share feedback. More recent work by the same research group (Davenport et al., 2017) includes a “Preparation Session Observation Tool” that faculty, LAs, program coordinators, or researchers can use to analyze and reflect on the interactions that occur during the weekly preparation session, and look for evidence of more collaborative partnerships.

Other scholars have also examined LA-instructor relationships more closely. Using LA written reflections, applications, and interviews, Close, Conn and Close

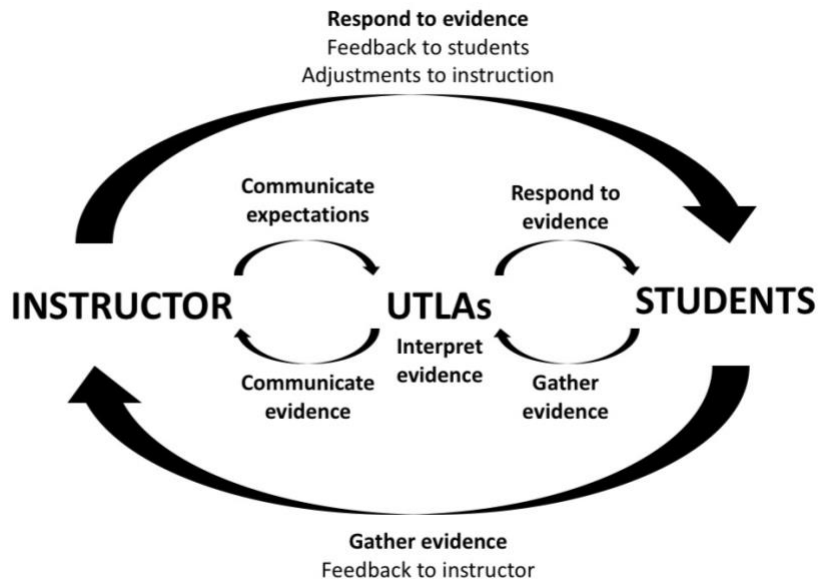
(2016) reasoned that the LA experience helped LAs become part of a “community of practice” (Wenger, 2000) of physics instructors. If LAs consider themselves to be members of a community of instructors, communication with faculty necessary for formative assessment may increase because LAs are more likely to share the instructor’s goal of helping students learn. Close, Conn and Close (2106) claimed “LAs are recognized by faculty as members of the community of instructors assisting with the educational mission of the department” (p. 10), but in their work it was not clear whether LAs being a part of a community of instructors involved communication of feedback and suggestions for how to improve teaching and learning.

In summary, a review of the literature on UTLAs in undergraduate science courses suggested that UTLAs meet and communicate with instructors regularly; these meetings could create a space to establish UTLA-faculty partnerships that support formative assessment practices. The literature suggested that UTLAs provided feedback to instructors on their teaching and learning; however, the literature did not explore in depth what went on during UTLA-instructor meetings, what information UTLAs and course instructors exchanged via in-person or digital communication, and most importantly, what enables and constrains more collaborative partnerships. In some cases, weekly meetings may be (ironically) rather lecture based and consist of the instructor discussing content or activities, but not opening up communication to hear from the UTLAs (Sabella et al., 2016). Additional research on the nature of UTLA-instructor interactions and communications, through the lens of student-faculty partnerships that embody respect, reciprocity, and

responsibility, is necessary to develop a clearer understanding of the impact of UTLA-faculty partnerships on formative assessment.

### **UTLA-Mediated Formative Assessment System**

As noted in Chapter 1, given their roles and unique expertise, UTLAs may be able to support formative assessment in undergraduate science courses. Figure 2.1 is a visual representation of a normative formative assessment system comprised of multiple, interacting feedback loops between UTLAs, instructor, and students. The outer loop, between instructors and students, represents the general conception of formative assessment amply described in the literature, the single feedback loop between instructor and students in which instructors gather evidence related to student learning and modify instruction in response to that evidence (Black & Wiliam, 2009; Cauley & McMillan, 2010; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). In undergraduate science courses, especially large lecture introductory courses, it may be difficult for instructors to interact regularly with all of their students and gather the evidence necessary for quality formative assessment (Yorke, 2003). UTLAs may be able to increase and enhance formative assessment by allowing for two additional feedback loops, between UTLAs and students and between UTLAs and instructors.



**Figure 2.1. UTLA-mediated formative assessment system**

### **UTLA-Student Interactions**

In the normative formative assessment system model I present, UTLAs share the responsibility of gathering, interpreting, and responding to evidence through fulfilling various roles interacting with students. As explored in the literature review, the UTLA role involves facilitating student discussion and small group work in lecture or recitation sections, evaluating students, or assisting students outside of class. These various roles provide UTLAs with opportunities to gather and respond to evidence about student learning as represented in the feedback loop between UTLA and students (Figure 2.1). The focus on UTLAs guiding, using probing questioning, eliciting student ideas, and providing feedback when working with students in class or in workshops and recitation sections (e.g. Otero et al, 2010; Gafney & Varma-Nelson, 2008) supports formative assessment. Additionally, UTLAs may receive

training on pedagogy and learning theory that provides them with valuable skills to interpret student thinking (Jardine & Friedman, 2017; Otero et al., 2010; Philipp et al., 2016; Tien et al., 2004). Thus, UTLAs may possess distinctive skills, experiences, and opportunities essential for gathering evidence related to student learning and can interpret and communicate that evidence to faculty from the perspective of a pedagogically informed student in the course.

The literature provides evidence that UTLAs may engage in formative assessment when interacting with students. Some studies provide survey findings where students acknowledge that UTLAs provide them with feedback on their learning (Groccia & Miller, 1996; Finn & Campisi, 2015; Jardine & Friedman, 2017). Other studies include UTLA interviews and written reflections that demonstrate UTLAs feel that they prompt students to reflect and justify their reasoning (Close et al., 2016; Philipp et al., 2016; Tien, Roth, & Kampmeier, 2002). Research on UTLA interactions with students demonstrates that UTLAs “can positively influence the articulation of reasoning in student discussions, especially if they use prompting questions and requests for reasoning” (Knight, et al., 2015, p. 10).

### **UTLA-Instructor Interactions**

When UTLAs meet regularly with course instructors for planning and reflection (Gafney & Varma-Nelson, 2008; Gosser & Roth, 1998; Otero et al., 2010; Sarquis et al., 2001), instructors may communicate expectations for UTLAs and UTLAs may communicate evidence of student learning, as represented in the

feedback loop between UTLAs and instructor (Figure 2.1). Digital communication (Groccia & Miller, 1996; Sarquis et al., 2001; Tien et al., 2004) creates additional opportunities for instructors to communicate with their UTLAs. As discussed in the literature review, the literature suggests that UTLAs provide useful feedback to instructors, but additional research on the nature of UTLA-instructor interactions is necessary to develop a clearer understanding of the UTLA-mediated formative assessment system. The guiding principles of student-faculty partnerships, respect, reciprocity, and responsibility (Cook-Sather, et al., 2014), provide constructs that are potentially useful as a lens through which to study UTLA-faculty instructional partnerships.

### **Respect, Reciprocity, & Responsibility in UTLA-Faculty Partnerships**

The student-faculty partnership literature considers respect, reciprocity, and responsibility to be the principles guiding student-faculty partnerships (Cook-Sather, et al., 2014); so, here I present a lens through which to explore these principles in the context of UTLA-faculty instructional partnerships. Earlier, in the literature review of student-faculty partnerships, I defined respect, reciprocity, and responsibility. Here I summarize my working definitions for each principle as well as ideas for what might provide observable and unobservable evidence of each principle (Table 2.1), specifically in regards to formative assessment. In other words, what might respect, reciprocity, and responsibility look like in interactions where faculty and UTLAs are



discussing improvements to teaching and learning? I developed these definitions by simultaneously considering literature on student-faculty partnerships, UTLAs, and formative assessment, as well as my experience testing the framework in a pilot study.

**Table 2.1. Respect, reciprocity, and responsibility in UTLA-Faculty instructional partnerships**

<b>Principle</b>	<b>Definition</b>	<b>Unobservable Evidence (Interviews &amp; Reflections)</b>	<b>Observable Evidence (Interviews &amp; Observations/Discourse)</b>
Respect	<ul style="list-style-type: none"> <li>• Openness</li> <li>• Receptivity</li> <li>• Trust</li> <li>• Valuing different perspectives and experiences</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizing others' perspectives and experiences</li> <li>• Feeling respected</li> <li>• Accepting differences</li> </ul>	<ul style="list-style-type: none"> <li>• Open communication-- Many different participants have opportunity to share ideas</li> <li>• Engagement with others' ideas</li> </ul>
Reciprocity	<ul style="list-style-type: none"> <li>• Balanced give and take</li> <li>• Mutual exchange</li> <li>• Sharing different perspectives</li> </ul>	<ul style="list-style-type: none"> <li>• Both UTLAs and instructors express expectations for exchanging ideas and perspectives</li> </ul>	<ul style="list-style-type: none"> <li>• Bi-directional conversation that includes exchanging ideas and perspectives</li> <li>• Both UTLAs and faculty raise concerns and share perspectives</li> <li>• Both UTLAs and faculty play a role in leading or directing conversation</li> </ul>
Responsibility	<ul style="list-style-type: none"> <li>• Investment in common goal of supporting student learning</li> <li>• UTLAs and faculty both responsible for pedagogy</li> </ul>	<ul style="list-style-type: none"> <li>• UTLAs feel they play a role in the instructional process</li> <li>• UTLAs recognize their development as teachers</li> <li>• Faculty recognize their continual development as learners</li> </ul>	<ul style="list-style-type: none"> <li>• UTLAs and faculty share evidence related to student learning</li> <li>• UTLAs and faculty discuss pedagogy and make suggestions for instructional adjustments</li> <li>• Faculty elicit feedback and insights related to student learning from UTLAs</li> <li>• Faculty provide feedback to UTLAs</li> <li>• Faculty make adjustments to instruction based on UTLA feedback</li> </ul>

Evidence of respect, reciprocity, and responsibility in regard to formative assessment may be both observable and unobservable, in that evidence may be directly observed in interactions or uncovered through interviews and reflections about those interactions. Unobservable evidence from UTLA and faculty interviews and written reflections may help to understand whether or not students and faculty perceive the presence of respect, reciprocity, and responsibility in their interactions. Much of the empirical literature on student-faculty partnerships used interviews and/or written reflections to explore partnership features and outcomes (e.g., Carey, 2013; Cook-Sather, 2008, 2009, 2011 2014, 2015; Bovil, 2014; Mchenry, Martin, Castaldo, & Ziegenfuss, 2009), but the literature lacked an in-depth account of what happens between students and faculty in real-time, gained through ethnographic methods. Observations of UTLA-faculty interactions, in addition to recounts of interactions shared during interviews, will provide a more comprehensive understanding of how respect, reciprocity, and responsibility play out in UTLA-faculty instructional partnerships.

The literature on student-faculty partnerships highlighted the importance of considering issues of power and positioning in student-faculty partnerships (Bovill, 2014; Bovill, et al., 2016; Cook-Sather, et al., 2014; Mann, 2008). Positioning theory (van Langenhove & Harre, 1999) may be useful to explore issues of power in UTLA-faculty partnerships because it considers how discourse is used to establish individual or group rights and responsibilities. Positioning theory posits that an individual's position comes with expectations and limitations for what that individual can say and do in that setting as well as how those actions are interpreted. Analyzing discourse

between UTLAs and faculty during meetings may help to reveal discourse patterns and structures that support or constrain UTLA-faculty instructional partnerships (Davenport, et al., 2017).

Through considering the theoretical basis behind student-faculty partnerships and drawing out implications for formative assessment from the literature on UTLAs in undergraduate science, I have developed a conceptual framework through which to study UTLA-faculty interactions. By applying what the literature notes about UTLA-faculty interactions in different contexts to well-recognized definitions of formative assessment, I have developed a normative conceptualization of a UTLA-mediated formative assessment system (Figure 2.1). To study UTLA-faculty interactions as part of a formative assessment system, I expanded definitions of the guiding principles of student-faculty partnerships, respect, reciprocity, and responsibility (Table 2.1), in regard to sharing ideas and evidence about student learning. The framework and principles provide a lens through which I will explore my research questions, and in turn, my analysis will allow me to build upon and refine the framework.

### **Chapter 3: Methodology and Data**

I employed qualitative case study research methods to study UTLA-faculty instructional partnerships. Since “the evidence from multiple cases is often considered more compelling, and the overall multiple-case study is therefore regarded as being more robust” (Yin, 2018, p. 54), I explored two cases. The two cases that I studied were purposefully and carefully chosen to demonstrate “replication logic” (Yin, 2018, p. 55), in that the second case helped to strengthen the findings of the first case in the same way that multiple experiments strengthen findings in traditional scientific research. One case was the UTLAs and instructor for the Cell Biology course for the ILS LLP at UMD discussed in the introduction. The second case was the UTLAs and instructor for an introductory genetics course at UMD. I chose these two cases because based on prior experiences and conversations with the instructors, I had reason to believe they would be information rich cases that would exhibit aspects of the formative assessment system and evidence of respect, reciprocity, and responsibility in UTLA-faculty interactions. Although the cases shared similar features, they were not entirely alike, which allowed for interesting comparisons of various factors, such as differences in UTLA preparation seminars and different UTLA roles.

In the below paragraphs, I argue why a qualitative case study approach was appropriate for this study. I then describe the two cases in order to illustrate why I considered them to be information rich. Then, I describe in detail the multiple data

sources that I collected for each case, my overall analytical approach, and how I addressed issues of validity and reliability.

### **Methodological Approach: Qualitative Case Studies**

Case study research is an appropriate method to study UTLA-faculty instructional partnerships as part of a formative assessment system for several reasons. Case study is a suitable method of inquiry when the research question focuses on contemporary events in a real-world context, “especially when the boundaries between phenomenon and context may not be clearly evident” (Yin, 2018, p. 15). A comprehensive understanding of UTLA-faculty instructional partnerships required studying UTLAs and faculty as they interacted in real-time and in a real-world context. Tangible, meaningful instructional partnerships could not exist separate from an actual course or educational institution, which blurs the boundary between phenomenon and context. Case study research supported the production of an “intensive, holistic description” (Merriam, 1998, p. 134) and in-depth understanding of UTLA-faculty partnerships within a real-world context (Yin, 2018).

I pursued a multiple case design and I considered the case unit of analysis to be the UTLAs and faculty instructor for a single course. A multiple-case design can lead to more powerful analytic conclusions than a single-case design because of replication and additional evidence to answer the research questions (Yin, 2018). In terms of choosing cases, it was not feasible for me to study all UTLA-faculty partnerships at a university, or even across a department, nor was data collection to

that extent necessary to begin to answer my exploratory research questions. Case study research, as any research design, requires trade-offs due to limited resources, limited time, and limits on human ability (Patton, 1990). Therefore, I conducted two in-depth case studies, to balance both breadth and depth.

Since partnerships and interactions are somewhat abstract notions, I “define a specific real-world case to be the concrete manifestation” (Yin, 2018, p. 31) of UTLA-faculty instructional partnerships. Yin (2018) considers defining and bounding the “case” an important component of the research design; however, cases are not always “easily defined in terms of the beginning or end points of the ‘case’” (p. 29). The boundaries of a case can become tricky when the phenomenon of interest is related to human dynamics (Patton, 1990). Since my research focus is UTLA-faculty partnerships, I considered a “case” to be the instructor and UTLAs for a single course. I bounded my cases to one semester, Fall 2018, since UTLAs and students in the course change each semester. In the following sections, I briefly describe the two cases through which I studied UTLA-faculty partnerships.

### **Case 1: UTLA-Faculty Partnerships for Cell Biology in the ILS LLP**

For my first case, I studied the UTLA-faculty instructional partnerships for a Cell Biology course that is part of the Integrated Life Sciences Living Learning Program (ILS LLP) at UMD. The ILS LLP was established to transform life sciences education as suggested by national calls (American Association of the Advancement

of Science, 2011) through collaborative, student-centered learning (Cooke, Quimby, Horvath, Jardine, & Levin, 2016). In this program, students live together; take a core set of science classes together; and participate in research internships, group excursions, and community service. The in-class sessions for all program courses incorporate small group learning exercises into the curriculum, where students answer application questions as they follow demonstrations, work with manipulatives or computer simulations, or discuss biological content.

All of the program's courses, including Cell Biology, are supported by UTLAs who regularly interact with students and instructors in various ways. UTLA support in the ILS program follows the general foundations of the learning assistant (LA) model (Otero et al., 2010), in that UTLAs engage weekly with practice, content, and pedagogy. During classes, the UTLAs circulate the room and guide student groups through activities and promote productive collaboration. The UTLAs also hold "office hours" in the dormitory lounge where the students live and they lead group discussions about course content and homework assignments. In addition, the UTLAs are responsible for grading homework assignments and portions of the exams.

The UTLAs for Cell Biology met weekly with the instructor to review content and provide feedback and support in improving instructional materials. Additionally, the UTLAs engaged in a pedagogy course focused on science education theory and practice during their first semester as a UTLA, which I created specifically for the program and taught in Fall 2016 and Fall 2017. In Fall 2018, the pedagogy course was taught by the Cell Biology instructor. In the seminar, UTLAs are introduced to a



variety of topics and education literature to help them support student learning, including literature and discussions about formative assessment (Cauley & McMillan, 2010). The seminar is also designed to provide structures through which UTLAs can share evidence of student learning relevant for formative assessment (Bell & Cowie, 2001; Coffey, Hammer, Levin, & Grant, 2011). The seminar is entirely discussion based and is meant to be an informal space where UTLAs can share their opinions and experiences and problem-solve together. Course description, goals, outcomes, and a list of topics and activities from the syllabus for Fall 2018 are included in the dissertation Appendix.

Through integration of practice, content, and pedagogy, the UTLAs worked towards developing the knowledge and skills necessary to be effective peer educators (Otero, et al., 2010). All of these interactions between students, UTLAs, and instructors provided ample opportunities for UTLAs to engage in the multiple feedback channels represented in the formative assessment system framework. Also, since in Fall 2018 the Cell Biology instructor was also the pedagogy course instructor, this case provided an opportunity to explore UTLA-faculty instructional partnerships where the course instructor is directly engaging with UTLAs around topics related to pedagogy and formative assessment.

Based on my prior experience working with the ILS LLP, I had reason to assume that the UTLA-faculty partnerships present in this setting would represent an “information rich” (Patton, 1990) case of respect, reciprocity, and responsibility in UTLA-faculty instructional partnerships. I have been involved with the ILS-LLP since Fall 2014, when I began a longitudinal ethnographic research study on the

program that occurred from fall 2014 through spring 2016 (Jardine, Levin, Quimby, & Cooke, 2017). During this two-year long study in which I regularly observed and spoke with instructors and students both formally and informally, I recognized that UTLAs and instructors in this setting established meaningful working relationships and that instructors valued UTLA feedback. For instance, during one interview, the director of the program told me “I don’t know how anyone does formative assessment, really genuine formative assessment, without UTLAs...to me, the UTLAs are a motherlode of information about what’s going on in the class.” My connection to and prior knowledge about the ILS LLP, and the documented impact of UTLAs and instructors on student-centered learning (Jardine et al., 2017; Jardine, et al., in press), made it a favorable context to inquire into UTLA-faculty instructional partnerships as part of a formative assessment system.

### **Case 1 Participants**

**Dr. Cell, the Cell Biology instructor.** In Fall 2018, Dr. Cell taught the ILS LLP Cell Biology course for the first time. Dr. Cell began working as the Associate Director for the ILS LLP in Fall 2017. Thus, it is important to note that Dr. Cell’s relationship with her UTLAs is multi-faceted in that she was not just the instructor of the course that they supported, but she was also their pedagogy course instructor and an administrator/advisor for them as part of the LLP. Also, before working with the ILS LLP, Dr. Cell spent over five years supporting faculty development at a teaching center on campus; she has extensive experience and familiarity with education

research. Therefore, she was prepared, and excited, to take on teaching the pedagogy seminar for the UTLAs in the ILS LLP.

**The Cell Biology UTLAs.** In Fall 2018, there were five UTLAs supporting the Cell Biology course. The UTLAs were advanced undergraduates in the living learning program that had previously performed well in the class. The instructor chose the five UTLAs based on a combination of GPA and ability to work well with students, as demonstrated in an application. UTLAs had either taken the course that they were assigned to work with one or two years prior. In Fall 2018, all of the Cell Biology UTLAs were new to the role, so all were enrolled in the pedagogy course except for one, Lynn, who was excused because she had experience taking other education courses. The five UTLAs (pseudonyms), academic year, and major are listed in Table 3.1.

**Table 3.1. Case 1 UTLAs**

<b>UTLA</b>	<b>Academic Year</b>	<b>Major</b>	<b>Additional Information</b>
Ann	Junior	Biology	
Gabe	Junior	Biology	
Kristen	Junior	Biology	
Lynn	Junior	Biology	Goal to become high school biology teacher
Sarah	Senior	Mathematics & Bioengineering	

## **Case 2: UTLA-Faculty Partnerships in Introductory Genetics**

For my second case, I studied the UTLA-faculty instructional partnerships for an introductory genetics course at UMD. I studied the partnerships between one of the course instructors for Fall 2018, who I refer to as Dr. Genetics, and her 11 UTLAs. The UTLAs for this course were each responsible for independently leading a weekly 2-hour discussion section aligned with the lecture meetings led by the course instructor. There were over 200 students in the lecture course and each UTLA was responsible for 23 students in their discussion section. In the discussion sections, the UTLAs guided students through a series of computer-based activities that required them to apply analytical techniques commonly used by geneticists to investigate a gene of their choice. Additionally, leading up to exams, the UTLAs ran guided review sessions during their discussion section. The UTLAs were also responsible for grading student work and holding office hours. Dr. Genetics met with the UTLAs weekly to discuss content, facilitation plans, successes, and challenges. Similarly to the ILS LLP case, I chose this case because frequent interactions between students, UTLAs, and instructors were likely to provide ample opportunities for UTLAs to participate in the various feedback channels represented in the formative assessment system framework.

Similarly to the UTLAs in Case 1, All of the Genetics UTLAs were required to participate in a one-credit pedagogy course during their first semester in the role. The pedagogy course that they were expected to take was designed to support all UTLAs in the biological sciences program at UMD that taught their own laboratory

or discussion section, and the course was run by another faculty member in the biology department (not Dr. Genetics). The course covered topics such as getting to know your students, active learning, public speaking and presentation skills, and academic integrity, and included assignments such as teaching reflections, observation of an experienced UTLA, and creation of a final teaching portfolio. Based on reviewing the syllabus and discussing the course with the instructor, this course seemed to focus more on logistics and troubleshooting and less on educational theory and formative assessment as compared to the Case 1 pedagogy seminar.

Like with Case 1, I had reason to believe this case would be an “information rich” (Patton, 1990) case of respect, reciprocity, and responsibility in UTLA-faculty partnerships. Although I did not have prior experience directly working with and conducting research on this course, like I had with Case 1, I had worked with the instructor and discussed her course through my administrative role on campus. Fall 2018 was a particularly interesting semester to study this instructor and her UTLAs because all of her UTLAs for Fall 2018 were returners. The instructor noted that the UTLAs therefore were more likely to be comfortable fulfilling their roles, collaborating with her, and sharing their opinions. The instructor also described to me that she consistently collaborates with her UTLAs in order to develop materials used in the UTLA-led discussion sections. Over the summer before the semester began, she had been in contact with her UTLAs for Fall 2018 several times, asking for their input as she finalized course structure and materials. The instructor expressed an overarching focus on incorporating UTLAs’ ideas and insights into improving the course.

## Case 2 Participants

**Dr. Genetics, the Introductory Genetics instructor.** By Fall 2018, Dr. Genetics had been teaching the Introductory Genetics course and coordinating the UTLA-led discussion sections for several years. She began teaching at UMD in 2016, and in Fall 2017, she implemented a re-designed curriculum for the UTLA-led discussion component of the genetics course. She created this curriculum, referred to as GeneLab, with the help of former UTLAs. In a typical semester, Dr. Genetics is one of several instructors teaching the Introductory Genetics course, but she is responsible for coordinating all of the discussion sections, and therefore works with all of the UTLAs across all instructors. In Fall 2018, Dr. Genetics was one of two instructors teaching Introductory Genetics, but she was the only one who applied the GeneLab version of the discussion component. Therefore, all of the UTLAs that Dr. Genetics worked with in Fall 2018 were leading discussion sections paired directly with her section of the lecture course.

**The genetics UTLAs.** In Fall 2018, there were 11 UTLAs supporting Dr. Genetics' section of the Introductory Genetics course. Ten of the UTLAs were leading their own discussion section and one of the UTLAs was in charge of the learning management system and all online components of the course. Like the Cell Biology UTLAs, the Genetics UTLAs were advanced undergraduates that had previously performed well in the class and were selected based on a rigorous application process. In contrast to the UTLAs working with the Cell Biology course, all of the Genetics UTLAs had served in the UTLA role in one or more previous semesters and had therefore taken their required pedagogy course in a previous

semester. All UTLAs consented to participate in the study, and their pseudonyms, academic year, major, and number of semesters as a UTLA for the Genetics course are listed in Table 3.2.

**Table 3.2. Case 2 UTLAs**

<b>UTLA</b>	<b>Academic Year</b>	<b>Major</b>	<b>Semesters as Genetics UTLA (including Fall 2018)</b>	<b>Additional Information</b>
Alex	Senior	Biology	2	
Brian	Junior	Biology	2	
Cara	Senior	Public Health Science	3	
Dana	Senior	Biology	3 (including summer)	
Evan	Junior	Biochemistry & Psychology	2	
Faith	Junior	Biology & Philosophy	3 (including summer)	Learning Management System UTLA
Gabby	Senior	Biology	3	
Heath	Senior	Biology & Psychology	2	
Ian	Senior	Biology	2	
Jessica	Senior	Public Health Science	2	
Karen	Senior	Biology	2	

In summary, my selection of both of these cases as cases through which to study UTLA-faculty partnerships was purposeful (Patton, 1990). Based on my prior experience and research with the ILS LLP, and my discussions with the instructors of both courses leading up to this study, I had reason to believe that I could learn a great deal about UTLA-faculty instructional partnerships by exploring these cases.

Although my aim was not to conduct a formal cross-case comparison between the two cases, the two cases exhibited notable contextual differences that provided opportunities to challenge and extend findings. I summarize the basic information about each case in Table 3.3 to clarify some of these contextual differences. The second case was a “replication” of the first in that it was also an introductory biology course supported by UTLAs and there was evidence of feedback loops between instructor, UTLAs, and students. However, the two cases provided opportunities to consider differences in UTLA and instructor experience, UTLA role in and out of the classroom, pedagogical preparation, and time and format of preparation meetings.

**Table 3.3. Summary of basic descriptive information for Case 1 and Case 2**

	<b>Case 1: Cell Biology in LLP</b>	<b>Case 2: Genetics</b>
UTLAs	5 UTLAs, all new	11 UTLAs, all returning
Instructor	Dr. Cell, first time teaching Cell Biology, experience in education research, administrator for LLP	Dr. Genetics, multiple semesters of experience teaching the course
UTLA Role	Facilitate small-group discussion in lecture, lead office hours in pairs, grade homework and exams	Independently lead discussion section and office hours, grade coursework and exams
UTLA Pedagogy Course	One-credit, 14 week course, during first semester as UTLA, taught by Dr. Cell, focus on reflection, active learning, metacognition, questioning, and formative assessment	One-credit, 10 week course, during first semester as UTLA, taught by other biology faculty member, focus on reflection, active learning, logistics, presentation skills, and academic integrity
UTLA-Faculty Preparation Meeting	Weekly meeting on Thursday evenings, following pedagogy seminar	Weekly meeting, approximately 45 minutes long, Friday afternoon directly before Genetics lecture course



## **Data Sources**

Case study research involves gathering multiple forms of evidence, guided by research questions (Merriam, 1998; Stake, 1995; Yin, 2018). According to Merriam (1998), “Understanding the case in its totality...mandates both breadth and depth of data collection” (p. 134). Merriam highlights the importance of utilizing various forms of evidence for case study; the different types of data collection “merge in the process of understanding and describing the phenomenon of interest” (Merriam, 1998, p. 149). Thus, I collected data over the entirety of the Fall 2018 semester, and data included observational field notes, audio recordings of meetings, interviews, and written documents. Data collection was flexible, context dependent, and responsive to ongoing analysis, in that the data I collected was informed by what I was observing and noticing over the course of the semester. For example, timing of interviews and questions asked during interviews depended on observational data and written artifacts. Essentially, I aimed to collect data in a way that would allow for the most comprehensive analysis of each case.

### **Observations and Audio Recordings of Meetings**

My largest source of data for this study was audio recordings of UTLA preparation meetings, supported by observational field notes. I attended all scheduled, in-person meetings between faculty and their UTLAs for both cases and collected field notes as well as audio recordings at every meeting. For Case 1, my attendance at all in-person meetings included the pedagogy seminar that the UTLAs were enrolled

in, since the Cell Biology instructor was leading the seminar, as well as the Cell Biology preparation meeting. These meetings occurred on Thursday nights, back to back, beginning with the pedagogy seminar, and ran weekly from August 30, 2018 until December 6, 2018, except for the week of Thanksgiving. In total, for Case 1, there were 14 weeks of meetings, and each week ranged from 1.5 hours to 3 hours long for the seminar and preparation meeting combined, totaling approximately 25 hours of meeting audio for Case 1. The meetings for Case 2 occurred every Friday afternoon from August 31, 2018 until November 30, 2018, except for a few Fridays when the instructor cancelled the meeting to make up for the extra time UTLAs put into exam grading. In total, for Case 2, there were 11 meetings, and each meeting ranged from 30 minutes to 50 minutes long, totaling approximately 7 hours of meeting audio for Case 2.

I collected video recordings at some, but not all, of the meetings, so that I had record of the room arrangement and typical body language between faculty and UTLAs. I chose not to collect video recordings during every meeting because having the camera present felt intrusive. Also, I noticed that body language and room arrangement changed minimally between sessions, so the few videos that I had could serve to represent body language for other meetings. To make up for lack of video data, I collected detailed accounts of seating arrangement, body language, participant movement, facial expression, and information about who was speaking in my field notes to supplement the complete audio recordings.

During observations, I acted as a participant observer (Merriam, 1998), in that my main role was to observe, but I interacted with the UTLAs and faculty as

appropriate to build rapport and better understand the situation. In both cases, I sat amongst the participants and took field notes using a laptop. I chose to use a laptop rather than pen and paper to collect field notes because the laptop allowed me to take more detailed notes at a faster rate. My use of laptop did not seem intrusive or distracting because the UTLAs and instructor often had laptops out themselves. Throughout the semester, I maintained a noticeable presence to help develop the feeling that I was a part of the group rather than just watching, but I remained minimally involved in the conversation by only speaking up when spoken to. I asked follow-up questions with participants before and after the meetings when necessary to better understand the situation. Since I was present for all meetings throughout the semester, from the first to the last, my presence was part of the norm and therefore the impact of my presence on the actions of the participants was minimized.

For both cases, meetings were held in the same location each week and the participants sat in generally the same places. In Case 1, participants sat around a long rectangular arrangement of desks in a meeting room in the dormitory building that the ILS LLP is housed. This arrangement allowed for eye contact between all UTLAs and the instructor (Figure 3.1). The meetings for Case 2 were held in the classroom in which the UTLAs taught their discussion sections. The classroom was small and designed for students to work on computer programs. Tables were arranged in three rows that faced the front of the room where there was a whiteboard and projector screen. Each seat had its own large computer monitor. The faculty member sat at a designated instructor desk, which was on the side of the room against the wall, aligned with the middle row. By sitting at this desk, Dr. Genetics could turn her chair

to face the UTLAs and make eye contact (Figure 3.2). The UTLAs sat spread between the three different rows in the same seats each week. I have included screen shots from the video recordings to illustrate the typical room and body arrangement (Figures 3.1 & 3.2).



**Figure 3.1.** Case 1 typical room and body arrangement (Pictured from left to right: Dr. Cell, Sarah, Gabe, and Lynn)



**Figure 3.2.** Case 2 typical room and body arrangement (Dr. Genetics in the back, facing forward)

In both cases, I sat myself in a place where I could most easily view instructor and UTLA body language and facial expressions. In Case 1, I typically sat at the opposite end of the tables from the instructor. For Case 2, I rotated between the three rows throughout the semester, always sitting on the end furthest from the instructor. I

placed myself close enough to the participants to create the feeling that I was part of the group and to be able to hear the conversation, but without coming in between any of the participants. I always placed the audio recording device amongst the group, close to the instructor.

### **Interviews with Faculty and UTLAs**

I conducted interviews with instructors and UTLAs throughout the semester in order to gain their personal perspective of their experience and compare to what I was interpreting from my observations. All interviews were semi-structured, in that I went in to the interview with pre-written questions (Appendix B & C) but asked follow-up questions as necessary, dependent on responses and what I had noticed about that participant's particular experience during the semester. I developed my initial interview questions for instructors and UTLAs based on pilot studies. I added questions to the final interview for the instructors based on my observations and informal preliminary analysis throughout the semester. I audio-recorded all interviews and refrained from taking notes to keep the conversation as casual and free flowing as possible.

I interviewed each instructor twice during the study. I interviewed both instructors individually before the start of the semester to gather a sense of the role UTLAs would play in their class, their expectations for UTLAs, and what they saw as the purpose for their meetings. These interviews early on also helped me, as the researcher, build rapport with the instructor with whom I would be working with

throughout the semester. I interviewed each instructor again after the conclusion of the semester to gather their perceptions of how the semester had gone and ask follow-up questions related to my observations throughout the semester. All instructor interviews occurred in the instructor's private office at a time that they chose, and lasted about one hour.

I also conducted one-on-one interviews with every UTLA that consented to be interviewed. I only interviewed each UTLA once, and I spread the interviews out throughout the semester. I decided that it was not necessary to interview UTLAs more than once throughout the semester because my research questions were not related to changes over time. Rather, I focused on interviewing as many UTLAs as possible so that I could speak to a greater breadth of experiences and confirm trends and similarities in their responses with greater confidence. I interviewed 4 of the 5 UTLAs from Case 1 and 8 of the 11 UTLAs from Case 2. Each interview occurred at a time and place on campus that was convenient and comfortable for the UTLA and UTLAs were compensated \$15 cash for their time. Locations included lounges in campus libraries, the student union, and academic buildings. I started conducting interviews in early October, after about a month of data collection, but most interviews occurred closer to the end of the semester.

### **Additional Relevant Artifacts & Observations**

In addition to audio recordings of meetings and interviews, I gathered different types of written artifacts relevant to understanding each case. For Case 1, I

collected all of the UTLAs' written submissions for their pedagogy seminar assignments (10 assignments, submissions from 3 consenting UTLAs for each) as well as the syllabus for the pedagogy seminar and the Cell Biology course that they were working in. For Case 2, I collected the syllabus for the Genetics course and the "TA Handbook" created by the instructor. I also collected the weekly handout that the instructor provided for each preparation meeting (11 total), which she referred to as the TWiG (This Week in Genetics).

For both cases, the instructors forwarded me all e-mail communication between them and their UTLAs and I downloaded and compiled all of these exchanges. In total, for Case 1, there were 4 e-mail chains, which were all related to draft exams. For Case 2, there were over 100 e-mails, some of which were sent to the whole group and others that were between the instructor and one UTLA or a subset of UTLAs. Case 2 engaged in significantly more e-mail communication than Case 1, which was likely due to the difference in UTLA roles and responsibilities as well as differences in how often they interacted in person outside of the weekly meetings. Since the Case 2 UTLAs taught independent discussion sections, preparing for their teaching required more asynchronous coordination and communication outside of class compared to the Case 1 UTLAs, who supported the instructor during class and could therefore touch base in-person before and after class.

To gather a more comprehensive understanding of the UTLA role and UTLA-faculty partnerships, I also conducted additional observations on occasion. For Case 1, I attended two class sessions when I knew there would be ample UTLA involvement in order to gain a better understanding of the role that UTLAs played in

the class and how the instructor interacted with UTLAs during class. For Case 2, I attended the first day of class so that I could note how the instructor introduced the role of the UTLAs in the course. I also attended one of the UTLA-led discussion sections on a day when they UTLA was conducting an exam review in order to get a sense of what the discussions were like. In addition, I sat in on part of one of the exam grading sessions and I also observed when the instructor gathered a smaller volunteer group of UTLAs to create a practice presentation video as a resource for the Genetics students. To learn more about the pedagogy course that the Case 2 UTLAs took during the first semester in the role, I met with the pedagogy course instructor and discussed the course structure, assignments, and topics. For these additional observations I only collected field notes and did not collect audio recording since they were for contextual understanding and rapport building.

To the best of my ability (and dependent on consent), I gathered all possible sources of data over the course of the semester (attended all possible meetings, interviewed instructors and all consenting UTLAs, collected all written artifacts and email communication, attended additional observations), which is crucial for rigorous case study (Merriam, 1998). Because of the large amount of data collected (summarized in Table 3.4), across various forms, attention to data management proved to be particularly important. I created an organized case study database (Yin, 2018) using Google drive. I kept the data from the two cases separate, and uploaded data sources immediately upon collection to folders labeled by type (e.g., audio recording, email correspondence, UTLA interview).



**Table 3.4. Complete list of data sources for both cases**

<b>Case 1</b>	
Observations & Audio Recordings of Meetings	14 meetings (7 meetings with video)
Additional Observations	2 class sessions
Instructor Interviews	2 (before and after semester)
UTA Interviews	4
UTA Written Reflections	10 assignments
Additional Artifacts	4 emails Cell Biology Course Syllabus Pedagogy Seminar Syllabus
<b>Case 2</b>	
Observations & Audio recordings of Meetings	11 meetings (2 meetings with video)
Additional Observations	1 class session 1 discussion section session
Instructor Interviews	2 (before and after semester)
UTA Interviews	8
UTA Written Reflections	10 assignments
Additional Artifacts	100+ emails 11 TwiG Meeting Handouts Genetics Course Syllabus Genetics Discussion Syllabus TA Handbook

### **Analytic Approach**

I conducted initial data analysis throughout the data collection process. I continually wrote memos with themes, hunches, and ideas to pursue, and noted things I planned to ask or look for in subsequent data collection activities (Merriam, 1998; Miles & Huberman, 2014). After conducting the instructor interviews at the beginning of the semester and before beginning observations, I wrote memos summarizing themes that came up in the initial interviews. While taking observational field notes, I consistently made interpretations and considered connections to other

data sources. In the field notes, I was careful to note interpretations and thoughts in italics to distinguish them from direct observations. Every 2-3 weeks I re-read my field notes and wrote memos summarizing patterns that I was noticing in my observations and developing thoughts about more concrete directions for research questions. About halfway through the semester I presented my emerging ideas at research group meetings, including the Physics/Science Education Research Group (PERG), gathered feedback from colleagues, and wrote a memo in response to research group discussions. All of this initial analysis during the data collection process helped me to develop more defined research questions and a concrete plan for increasingly rigorous data analysis.

I also wrote memos during and after creating transcriptions for the audio recorded data. I personally transcribed all audio recordings, both of meetings and interviews, using InqScribe, as close to the time they were collected as possible. By transcribing close to the time that the data was collected, I was able to better connect my field notes to the data and note initial impressions while the experience was fresh in my mind. Transcribing the data myself over the course of the semester allowed me to develop a deeper connection to the data; I was able to conduct informal analysis during the study and better recognize trends and patterns to bring up in interviews or look for in subsequent observations.

After data collection was complete, I began to “consolidate, reduce, and interpret” (Merriam, 1998, p. 178) the data so that I could apply an open constant comparative coding method (Miles & Huberman, 2014; Strauss & Corbin, 1990) to attend to my specific research questions. First, I converted all of my data sources to

PDF or Word documents and added them to a new project in NVivo 12. I kept the data sources organized in the same way as I had in Google, by case, and then by type. I created separate code folders for each research question, “interactions” and “feedback,” and a “general” codes folder for information that was broadly relevant to the overall study (e.g., UTLA role, value of UTLAs, memorable quotes).

My first research question related to characterizing UTLA interactions was originally “In what ways might respect, reciprocity, and responsibility manifest in UTLA-faculty interactions?” Thus, I originally attempted to code for respect, reciprocity, and responsibility in the data. I began with the codes “respect,” “reciprocity,” and “responsibility” as parent codes, but developed out more specific codes under each category. The development of codes was an iterative process; I started with codes to match the descriptions of evidence for each construct (based on Table 2.1), but I also added and adjusted codes based on memos that I had developed during the semester. I added an additional parent code, “relationship,” to note interactions that seemed valuable for building trust and comfort amongst the group, and that didn’t seem to be encompassed in the other constructs.

After coding the first few transcripts, I found that coding for the constructs of respect, reciprocity and responsibility was not very straightforward, nor did it seem to be helping me develop meaningful answers to my research question. The constructs overlapped in many ways; trying to label pieces of transcript based on the categories often resulted in assigning the data a long list of codes. It also seemed that coding the data in this way was limiting the implications I could draw; I was only gaining a better sense of if and how these constructs were occurring, but not what was

happening in the interactions. I continued to code loosely for respect, reciprocity, and responsibility and use them as look-fors, but I began to code systematically for different ways that UTLAs were positioned in the interactions. I decided to apply the theoretical framework of positioning theory (Harré, Moghaddam, Cairnie, Rothbart, & Sabat, 2009; van Langenhove & Harre, 1999) and altered my research question to “In what ways are UTLAs positioned in UTLA-faculty interactions?” By coding for positioning, I would be able to illuminate in what ways respect, reciprocity, and responsibility manifest when UTLAs are positioned in these different ways.

After deciding to analyze the data for the ways in which UTLAs were positioned, I first reviewed all of the observational field notes for each case, along with the memos I wrote throughout the semester, to generate a general description of the interactional norms for each case, based on patterns of interactions. Then, to develop more specific codes about UTLA positioning, I read through each meeting transcript, one case at a time, in chronological order, and noted instances where either the faculty member or a UTLA did or said something that provided evidence of a specific UTLA “right, duty, or expectation” (Harré et al., 2009; van Langenhove & Harre, 1999). In other words, I considered instances where different UTLA positions were implicitly or explicitly established, taken up, or assumed. As I was coding the data, I sorted the codes into general themes, some of which came from the student-faculty partnerships literature (consultant, co-creator), some of which came from pilot data analysis (student, co-instructor), and a new category, informant, which I felt was important to differentiate from consultant in that it involved UTLAs reporting information but not necessarily providing advice or suggestions based on that

information. Table 3.5 includes the final list of categories and the codes that fit under each.

**Table 3.5. Final list of themes and codes for UTLA positioning**

<b>Theme</b>	<b>Codes</b>
UTLAs as Student	UTLA complete assignment UTLA answer question Faculty gives directions Faculty explains (or facilitates discussion about) concepts Faculty explains (or facilitates discussion about) pedagogy
UTLAs as Informant	UTLA share information (about students in the course) UTLA share personal experience Faculty request information
UTLAs as Consultant	UTLA suggestion/advice Faculty request suggestion/advice Faculty credits UTLA ideas
UTLA as Co-Instructor	UTLA make grading decision UTLA discuss work with students UTLA referred to as teacher UTLA discuss pedagogy UTLA choice and flexibility
UTLA as Co-Creator	UTLA make decision about design of instructional materials (including exam) UTLA creates instructional materials (including exam questions)

The development of codes and themes for my second research question about the content of UTLA feedback was also an iterative, inductive process. I defined feedback broadly as any instance where UTLAs provided information to the instructor related to what was happening in the course that could be used to make changes to the course. I considered Hattie and Timperley's (2007) definition, that feedback is "information provided by an agent regarding aspects of one's performance or understanding" (p. 81). However, because of the unique role of the

UTLAs between instructor and student, the information provided by the agent (UTLAs) to the instructor could be regarding the instructor's performance or understanding (including instructional materials such as exams and activities) OR student's performance or understanding.

I created an initial list of codes before beginning to code the data by reviewing analytic memos that I had written over the course of the data collection process and referring back to a pilot study analysis. My initial list of codes included logistics, exams, activities and assignments, student attitudes, student behaviors, student opinions, and student ideas about concepts. As I began to code the data, I decided it was important to also code for type of feedback (evidence, interpretation, suggestion, and prediction) in addition to topic of feedback (e.g., student attitudes, student ideas) to differentiate between when UTLAs were merely sharing direct evidence about what students did or said to when they were going beyond by offering interpretations, suggestions, or predictions. Thus, I added the codes "evidence," "interpretation," "suggestion," and "prediction" and each instance of feedback was coded for both type and topic. I also created codes beyond type and topic of feedback to tag specific feedback-related instances that I was finding in the data, such as "instructor asks for feedback" so that I could look for patterns in terms of how instructors went about requesting feedback and "UTLA personal student perspective" to note instances where feedback was based on the UTLAs' personal experiences, as compared to their experiences working with students.

After I coded the data, I reviewed the codes to identify relationships and combine codes into broader themes. I combined "logistics" (which was defined as

timing, procedures, and management), “exams,” and “activities and assignments” into one theme of “course logistics and instructional materials” because they were related to procedures, planning, and curriculum. I combined the codes “student attitudes,” “student behaviors,” and “student opinions” into one theme of “student attitudes and behaviors” because they all were related to what students were saying about the course or doing in the course separate from content or concepts. Then, I considered a third theme to be “student ideas and conceptual understanding,” which was its own code. I used these themes to organize and present my findings in Chapter 5.

For both research questions, I developed codes with the intention of using them as an organizational tool, in that I was not planning to code to be able to quantify or count instances, but instead to be able to notice and track patterns and tag relevant examples. I read through and coded each data source one by one in chronological order, starting with the meeting transcripts, then interviews, then additional artifacts. I coded both research questions simultaneously. Originally, I had planned to code for the first research question and then return to the data to code for the second, but I found that due to the relatedness of the research questions it was challenging to ignore interesting and relevant segments when taking the time to thoroughly review each transcript. I found that coding both questions simultaneously helped me to better recognize implications of the first study for the second, and this approach also streamlined the data analysis process.

## **Validity and Reliability**

Notions of validity and reliability may look different for qualitative case study research as compared to quantitative research, but they are still imperative and achievable (Lincoln & Guba, 1985). Throughout my research, I applied a number of strategies to ensure validity and reliability, as suggested by Goetz and LeCompte (1984) and Merriam (1998). To enhance internal validity, or show that my conclusions “make sense,” I employed a number of techniques as suggested by Merriam (1998), including triangulation, member checks, long-term observation, peer examination, and attention to researchers’ biases. I triangulated multiple data sources from a variety of participants. I conducted member checks with the faculty participants by sharing my findings and asking them to confirm that I did not misrepresent them in any way. Gathering data consistently across an entire semester, rather than for a short period of time or sporadically, ensured that I captured all scenarios for the pre-determined period for the study. By presenting my emerging ideas at research group meetings, I shared my work with scholars that were familiar with my topic of study as well as a variety of qualitative methods, which helped to hold me accountable to rigorous data collection and analysis procedures. Lastly, throughout the process, I committed to being transparent about my assumptions, prior experiences, and orientation to the research.

To help improve the accuracy and validity of the analysis for Chapter 4 specifically, I sent a draft of the chapter to both Dr. Cell and Dr. Genetics for member checking. I asked them to review my description of the role of the UTLAs and meeting space and comment on anything I might be misinterpreting or



misrepresenting. Dr. Cell confirmed that the descriptive information I included was accurate and that my interpretations aligned with her intentions. Dr. Genetics provided critique about several aspects of the manuscript and clarified a few of my interpretations. Her insight was incorporated into the final manuscript. I also asked the UTLAs to engage in member checking, but none of them responded to my request. Thus, the analysis may be biased towards the instructor perspective, as I relied on UTLA interview data only to confirm interpretations from their perspective.

For qualitative case study research, the notion of external validity must be reimagined. A case study is not meant to produce generalizations applicable to populations; rather, a case study can provide “analytic generalization” (Yin, 2018) where the findings can be applied to better understand a theory or framework that can be applied to other situations. To minimize threats to external validity, I have included thorough descriptions of setting, participants, data collection, and analysis. Clarity and transparency, as well as including rich description in the presentation of findings, help the reader to understand how the findings may be applicable to other situations.

To ensure reliability, or consistency of results with data, I have focused on developing a clear, transparent, explicit chain of reasoning. For qualitative research in education, reliability in the traditional sense is nearly impossible to achieve because human behavior is never static or replicable. Therefore, it is more useful to focus on dependability or consistency of results (Lincoln & Guba, 1985, p. 288). Readers should be able to follow my chain of reasoning and understand how I came to my conclusions. Many of the strategies that I used to ensure internal and external validity,

such as transparency, triangulation, and rich description, also help to ensure reliability. Through triangulation of multiple data sources, and comprehensive attention to my research questions, I hope to make both theoretical, empirical, and practical contributions to the literature regarding UTLA-faculty instructional partnerships.

## Chapter 4: Positioning UTLAs as Instructional Partners

**Abstract:** In this chapter, I explored interactions between undergraduate teaching and learning assistants (UTLAs) and the faculty they work with, in order to better understand whether and how UTLAs were positioned as instructional partners. Using an interactional sociolinguistics perspective, I examined discourse in audio recordings of meetings and e-mail communication between two different Biology faculty and their UTLAs, collected over the course of an entire semester. I supported my interpretations using interviews with the instructor and UTLAs, as well as observations and artifacts from the meetings. I used the constructs of respect, reciprocity, and responsibility, as defined in the student-faculty partnerships literature, as a lens through which to explore the data. An in-depth examination of UTLA-faculty interactions revealed that UTLAs may be positioned as students, informants, consultants, co-instructors, or co-creators, that these positions were fluid and may occur simultaneously, and that respect, reciprocity, and responsibility manifested in various ways across these different positions. Thus, UTLA-faculty partnerships are complex and dynamic; even if we rank or characterize partnerships more broadly, considering the variety and fluidity in positioning may help understand the nuances behind different types of partnerships. This research helps to elucidate the interactional features of collaborative instructional partnerships between UTLAs and faculty and provide insight into the contextual factors that may affect those interactions.

## Introduction

In order to support more student-centered instruction in undergraduate science, as suggested by national reports over the last several decades (American Association of the Advancement of Science, 2011; National Research Council, 1996, 1999, 2003, 2009, 2012; National Science Foundation, 1996), instructors may integrate undergraduate teaching and learning assistants (UTLAs<sup>2</sup>) into their courses (Gafney & Varma-Nelson, 2008; Miller, Groccia, & Miller, 2001; Otero et al., 2010). UTLAs are advanced undergraduate students who have recently taken, and done well in, the course in which they are appointed to support. UTLAs may support student learning through various roles, including facilitating active engagement and student discussion in lecture and recitation sections (e.g., Jardine & Friedman, 2017; Otero, Pollock, & Finkelstein, 2010), evaluating students' work (e.g., Preszler, 2009), and assisting students outside of class (e.g., Close, Conn, & Close, 2016; Kopp, 2000). Undergraduate science courses that have UTLA support have demonstrated a variety of benefits, including greater student academic achievement (e.g. Preszler, 2009), increased student articulation of reasoning (e.g. Knight, Wise, Rentsch, & Furtak,

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<sup>2</sup> I use the term “undergraduate teaching and learning assistants” (UTLAs) to refer to undergraduates who facilitate student-centered instruction in a lecture course or in mandatory recitation sections associated with a lecture course. The term “undergraduate teaching and learning assistants” and acronym UTLA are not common in the literature; I chose this term to cover the various terms that are used in the literature that fit my definition. The literature I review includes literature related to the “learning assistant” model (Otero, Pollock, & Finkelstein, 2010), the “peer led team learning” model (Gafney & Varma-Nelson, 2008), a “peer learning assistant” model (Groccia & Miller, 1996), and other literature that may use terms such as “undergraduate teaching assistants” or “peer facilitators.” I recognize that different terms may represent different UTLA roles and responsibilities; therefore, when describing specific UTLA models in the literature, I will use the term associated with that model. When synthesizing across models and terminology, I will use the overarching term UTLA.

2015), and improved student understanding of core science concepts (e.g. Otero, Pollock, & Finkelstein, 2010).

Beyond aiding faculty in enacting student-centered instruction, UTLAs can also work with faculty to improve teaching and learning through UTLA-faculty instructional partnerships. According to Fingerson and Culley (2001), “Faculty members who wish to continue to improve and adapt their teaching to best help students learn can benefit greatly from the added perspective of an undergraduate assistant” (p. 310). A growing body of literature explores the potential of student-faculty partnerships in teaching and learning, or reciprocal relationships where students and faculty work together towards improving teaching and learning (Cook-Sather, Bovill, & Felten, 2014; Healey, Flint, & Harrington, 2014; Little, 2011; Mercer-Mapstone et al., 2017; Werder & Otis, 2010). More specifically, scholars have begun to explore partnerships between faculty and learning assistants (LAs), and emerging research demonstrates that partnerships may vary in terms of level of communication and collaboration (Sabella et al., 2016). These scholars have begun to investigate what occurs during LA-faculty meetings (Davenport et al., 2017), but additional research is necessary to better understand the characteristics of UTLA-faculty interactions and what interactional norms or discourse patterns might be associated with more productive instructional partnerships.

In this chapter, I examined interactions between UTLAs and the faculty they work with, in order to better understand how UTLAs are positioned in instructional partnerships. Thus, I addressed the empirical question: In what ways are UTLAs positioned in UTLA-faculty interactions? Using an interactional sociolinguistics

perspective (Gordon, 2011; Gumperz, 2003), I examined discourse in audio recordings of meetings and e-mail communication between two different Biology faculty and their UTLAs, collected over the course of an entire semester. I supported my interpretations using interviews with the instructor and UTLAs, as well as observations and artifacts from the meetings. Studying behavior during UTLA preparation meetings and electronic communication from an interactional sociolinguistics perspective allowed for an in-depth examination of the nature of UTLA-faculty interactions as well as how interactions both impacted and were impacted by how UTLAs were positioned. This research helps to elucidate interactional features of collaborative instructional partnerships between UTLAs and faculty and provide insight into the contextual factors that may affect those interactions.

## **Literature Review**

### **Student-Faculty Partnerships in Teaching and Learning**

Student-faculty partnerships reconsider the traditional divide between teacher and learner in order to provide opportunities for both faculty and students to better understand and engage in student-centered educational practices, where student ideas, experiences, and goals are the focus of instruction (Bovill, Cook-Sather, & Felten, 2011; Cook-Sather, 2008, 2009, 2010, 2011a, 2011b; Sorenson, 2001). By disrupting the traditional teacher-student hierarchy, student-faculty partnerships aim to create a

community of shared knowledge and combined strengths that may benefit both parties. Student-faculty partnerships may vary in structure, foci, and level of engagement. According to literature that summarizes various forms of student-faculty partnerships (Bovill et al., 2016; Bovill et al., 2011), students tend to fill three general roles as partners in teaching and learning: consultant, co-creator of course design or curricula, and co-researcher. These roles are not mutually exclusive, but certain partnerships or partnership programs may focus on one more than the others.

There are a variety of benefits associated with student-faculty instructional partnerships. Since the overall goal of the student-faculty partnership is to work collaboratively to improve teaching and learning, student-faculty partnerships may lead to courses that result in deeper, more meaningful, and more equitable learning experiences for students enrolled in the courses (Bovill et al., 2011; Cook-Sather et al., 2014; Mercer-Mapstone et al., 2017). Additionally, the students and faculty involved in the partnerships reap various personal and professional benefits. Decades of research demonstrate that student-faculty interactions are beneficial for student learning, development, engagement, and sense of belonging (Astin, 1993; Kuh, et al., 2010; Tinto, 1993). Students that participate in student-faculty partnerships demonstrate an increase in confidence, motivation, engagement, and enthusiasm for learning (Bovill et al., 2011; Cook-Sather, 2010, 2011a). Faculty that engage in student-faculty partnerships reap practical, emotional, and intellectual benefits (Cook-Sather, et al., 2014). One of the most noteworthy outcomes of student-faculty partnerships is an increase in understanding of differences in social identity, for both students and faculty, and an engagement and empowerment of traditionally

underrepresented perspectives (Cook-Sather, 2008, 2015; Cook-Sather & Agu, 2013; Mercer-Mapstone et al., 2017).

Although student-faculty partnerships are beneficial in many ways, forming and maintaining successful student-faculty partnerships can be quite challenging. According to Bovill (2014b), establishing student-faculty partnerships is “highly dependent on motivations of the individuals involved” (p. 471). Both students and faculty must overcome resistance to collaboration that may be influenced by personal experiences and expectations as well as institutional structures, practices, and norms (Bovill et al., 2016). Another challenge is that student-faculty partnerships require reconsideration of traditional ideas about student and faculty roles and power (Cook-Sather et al., 2014; Popovic & Green, 2012). Student-faculty partnerships also require communication across differences in power, perspective, position, and identity (Cook-Sather, 2015; Cook-Sather & Agu, 2013); therefore, students may find difficulty in raising certain critiques and voicing their opinion.

### **UTLA-Faculty Instructional Partnerships**

UTLA-faculty instructional partnerships are a unique type of student-faculty partnership, in that UTLAs are students, but they are filling an instructional role in the faculty member’s course. The literature on UTLAs in science courses suggests certain regularities in terms of the role of UTLAs and how they interact with faculty; UTLAs typically meet regularly with faculty to plan, cover content, and share concerns in addition to the variety of roles that they take on in and out of class to support student-



centered learning. Weekly meetings with course instructors are a key component of integrating practice, content, and pedagogy, which is necessary for UTLAs to develop the knowledge and skills to be effective peer educators (Otero et al., 2010). However, meetings may vary in format depending on time and resources (Sabella et al., 2016). For instance, meetings may be run solely by instructors or collaboratively by instructors and learning specialists (Jardine & Friedman, 2017; Sarquis et al., 2001; Tien, Roth, & Kampmeier, 2004). They also may range from one-on-one weekly meetings where UTLAs talk directly to the instructor of the course, to large group meetings where UTLAs meet with a faculty member who may not even be teaching the course (Davenport et al., 2017; Sabella et al., 2016). UTLAs may also communicate with faculty through journals or e-mail (Groccia & Miller, 1996; Sarquis et al., 2001; Tien et al., 2004).

Just as the literature describes how student-faculty partnerships cut across foci and level of engagement, the literature also suggests UTLA-faculty instructional partnerships vary in terms of level of collaboration. Sabella et al. (2016) characterized three levels of LA-faculty partnerships: mentor-mentee, faculty-driven collaboration, and collaborative. They characterized mentor-mentee partnerships as one directional with limited LA input, where meetings consisted mostly of faculty reviewing content and introducing future class activities. In faculty driven collaboration, faculty elicited feedback and insights from LAs, but faculty were still in control of LA involvement. Collaborative partnerships resulted when faculty members shared control and LAs were willing and able to make substantive suggestions and contributions to help improve the course. Sabella et al. (2016) suggested that the nature of LA-faculty

interactions might have depended on both the faculty members' and the LAs' views of their role as well as the LAs' aspirations and abilities.

### **Respect, Reciprocity, and Responsibility in UTLA-Faculty Partnerships**

Cook-Sather, et al. (2014) describe successful student-faculty partnerships as demonstrating three guiding principles: respect, responsibility, and reciprocity. Respect is “taking seriously and valuing what someone else brings to an encounter (Cook-Sather et al., 2014, p. 2).” Faculty and students demonstrating respect for each other demonstrate trust, openness, and appreciation for different perspectives and experiences. Reciprocity is a “process of balanced give and take” (Cook-Sather et al., 2014, p. 3), which rests on an understanding of mutual exchange. In terms of responsibility, both students and faculty demonstrate investment in the common goal of supporting student learning and share a responsibility for pedagogy. Respect, reciprocity, and responsibility do not imply faculty give up power and authority, but that they share power in student-centered ways. Between students and faculty, the “roles, expertise, responsibilities, and status are different” (Cook-Sather et al., 2014, p. 7). These three guiding principles are meant to distinguish the features of successful student-faculty partnerships in teaching and learning; thus, I use these principles as a lens through which to explore the data.

## **Theoretical Framework: Positioning Theory**

I used positioning theory (van Langenhove & Harre, 1999) as a framework through which to explore how UTLA-faculty instructional partnerships were established through interactions. An exploration of positioning is “concerned with revealing the explicit and implicit patterns of reasoning that are realized in the ways that people act toward others” (Harré et al., 2009, p. 7).

The process of positioning happens through interaction (Harré et al., 2009); therefore, positioning is examined through studying discourse in interactions. Positions are local and momentary, meaning they are influenced by the time and place in which the individuals are situated. Through discursive processes, people may be assigned positions or they may determine their own positions. Positions may also be challenged and changed through discourse. For this study, I adopted the perspective that positioning can be examined from both the macro and micro scale (Anderson, 2009), in in that positioning happens through both general patterns of interactions at the macro scale as well as moment to moment interactions at the micro scale.

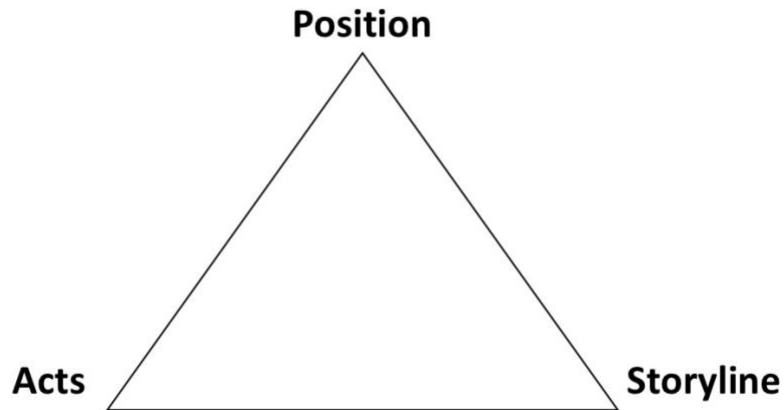
There are three fundamental aspects of positioning theory (Harre & Moghaddam, 2003; Harré et al., 2009; van Langenhove & Harre, 1999):

- (1) Positions: Rights, duties, obligations, and associated expectations; distributed among people in changing patterns (storylines) as they engage in performing particular kinds of actions (acts)

(2) Acts: Spoken, written, or other communicative acts through which positions are enacted

(3) Storylines: Pattern, or narrative, created through acts and positions

These three fundamental aspects of positioning theory are overlapping and interconnected and are often viewed as three separate points of the same triangle (Figure 4.1).



**Figure 4.1.** Visual representation of the positioning triangle, adapted from (van Langenhove & Harre, 1999)

## **Methods**

### **Research Settings**

The data included in this study come from a larger, multiple case study of UTLA-faculty instructional partnerships in two different undergraduate science courses at UMD that occurred over the course of an entire semester, Fall 2018. I chose these two cases specifically because based on prior experiences and

conversations with the instructors, I had reason to believe they would be “information rich” (Patton, 1990) cases that would exhibit evidence of respect, reciprocity, and responsibility in the UTLA-faculty partnerships and therefore be useful for studying UTLA positioning.

**Case 1: Cell Biology in a Living-Learning Program.** For my first case, I studied the UTLA-faculty instructional partnerships for a Cell Biology course that is part of the Integrated Life Sciences Living Learning Program (ILS LLP) at UMD. During class sessions for the Cell Biology course, UTLAs were expected to circulate around the room and guide student groups through activities and promote productive collaboration. The UTLAs also held “office hours” in the dormitory lounge where the students lived and led group discussions about course content and homework assignments. In addition, the UTLAs were responsible for grading homework assignments and portions of the exams.

The 5 UTLAs for the Cell Biology course met weekly with the instructor, who I refer to as Dr. Cell, to discuss upcoming activities, share insights, and provide feedback and support in improving instructional materials. Additionally, the UTLAs engaged in a one-credit pedagogy course, as students, focused on science education theory and practice during their first semester as a UTLA, which in Fall 2018 was taught by Dr. Cell. The goal of this course was that, through integration of practice, content, and pedagogy, the UTLAs would develop the knowledge and skills to be effective peer educators (Otero, et al., 2010). In Fall 2018, all of the Cell Biology UTLAs were new to the course, so all were enrolled in the pedagogy course except for one who was excused because she had experience with other education courses.

In Fall 2018, the instructor, Dr. Cell, taught the ILS LLP Cell Biology course for the first time. Dr. Cell had recently begun working as the Associate Director for the ILS LLP, after several years of working in faculty development at a teaching center on campus. Thus, it is important to note that Dr. Cell's relationship with her UTLAs was multi-faceted in that she was not just the instructor of the course that they support, but she was also their pedagogy seminar instructor and an administrator/advisor for them as part of the LLP. It is also important to note that although her background is in biology, she has significant experience with education research and faculty development.

**Case 2: Introductory Genetics.** I also studied the UTLA-faculty instructional partnerships between one of the instructors for an introductory Genetics course at UMD, who I refer to as Dr. Genetics, and her 11 UTLAs. The UTLAs for this course filled roles akin to a more traditional teaching assistant model typically filled by graduate students. They were each responsible for independently leading a 2-hour weekly discussion section aligned with the lecture meetings led by the course instructor. There were about 200 students in the lecture course and each UTLA was responsible for 23 students in their discussion section. The UTLAs were also responsible for grading student work and holding office hours. The course instructor met with the UTLAs weekly in preparation for the upcoming week to discuss content, facilitation plans, successes, and challenges.

By Fall 2018, Dr. Genetics had been teaching the Genetics course and coordinating the UTLA-led discussion sections for several years. In Fall 2017, she implemented a re-designed, application-based curriculum for the UTLA-led

discussion component of the Genetics course, referred to as GeneLab, with the help of former UTLAs. In a typical semester, Dr. Genetics is one of several instructors teaching the Introductory Genetics course, but she is responsible for coordinating all of the discussion sections, and therefore works with all of the UTLAs across all instructors. In Fall 2018, Dr. Genetics was one of two instructors teaching Introductory Genetics, but she was the only one who applied the GeneLab version of the discussion component. Fall 2018 was a particularly interesting semester to study this instructor and her UTLAs because all of the UTLAs for Fall 2018 were returners, and they were all leading discussion sections paired directly with her section of the lecture course. The instructor noted that the UTLAs therefore were more likely to be comfortable fulfilling their roles, collaborating with her, and sharing their opinions.

Although my aim was not to conduct a formal cross-case comparison between the two cases, the two cases exhibited notable contextual differences that provided opportunities to challenge and extend findings. I summarize the basic information about each case in Table 4.1 to clarify some of these contextual differences. The second case was a “replication” of the first in that it was also an introductory biology course supported by UTLAs and there was evidence of feedback loops between instructor, UTLAs, and students. However, the two cases provided opportunities to consider differences in UTLA and instructor experience, UTLA role in and out of the classroom, pedagogical preparation, and time and format of preparation meetings.

**Table 4.1. Summary of basic descriptive information for Case 1 and Case 2**

	<b>Case 1: Cell Biology in LLP</b>	<b>Case 2: Genetics</b>
UTLAs	5 UTLAs, all new	11 UTLAs, all returning
Instructor	Dr. Cell, first time teaching Cell Biology, experience in education research, administrator for LLP	Dr. Genetics, multiple semesters of experience teaching the course
UTLA Role	Facilitate small-group discussion in lecture, lead office hours in pairs, grade homework and exams	Independently lead discussion section and office hours, grade coursework and exams
UTLA Pedagogy Course	One-credit, 14 week course, during first semester as UTLA, taught by Dr. Cell; focus on reflection, active learning, metacognition, questioning, and formative assessment	One-credit, 10 week course, during first semester as UTLA, taught by other biology faculty member; focus on reflection, active learning, logistics, and presentation skills
UTLA-Faculty Preparation Meeting	Weekly meeting on Thursday evenings, following pedagogy seminar	Weekly meeting, approximately 45 minutes long, Friday afternoon directly before Genetics lecture course

### **Research Approach: Interactional Sociolinguistics**

To address my research questions, I applied interactional sociolinguistics (IS) discourse analysis methods. IS studies perform thorough analysis of interactions as captured in audio or video recordings to understand how meaning is negotiated between participants. IS also considers the broader social and interpersonal context in which the interactions under analysis occur, which helps the researcher to “more fully identify the contextual presuppositions that figure in hearers’ inferences of speakers’ meaning” (Schiffrin, 1994, p. 105). IS allows researchers “to explore not only how language works but also to gain insights into the social processes through which individuals build and maintain relationships, exercise power, project and negotiate



identities, and create communities”(Gordon, 2011, p. 67). Since IS is utilized by researchers to consider the ways in which relationships and power are established and maintained through interaction, it is an appropriate framework within which to analyze UTLA positioning.

## **Data Sources**

Utilizing an IS framework, this study triangulated multiple data sources. IS employs ethnographic data collection methods, such as participant observation, artifact collection, and interviewing, while focusing in on specific instances of interactions in naturalistic situations collected through audio or video recording(s) (Bleicher, 1998). Thus, the data for this study include observational field notes, audio and video recordings of meetings, interviews, and written documents.

**Audio and video recordings of meetings.** I attended all scheduled, in-person meetings that occurred during Fall 2018 between faculty and their UTLAs for both cases, and collected audio recordings at every meeting. For Case 1, attendance at all in-person meetings included the pedagogy seminar that the UTLAs were enrolled in, since the Cell Biology instructor was leading the seminar, as well as the Cell Biology preparation meeting. In total, for Case 1, there were 14 weeks of meetings, and each week ranged from 1.5 hours to 3 hours long for the seminar and preparation meeting combined, totaling approximately 25 hours of meeting audio for Case 1. In total, for Case 2, there were 11 meetings, and each meeting ranged from 30 minutes to 50 minutes long, totaling approximately 7 hours of meeting audio for Case 2. I always

placed the audio recording device in the center of the group, so that all voices could be heard clearly.

I collected video recordings at some, but not all, of the meetings, so that I had record of the room arrangement and a representative sample of body language between faculty and ULTAs. I chose not to collect video recordings during every meeting because having the camera present felt intrusive and I noticed that body language and room arrangement changed minimally between sessions. To make up for lack of video data, I collected detailed accounts of seating arrangement, body language, participant movement, and facial expression in my field notes to supplement the complete audio recordings.

**Ethnographic methods: Participant observation, field notes, and artifacts.**

During observations, I acted as a participant observer (Merriam, 1998), in that my main role was to observe, but I interacted with the UTLAs and faculty as appropriate to build rapport and better understand the situation. In both cases, I sat amongst the participants in a place where I could most easily view instructor and UTLA body language and took field notes using a laptop. Throughout the semester, I maintained a noticeable presence to help develop the feeling that I was a part of the group rather than just watching, but I remained minimally involved in the conversation by only speaking up when spoken to. I asked follow-up questions with participants before and after the meetings when necessary. Since I was present for all meetings throughout the semester, from the first to the last, my presence was part of the norm and therefore the impact of my presence on the actions of the participants was likely minimal.

To gather a holistic understanding of the UTLA role and UTLA-faculty partnerships, I also conducted additional observations on occasion. For Case 1, I attended two class sessions when I knew there would be ample UTLA involvement in order to gain a better understanding of the role that UTLAs played in the class and how the instructor interacted with UTLAs during class. For Case 2, I attended the first day of class so that I could note how the instructor introduced the role of the UTLAs in the course. I also attended one of the UTLA-led discussion sections on a day when they UTLA was conducting an exam review in order to get a sense of what the discussions were like. In addition, I sat in on part of one of the exam grading sessions and I also observed when the instructor gathered a smaller volunteer group of UTLAs to create a practice presentation video as a resource for the Genetics students. For these additional observations I only collected field notes and did not collect audio recording since my purpose in attending was to understand context and build rapport.

In addition to observations and interviews, I gathered different types of written artifacts relevant to understanding each case. For Case 1, I collected all of the UTLAs' written submissions for their pedagogy seminar assignments as well as the syllabus for the pedagogy seminar and the Cell Biology course that they were working in. For Case 2, I collected the syllabus for the Genetics course and the "TA Handbook" created by the instructor. I also collected the weekly handout that the instructor provided for each preparation meeting, which she referred to as the TWiG (This Week in Genetics).

For both cases, the instructors forwarded me all e-mail communication between them and their UTLAs and I downloaded and compiled all of these

exchanges and I downloaded and compiled all of these exchanges. In total, for Case 1, there were 4 e-mail chains, which were all related to draft exams. For Case 2, there were over 100 e-mails, some of which were sent to the whole group and others that were between the instructor and one UTLA or a subset of UTLAs. Case 2 engaged in significantly more e-mail communication than Case 1, which was likely due to the difference in UTLA roles and responsibilities as well as differences in how often they interacted in person outside of the weekly meetings. Since the Case 2 UTLAs taught independent discussion sections, preparing for their teaching required more asynchronous coordination and communication outside of class compared to the Case 1 UTLAs, who supported the instructor during class and could therefore touch base in-person before and after class.

**Interviews with faculty and UTLAs.** I conducted interviews with both instructors and many of the UTLAs throughout the semester. Interviews in IS studies provide information for several purposes: context and background information, triangulation of data to draw conclusions, and confirmation of appropriate representation of participants' interpretations of the discourse (Gordon, 2011). All interviews were semi-structured, in that I went in to the interview with pre-written questions but asked follow-up questions as necessary, dependent on responses and what I had noticed about that participant's particular experience during the semester. I audio-recorded all interviews and refrained from taking notes to keep the conversation as casual and free flowing as possible.

I interviewed each instructor twice during the study. I interviewed both instructors individually before the start of the semester and again after the conclusion

of the semester. All instructor interviews occurred in the instructor's private office at a time that they chose and lasted about one hour. I also conducted one-on-one interviews with every UTLA that consented to be interviewed. I interviewed 4 of the 5 UTLAs from Case 1 and 8 of the 11 UTLAs from Case 2.

## **Data Analysis**

Data analysis occurred in stages, both during and after the data collection process. Over the course of the semester, I continually wrote memos with themes, hunches, and ideas to pursue, and noted things I planned to ask or look for in subsequent data collection activities (Merriam, 1998). I personally transcribed all audio recordings, both of meetings and interviews, using InqScribe, as close to the time they were collected as possible. By transcribing close to the time that the data was collected, I was able to better connect my field notes to the data and note impressions and interpretations while the experience was fresh in my mind. Transcribing the data myself as the semester went allowed me to develop a deeper connection to the data; I was able to conduct informal analysis during the study and better recognize trends and patterns to bring up in interviews or look for in subsequent observations.

After data collection was complete, I began to “consolidate, reduce, and interpret” (Merriam, 1998, p. 178) the data and attend to my specific research questions. First, I reviewed all of the observational field notes for each case, along with the memos I wrote throughout the semester, to generate a general description of

the interactional norms for each case, based on patterns of interactions. Then, I used an open constant comparative coding method (Miles & Huberman, 2014; Strauss & Corbin, 1990) to generate categories and themes related to the ways UTLAs were positioned in moment to moment interactions. I read through each meeting transcript, one case at a time, in chronological order, and noted instances where either the faculty member or a UTLA did or said something that provided evidence of a specific UTLA “right or duty.” In other words, I considered instances where different UTLA positions were implicitly or explicitly established, taken up, or assumed. I paid particular attention to the faculty members’ questions or directions and how the UTLAs responded. In reality, this coding process was more iterative than linear, and I reworked the codes as I analyzed more of the data.

After coding all of the data, I reviewed the codes, looked for similarities and patterns, and then categorized the codes into overarching themes (student, informant, consultant, co-instructor, and co-creator). The themes were determined through both an inductive and deductive process, in that some were based on the literature (consultant, co-creator) but others came out of the data (student, informant, co-instructor).

I used the data collected through ethnographic methods and interviews to support analysis of UTLA-faculty interactions captured in recordings. I read through all field notes multiple times during data analysis and referenced them whenever reviewing audio transcripts. I reviewed all interview transcripts after coding the meeting transcripts in order to compare participant perceptions with my interpretations of the transcript data. Ethnographic data also helped to describe the

context in which the interactions were taking place. To help improve the accuracy and validity of the analysis, I sent a draft of the manuscript to both Dr. Cell and Dr. Genetics for member checking.

### **UTLA-Faculty Interactional Norms**

The overarching research question that I aim to address in this chapter is: In what ways are UTLAs positioned in UTLA-faculty interactions? Positioning can be examined from both a macro and a micro perspective (Anderson, 2009). Thus, I start at the macro level by presenting a rich description of the overarching interactional norms between faculty and UTLAs for the two cases. Then, at a more micro level, I explore the moment-to-moment positions, or “rights and duties” (Harré et al., 2009), that UTLAs and faculty take on and suggest associated acts and storylines. Exploring positioning from both a macro and micro perspective will allow me to understand the general interactional norms of instructional partnerships while also exploring the moment to moment variations in the ways discourse plays out in UTLA-faculty instructional partnerships.

#### **Case 1: Open Discussion Amongst a Teaching Team**

For Case 1, the interactional norm could be described as open discussion amongst a teaching team. The UTLAs and Dr. Cell met every Thursday evening, in a classroom located in the dormitory building for the program, and gathered around

tables grouped together so that everyone could easily see and hear each other. Dr. Cell sat amongst the UTLAs as if she was an equivalent member of the group. Use of the terms “we,” “us,” and “together” were very common and Dr. Cell regularly provided the UTLAs with opportunities to discuss their opinions and make decisions amongst themselves and she constantly thanked them for their input and efforts. In an interview, one UTLA noted that “she always tells us that we help her out a lot which I really appreciate.”

From my perspective, participants seemed relaxed and comfortable in all of the meetings over the course of the semester from day one, and this comfort was reflected in the use of informal talk. The meetings were entirely discussion-based and everyone had opportunities to speak, although some UTLAs spoke more than others. Dr. Cell was the recognized leader of the meetings, in that she determined the topic of discussion or task to be accomplished, but the UTLAs did the majority of the talking. Hand-raising was minimal; the UTLAs seemed to feel comfortable starting and adding to conversation fluidly. Laughing and smiling was very common.

The Thursday night meetings began with the one-hour long pedagogy seminar. For these meetings, 4 additional UTLAs working with other courses in the ILS LLP were present. The pedagogy seminar sessions felt more like a class than a meeting, in that the UTLAs came prepared to discuss assigned readings and written reflections and they completed activities and assignments. Still, the sessions were still highly discussion-based and relatively open-ended. Dr. Cell would let the UTLAs discuss issues that came up based on their experiences for a significant amount of time, even if they were unrelated to the pre-planned seminar topic for the week. Dr.



Cell noted that this group functioned as a “support group.” Although the seminar had a set, structured curriculum, she asked them at the beginning, middle, and end of the semester what topics they were interested in, what they liked or didn’t like about the course, and how it could be improved for future UTLAs.

The pedagogy seminar sessions would typically start by Dr. Cell asking the UTLAs how things were going. This question provided them a time and space to talk about issues going on related to their UTLA role, but also to discuss their experiences as students. Then, Dr. Cell would start a conversation about the reading or topic by asking the UTLAs to elaborate on their reflections and assignment submissions. She connected their experiences with readings and discussions to help them develop teaching skills, often asking the UTLAs to redirect discussions about their experiences as students and “translate to your teaching.” It was common for Dr. Cell to discuss her own pedagogical moves explicitly and point out connections to education literature beyond what they were reading for the class. Dr. Cell also frequently explained academic issues and policies as they came up naturally in conversation, providing UTLAs with a sense of “insider information” on topics such as tenure, financial aid, and academic integrity. The instructor maneuvered her dual role as pedagogy instructor and Cell Biology instructor by explicitly stating which “hat” she was wearing at different moments.

At the conclusion of the pedagogy seminar sessions each week, the UTLAs for the other ILS LLP courses would leave the room and the smaller group of Dr. Cell and her five UTLAs would gather closer together and discuss logistics and issues for the Cell Biology course, or as Dr. Cell said in an interview, “this is what the team is

doing this week.” Dr. Cell typically started off the meeting informally by passing out upcoming assignments or answer keys that she had prepared and discussing her thoughts about implementation. However, she would always follow up her plan by asking the UTLAs for their thoughts and suggestions. In interviews, both UTLAs and Dr. Cell noted that the meeting time was a time to provide feedback.

The group spent a significant amount of meeting time over the course of the semester discussing exams together. Before each exam, they would review and discuss the exam questions. After each exam, they would grade norm by beginning grading together and discussing acceptable answers and partial credit values for their questions. After grading, they would work as a team to compile and add up the exam points and discuss exam follow-up. When discussing exams, the UTLAs shared their predictions of how students would approach questions, interpretations of why students answered questions a certain way, and perspectives on how students approached studying or taking the exam.

In both meetings, the UTLAs and Dr. Cell often shared details about their personal lives and experiences, past and present. It was normal for the group to have conversations about family, friends, relationships, hobbies, career goals, and even their feelings about controversial current events, such as the Colin Kaepernick Nike campaign. In the pedagogy course, the UTLAs and Dr. Cell connected topics of discussion to their personal school experiences, from elementary school through their current undergraduate experiences. The UTLAs even felt comfortable sharing their ongoing frustrations related to their own courses or instructors.

Dr. Cell frequently expressed concern for the UTLAs' personal well-being. When Dr. Cell began each meeting by asking the UTLAs how things are going, they often responded by discussing their own personal experiences as students. Dr. Cell allowed the UTLAs to vent and did not cut off these conversations. Almost every week she brought snacks to the meeting and commented on being concerned that they would be hungry because they met during dinnertime. Dr. Cell noticed when UTLAs seemed tired, frustrated or sick.

Through their interactions, the UTLAs and instructor for Case 1 created norms of casual conversation and open discussion around teaching and learning. In general, Dr. Cell facilitated the interactions but the UTLAs often led the conversation and brought up their own concerns. As one UTLA, Gabe, put it in an interview, “She really makes it feel like we’re a team as opposed to I guess just follow the leader.” These norms were established through both the pedagogy seminar and the preparation meetings, and the fact that Dr. Cell led both meetings and served as the LLP advisor likely contributed to the highly collaborative and community-oriented feel.

## **Case 2: Teaching Team Gathering to Review Responsibilities**

The interactional norm for the UTLA-faculty meetings for Case 2 could be described as a teaching team gathering to review UTLA responsibilities. Since the UTLAs each individually led their own discussion sections, the meetings served as a space for the instructor and UTLAs to debrief and review issues, and for the UTLAs to attain the information and support necessary to prepare for the upcoming week. As one UTLA put it,

The purpose for those meetings is to make sure everyone's on the same page for what's to come in the next week. It's a good time to touch base on how discussion went the week before because she always wants input. Sometimes things take too long sometimes they're really quick sometimes they go perfectly smoothly and she always wants to improve discussion. And she uses that. And she took our advice on a couple of weeks from last semester... So it's definitely a good time to give feedback on how the week went. And then in terms of preparing for the next discussion... at that moment we can go over any questions we have or kind of problems we foresee.

The meetings were very structured and organized, but at the same time comfortable and casual. The UTLAs and Dr. Genetics often chatted casually before and after meetings.

The Genetics preparation meetings were held on Friday afternoons in one of the classrooms where the UTLAs taught their discussion sections, and this setting was practical for several reasons. The classroom was small and designed for students to work on computers, therefore each seat had its own computer monitor. Tables were arranged in three rows that faced the front of the room where there was a whiteboard and projector screen. Through this arrangement, the UTLAs were able to follow along on their computer screens and put themselves in their students' shoes while Dr. Genetics talked through the upcoming activities and projected them at the front to follow together as a group. Dr. Genetics sat at a designated instructor desk, at the side of the room, and remained seated throughout the meeting to feel more level and connected with the UTLAs. All of the chairs in the room could be easily moved and

rotated, so despite the computer screens occasionally blocking view between UTLAs and Dr. Genetics, eye contact was frequent. The UTLAs typically sat themselves with their closest friends in the group, but there was also an overall feeling of friendliness and support amongst all of the UTLAs and Dr. Genetics.

Dr. Genetics led the meetings using the TWiG (This Week in Genetics) handout that she prepared weekly to guide the conversation. The TWiG included an overview of the coming week's activities, reminders related to ongoing course logistics, and suggestions for reminders to send to students in a weekly email. The majority of the meeting time was spent on Dr. Genetics talking through activities as UTLAs followed along and took notes on the TWiG for their reference when teaching. She explained the how and why of each assignment and went over expected student outcomes and answers. The UTLAs typically raised their hands if they had a question about what Dr. Genetics was sharing with them or if they wanted to bring up a separate issue. Throughout the meeting, Dr. Genetics stopped herself regularly to ask if the UTLAs had any questions. At various times she would ask for their perspective on students' performance the previous week or their opinions on the design or implementation of future activities and assignments.

Although Dr. Genetics took up the majority of the speaking time during the meetings, the UTLAs seemed engaged and included. She often used the terms "we" and "us" when discussing the course plan and she regularly shared her reasoning behind instructional decisions. Directions and requests were always followed by rationale. She mentioned areas for flexibility or teaching decisions where UTLAs could make their own judgment calls, and frequently highlighted their experience

with statements such as “you’ve all done this before.” At least once per meeting, Dr. Genetics allowed the UTLAs space to discuss and make decisions amongst themselves related to their teaching. Dr. Genetics recognized that time limited the types of conversations that they could have in the meetings: “... so we do just a one hour meeting, and so that means that it's pretty...it can be pretty frenzied sometimes to try to cover everything in the time and it does mean that we're not necessarily spending much time on the content, the information.” Meaning, she expected that they would spend more time on logistics and procedures relevant to their teaching than reviewing and discussing biological content.

To compensate for the limited in-person meeting time, Dr. Genetics and her UTLAs also communicated frequently via e-mail. Each week before meeting, Dr. Genetics sent out an e-mail to the entire team to share the TWiG and preview their conversation. She also often e-mailed the team after meetings to summarize and confirm the logistics related decisions they made as a group during the meeting. When necessary, Dr. Genetics used email to communicate logistical matters, sometimes to the entire group, or sometimes to a specific subset of UTLAs to which the information was relevant. UTLAs often emailed her to ask questions about specific students; these emails were mostly related to grading or attendance. In general, whether in person or via email, interactions between Dr. Genetics and the UTLAs were mostly focused on logistics and preparation, not so much on student understanding of content or analysis of instruction.

### **UTLA-Faculty Positioning**

The brief descriptions above served to summarize the interactional norms for two cases of UTLA-faculty instructional partnerships explored in this study. Here, I dig deeper into each case to elucidate how UTLAs were positioned in interactions with faculty moment to moment, provide more detailed examples to supplement the descriptions presented above, and determine if certain positions or patterns of positioning were more or less pervasive in each case. A complete analysis of all audio recordings coupled with a review of all other data sources revealed that UTLAs were positioned in generally five different ways mediated through discourse in UTLA preparation meetings and e-mails. UTLAs may be positioned as (1) students (2) informants (3) consultants (4) co-instructors and (5) co-creators. These positions were not fixed for any setting, time, or individual, nor were they mutually exclusive.

This additional analysis demonstrates that even when UTLAs and faculty have established relatively stable interactional norms, UTLAs are not always positioned in the same way. Thus, even if we characterize partnerships broadly, we should consider how UTLA-faculty partnerships might be more of a fluid mix of different characterizations, dependent on the moment.

I describe how UTLAs were positioned in these various ways in more detail based on triangulation of all of my data sources. For each, I note potential storylines (in bold) that support these positions. I then provide excerpts from transcripts as examples of the acts that demonstrate these positions under each storyline.

## UTLAs as Students

UTLAs are, first and foremost, undergraduate students. They spend a significant amount of their time outside of the UTLA role in classrooms, answering to authority, and learning from those that are considered more expert. They also have less teaching experience than the faculty that they work with. Thus, reasonably, UTLAs were often positioned as students. I considered UTLAs to be positioned as students when their expectations for behavior were to listen to the faculty member, follow directions, complete assignments, or answer questions. Most often, the faculty member was the one to position UTLAs as students by explaining concepts, giving directions, or providing teaching-related advice; however, at times, the UTLAs would position themselves as students by behaving as if they were in a classroom.

**Storyline: Faculty instructors are more expert in both content and pedagogy than UTLAs.** Thus, Dr. Cell and Dr. Genetics often took on the responsibility of explaining logistics, biological concepts, or pedagogy to the UTLAs while UTLAs behaved as if they were in a classroom. Most of the time, when the faculty members explained something to the UTLAs they spoke for extended periods of time while the UTLAs listened. However, sometimes explanations involved back and forth discussion amongst the group while UTLAs asked follow-up or clarifying questions.

In both cases, the faculty member was the clear leader of the meetings, and at times, the UTLAs behaved as students in a classroom in response. In Case 1, UTLAs were much more likely to behave as if they were in a classroom during the pedagogy course, which makes sense, because it was a class that they were receiving credit for.



Dr. Cell typically guided the conversation by asking questions based on the assignments that they had completed and the UTLAs often answered one-by-one in an orderly fashion. For example:

Dr. Cell: So who would like to go first? Can you give us a summary of the paper and what you thought was interesting?

Kristen: So the paper I read was about women in STEM...[summarizes article summary and findings]

Dr. Cell: So what did you think was interesting about it?

Kristen: I thought that one of the really interesting...[shares thoughts about article]

When the UTLAs shared their thoughts on readings or assignments, Dr. Cell and the other UTLAs always made eye contact with the speaker and allowed them to talk freely. Hand raising was rare and the discussion was rather free-flowing and open-ended. So, even though UTLAs were positioned as students, the situation was highly interactive.

In Case 2, the UTLAs typically behaved as if they were in a classroom throughout the meetings, despite it not being a credit-bearing class. The UTLAs almost always raised their hands when asking clarification questions or when they were answering a question posed by Dr. Genetics and they took notes as she explained concepts and logistics. With a group of 11 UTLAs, they may have felt that hand-raising was the most organized way to speak up while respecting everyone's ideas and input. Also, the meetings were held in a classroom, and the UTLAs sat in student desks while Dr. Genetics led the meetings from what was considered the

“instructor desk”, so location and layout may have influenced behavior. However, by seating herself level with the UTLAs and off to the side of the room rather than the front, Dr. Genetics positioned herself as part of the group, as if she was learning along with the UTLAs.

Dr. Genetics spoke for the majority of her meeting time with UTLAs, which positioned them as students. Much of the meeting was spent talking through what they should be doing when they led their individual discussion sections. For example:

Ok so this week in discussion when your students arrive after you take attendance you want to give a little bit of an intro and I think this is one of those places where explaining why we're doing it is really important. Right? So I gave you guys some little talking points here. The purpose of the assignment is to get some background information. They should be discussing it in the groups. Right. We use the groups because they don't have a lot of experience reading papers on average. Some of them have more than others...And then just emphasize the assignment should be in the students' own words, not copied from the text, not copied from your friends, not copied from the internet. We have had, I think one case where we sent a foundation paper assignment in for a plagiarism referral because they just copied the text off the paper. Right. You don't learn anything by doing that. Right [laughs] So just enforce that. And really enforce it. The reason for this is the learning. You do not learn by copying you learn by putting it in your own words.

This excerpt demonstrates that when Dr. Genetics spoke at the UTLAs, she still brought them into her explanation. She always provided the UTLAs with rationale behind the assignments and reasoning for why she asked them to emphasize certain points with their students.

Even though a significant amount of time in the Genetics UTLA-faculty meeting was spent on instructor explanations, the UTLAs appreciated Dr. Genetics' commitment to helping them prepare and were thankful to receive structured support in this way. As one UTLA noted in an interview, "The one week that I did miss the meeting it was a little bit more stressful that week. I feel like she covers little things that you wouldn't think of. So yeah [the meetings] are definitely super helpful. I'm very thankful for them." Another UTLA perceived the structure and organization as valuable for their work as a team: "So it kind of grounds us all to like, so like we're all like, we can operate better as a unit almost because we're able to know exactly what's going on." The UTLAs did not seem to feel that the structure, a part of being positioned as students, limited their authority, but instead that her explanations and detailed directions made them better teachers.

Often when speaking through the coming week's activity and providing directions, Dr. Genetics took the time to explain course content so that they were better prepared to communicate that content to students. For example:

So one thing to be careful about when you're talking about this...it's really easy to say we're building a phylogeny between species but that's not really what we're doing. A species tree usually has many genes in it that are all used together to kind of get the average relationship between the species. We're

building a gene tree where we've taken the copy of this gene from each of these species and built the tree. So be careful that you're not just saying 'oh let's compare these species'. Take the extra time to say let's compare the gene sequences of our gene found in these species. It's slightly different but it's an important distinction and we want to make sure that students are getting that distinction.

When explaining content, Dr. Genetics framed what she said in a way that she was sharing advice for how the UTLAs could present that content to students. So, while she was positioning them as students, she was still crediting their role as teachers. Her use of the word “we” throughout demonstrated that she sees the group as sharing a common goal of supporting students. One UTLA in an interview noted that reviewing the material was helpful since they had been out of the class for a while: “I think it's been like a year or two for us that's why she tries to do a little refresher.”

During the Cell Biology preparation meetings, Dr. Cell also at times explained biological concepts to the UTLAs to help them better understand the in-class activities or the exam questions. She typically framed the conversation as a discussion and positioned other UTLAs as content experts as well as herself. For example:

1. Dr. Cell: ...someone had a question about the time course. Who had the question about the time course?
2. Kristen: I think it was me.
3. Dr. Cell: Ok.
4. Kristen: It was like a little bit confusing...I mean it could just be me because I'm also kind of fried this week. I was just a little confused.

5. Dr. Cell: Does anyone have an idea of how you might do a time course with the GFP construct?
6. Sarah: It's monitoring continuously for 12 hours.
7. Dr. Cell: Essentially like every 20 minutes you take a picture.
8. Sarah: Yeah you can probably set up a microscope to do that, just tell it to, you can program it to just take a picture every 20 mins
9. Dr. Cell: So... yeah... but because this is live you can't use antibodies so it's gonna have to either be a stain that doesn't require you to permeabilize the cell or you would have like a GFP with a kdel tag and a GFP with something that's supposed to go to the golgi [Kristen: ok] and a GFP with something that's supposed to go to the lysosome. The lysosome is the hardest one 'cause it tends to break everything down.
10. Kristen: So you would just like tag things that are supposed to go specific places. That's where I was like... so tag one with kdel tag one with that and then you can watch over time how it moves? ok
11. Dr. Cell: yeah but you'd have to have usually one for the ER one for the golgi one for the lysosome so you'd have to have three different transgenic cell lines
12. Kristen: ok

In line 5, she opened up the conversation for any other UTLAs to explain what they know about the concept before explaining it to Kristen herself, and Sarah took up that opportunity. She also allowed Kristen to think through the concept out loud (line 10) and responded to her idea (line 11) to further clarify. In this example, although Dr.

Cell is positioned as the teacher and the UTLAs are positioned as students, she is positioning them as students with respect to each other in addition to learning from her.

Beyond giving directions and explaining biological concepts, Dr. Cell and Dr. Genetics took time to communicate pedagogical advice to their UTLAs. During every pedagogy seminar session, Dr. Cell shared pedagogical advice through facilitating discussions around education topics and readings, pointing out when and why she was making certain pedagogical moves, and sharing resources to support their teaching. This modeling started on the first day; after engaging the UTLAs in an icebreaker, Dr. Cell stated “This is one way of making sure everyone has a voice. Different techniques I will try to make explicit when I'm doing them so notice we did the icebreaker first...” Dr. Cell shared resources to support their teaching, such as a list of active learning strategies and examples of questioning techniques. She introduced these resources by talking through why they are helpful for student learning and the connections to education research.

Dr. Cell also occasionally interrupted the UTLAs’ discussion about their experiences to teach them pedagogical terminology. For example, during the conversation about motivation and mindset, the UTLAs discussed their high school experiences and Dr. Cell intervened: “So I'm going to take over the convo and call out exactly what you guys are talking about which is a lovely conversation but I'm going to start pointing out the educational terms that you guys don't realize you're talking about.” She explicitly recognized that she was stepping in to the conversation, after the UTLAs had been talking as a group on their own for over 5 minutes, by

stating “so I’m going to take over the convo” and credited their ideas by commenting “which is a lovely conversation.” She brought in the terms fixed and growth mindset along with extrinsic and intrinsic motivation, to help the UTLAs in their understanding of pedagogy.

Although Dr. Genetics was not working with her UTLAs in a pedagogy seminar context, she also sometimes shared pedagogical advice with the UTLAs during their preparation meetings. For example, before they led review sessions for the first exam, she told them:

So please just make sure that when you're doing practice problems this week that you're using questioning strategies that are inclusive and not just letting one or two people kind of dominate the conversation.

To support this statement, she included information and resources on the TWiG handout that week, which stated:

Think about review delivery method. Are your questions being answered only by a core group of “star” students? Make sure you are targeting everyone and use a mix of questioning techniques to keep them engaged. Using a mix of questioning methods helps to keep students engaged. Take a look at this list of active learning strategies to find methods that may help you: [\[link to resource\]](#)

She made a recommendation (“use a mix of questioning techniques”), provided a rationale (“to keep students engaged”), and shared a resource with explicit strategies.

Dr. Genetics also collected mid-semester feedback from students in the Genetics course so that she could provide her UTLAs with feedback on their teaching. She compiled and summarized the quantitative and qualitative results and

emailed them individually to each UTLA, with positive and constructive feedback based on their results. She credited each UTLA for what they were doing well, with statements such as “Looking at your written comments, it’s clear that the students see your greatest strength as your approachability both in the classroom and outside of it” and made suggestions for improvements, with statements such as “Another approach you could try is...” For those that she gave more critical advice, she noted “My suggestions here are only to support your continued development as a teacher.” Again, while positioning the UTLAs as students, she is still crediting their position as teachers.

### **UTLAs as Informants**

UTLAs regularly fulfilled the duty of informing instructors what students were saying and doing in and out of class. Sometimes, the informant position was established because the instructor explicitly asked the UTLAs to report on how things were going in class, office hours, or just overall. At other times, the UTLAs positioned themselves as informants by sharing information about specific students, even when not explicitly asked to do so. The UTLAs occasionally provided information about situations and contexts where instructors would not have been present, such as the dormitory lounge, before and after class, or at the back of the room in lecture. They felt comfortable sharing “everyone told me” or “they told us” with the faculty member.



**Storyline: UTLAs serve as a communication channel between faculty instructors and students in the course because of their approachability and access to students.** In both Case 1 and Case 2, UTLAs positioned themselves as informants after the instructor asked questions such as “How are things going?” Typically, both Dr. Cell and Dr. Genetics would start their meetings by asking this question or a similar question. For Genetics, the meeting always started with debrief of the previous week, and UTLAs were given a chance to inform Dr. Genetics about what did or didn’t go well in their discussion sections. For example:

1. Dr. Genetics: How was this week?
2. Group: Good
3. Dr. Genetics: Good start yeah? How were Bendaroos? Did you guys use them very much?
4. Gabby: Mmhm
5. Heath: Yeah
6. Dana: My students actually liked them
7. Dr. Genetics: Ok? They liked them?
8. Heath: Yeah. My students liked them
9. Dr. Genetics: I find that it's really variable between sections and between semesters.
10. Gabby: Last year didn't like them
11. Heath: Yeah last year some people stared at me and I was like you don't want to do this do you?
12. Dr. Genetics: ha ha ha well that's fine. Yup, ok well good.

As seen in this example, UTLAs typically responded to “how did things go” by sharing how things went logistically, such as timing, how students felt about a certain activity (“my students liked them”, line 6 & 8), or how students behaved (“last year some people stared at me”, line 11). UTLAs are functioning as informants both collectively (line 2) and individually (lines 4-6, 8, 10-11). Dr. Genetics positioned herself as information seeking, which positions the UTLAs as informants.

In weeks when Dr. Genetics had made significant changes to an assignment, conversations about how the activity went were longer and involved input from a larger number of UTLAs:

1. Dr. Genetics: was this version of the assignment better than the last version?  
Did they seem to understand what was going on?
2. Gabby: There were a lot of questions on the blue part [Dana: yeah I made] even after I explained the whole announcement
3. Dr. Genetics: So you said the blue bar are the parts that are being used [Gabby: yeah; Dana: yeah] to make the tree
4. Dana: yeah. So many people when I went to grade, so many of them were like the blue bar is where all the sequences are exactly the same [Gabby: yeah] and I was like I literally told you guys there's snips in there you can see it yourself [laughs]
5. Gabby: yeah I sat there for like 10 minutes and was like the blue bar is what's used in the tree and they're like oh so that's where the similarities are and I'm like no
6. Dr. Genetics: and the differences

7. Gabby: yeah
8. Dana: yeah I told people you can see there are snips in the blue region
9. Alex: that's because I think number three asked them to kind of go beyond  
what we told them like all we told them
10. Dr. Genetics: I can't remember what number three said
11. Brian: what was the conserved region
12. Alex: it was like the region where all the sequences were represented  
basically...and they just wanted to write what I said, which is in the sequences  
being used to make the tree but the question said based on what your TA said  
what do you think these regions like [Dr. Genetics: ahh] they were asking, the  
question was asking about
13. Dr. Genetics: ah ok maybe the question shouldn't have been written the way  
that it was
14. Alex: there weren't any indels in it, yeah
15. Dr. Genetics: I was trying to encourage them to think about what you said  
[Alex: right] and not just make it up [Alex: right] [laughs]
16. Alex: like every single student asked me about that
17. Dr. Genetics: ok well that's...so we'll revise that question but overall the  
structure was better?
18. Alex: otherwise yeah

In this example, Dr. Genetics positioned the UTLAs as informants by asking how the assignment went (line 1), and several UTLAs took up the position and enthusiastically shared information about what students had questions on and where

students went wrong. In line 9, Alex commented where he thought the confusion was coming from, offering an interpretation beyond just information. Both by opening up the conversation and concluding it with “*we’ll* revise that question,” Dr. Genetics demonstrated that she valued their feedback and considered assignment improvement a team effort that depended on information they provided.

Sometimes, UTLAs positioned themselves as informants even when they weren’t explicitly asked to report on how things were going. For example, when talking through a draft of the final exam, Dr. Cell mentioned potential question topics and one UTLA informed her that students were not understanding a concept, based on her experience talking to students in office hours about the homework assignment:

Dr. Cell: ...since I’m still messing with the energetics lecture I wasn’t ready to finalize it but that’s kind of where I am with that one [question].

Kristen: I was a little worried about junctions with them it’s not going so hot...I just think it’s like really complicated and they’re feeling a little lost the people who just...I feel like a little swimming in the water with the homework just kind of like...

Dr. Cell: oh wow. ok! good to know!

Dr. Cell’s enthusiastic response demonstrated that she appreciated that Kristen shared the information. In an interview, Kristen mentioned “I think all of us are super comfortable telling her anything we might be hearing or anything we might think because she is so receptive to it,” which corroborates the interpretation that Dr. Cell is appreciative of their insight.

Both Dr. Cell and Dr. Genetics recognized the UTLAs as informants in interviews and noted that they gained valuable insights through their accessibility and approachability. Dr. Cell stated, "...because they're peers, they're going to be a little bit more approachable than I would be to a certain extent the first line of defense when there's like issues in the class they'll hear probably the grumblings before I do...If all the students are coming into their office hours with the same problems then they can tell me and I can use that information to go over problems in class or send out extra help." Dr. Genetics expressed similar thoughts in stating, "[the UTLAs] are valuable because of their perspective, they interact with the students in a smaller group right." Both instructors focused on the fact that UTLAs have increased access to students as well as a shared level of understanding, and can therefore provide them with insider information.

The UTLAs seemed to recognize the value in their perspective as well and seemed to think that the faculty members appreciated their insight. One UTLA elaborated in an interview:

I think [Dr. Cell] also likes that we get feedback from the students that we can give to her that they might not necessarily say to her...how they're feeling about like tests the class in general especially since like I know many of the same students since we lived on the same floor and things like that like I think sometimes they're like a lot more open with me about like oh were taking...like class is going too slow or like I don't want to spend so much time on activities or like I didn't think that test question was fair and things

like that they probably wouldn't outright say to her so then we can kind of like gather their feedback and like filter it from like what it's like being a student

Several statements the UTLA made are worth highlighting. The UTLAs know the students, and therefore, students are more open and honest with them than they would be with an instructor. Also, UTLAs play a role in "filtering" student feedback and determining which student comments are important or relevant for the instructor.

### **UTLAs as Consultants**

Quite frequently, UTLAs were positioned as consultants in interactions with faculty, in that their assumed right or duty was to provide advice to the instructor. The position of consultant is similar to informant but goes beyond; informants report information while consultants report information and make suggestions based on that information. Like with informant, sometimes this position was established after the instructor explicitly requested advice, while other times, the UTLAs positioned themselves as consultants by making unsolicited suggestions.

**Storyline: UTLAs can provide advice and make suggestions to the faculty instructor based on their student perspective and experiences.** The UTLAs regularly provided solicited and unsolicited advice to Dr. Cell and Dr. Genetics. Most often, the advice was related to specific activities, assignments, and exams. As part of the pedagogy seminar requirements, Dr. Cell positioned UTLAs as consultants by assigning them the task at the end of the semester to choose an assignment or exam questions to revise and explain how and why they would make those revisions, in

writing. Sometimes, UTLAs made suggestions for topics to revisit in class or general approaches to working with students.

Dr. Cell positioned her UTLAs as consultants by asking them to review draft exams. When passing out the draft of the first exam to her UTLAs during their meeting she explicitly stated, “One of your assignments is to go through it and give me feedback.” She then elaborated and mentioned the specific feedback she was interested in: “...part of this is I was struggling with how many...between making the exam longer versus count more points. It's always a struggle for me because I don't want to make it too long but then I don't want to make it too many points.” By stating that “it’s always a struggle for me” she opened up to her UTLAs and communicated the idea that she faces challenges as an instructor and needs their help.

For each exam as well as the final exam, the UTLAs and Dr. Cell talked through the entire draft of the exam together, and she listened to their thoughts on each question. These conversations would last at least one hour, sometimes two, and involved a lot of back and forth discussion amongst the entire group. Dr. Cell facilitated the conversation through the use of questions such as “Is this too broad?” or “If you had to replace this with a different question related to [topic], what would you replace it with?” She often used the word “we” when asking for their thoughts, which demonstrated she saw exam writing as a group effort, not just as a one-directional conversation from them to her. For example, “so what changes do you think *we* need to make to the question?” “What if *we* changed this entirely?” She constantly took notes during the discussion and always concluded with letting them know she would make the changes and would send them an updated version for final

review. In the final interview, Dr. Cell noted how helpful it was to have the UTLAs review the exams; she stated "...they picked up a bunch of things, some things I thought were super obvious they said they thought would be difficult, and some things that I thought would be difficult they thought were super obvious." She recognized that they provided her with a new perspective on the questions.

The excerpt below is an example of Dr. Cell and the UTLAs talking through an exam question. Earlier in the conversation, Dr. Cell had mentioned being interested in adding additional questions to better distribute the exam points:

1. Kristen: This one might be like a good one that like you could like probably easily slip in a question about cholesterol or something
2. Lynn: Yeah
3. Kristen: that isn't necessarily like super tricky but I feel like sometimes cholesterol can be a little tricky where students want to add it for fluidity rather than thinking it's a fluidity buffer but that just might be something that wouldn't require too much time for them to get because we did talk about it
4. Gabe: I think one could be like if the temperatures are too high how would cholesterol act to stabilize the membrane or on the other hand if the temperatures are too cold how would cholesterol work to
5. Dr. Cell: Well what if I added in 'would the presence or absence of cholesterol help you identify the organism?'
6. Kristen: Yeah I think that's a good way to test if they really know what it's for. We talked about this in office hours. We were asking them different ways...we had two people come to office hours this week...and we were asking them



different ways and like they want to say cholesterol because it's something we talk about but we're like the thing to remember with cholesterol is fluidity buffer

As seen in the transcript, the conversation is free-flowing and collaborative, in that several different UTLAs make suggestions and build off of each other's suggestions. Kristen and Gabe are making suggestions (lines 1 & 4), positioning themselves as consultants, and Kristen backs up those suggestions with information about students' ideas based on working with students (line 3 and 6). Dr. Cell listens to those suggestions (line 5), which helps to maintain their position as consultants. The UTLAs who didn't speak in the transcript were still engaged in the conversation and in agreement with the team as demonstrated by nods and small verbal cues such as "mmhm."

There were instances where Dr. Cell and Dr. Genetics positioned the UTLAs as informants by asking for their advice and opinions about logistical matters, but then UTLAs positioned themselves as consultants. For example, Dr. Genetics asked for her UTLAs' thoughts on how introducing the BLAST tool to students went without having a Power Point slide to structure the conversation:

Dr. Genetics: How was doing BLAST without power point and just using, like just talking through it? Was that fine? Any negative thoughts on that?

Ian: Maybe we can include like one slide?

Dr. Genetics: Just a summary slide?

Ian: Yeah really quick break down

Dr. Genetics: And then you can just leave it up

Even though the questions “How was...” and “was that fine?” positioned UTLAs more as informants than consultants, Ian positioned himself as a consultant by making a suggestion to include a slide when teaching in the future.

There were other instances when UTLAs positioned themselves as consultants after they were positioned as informants. For example, the following excerpt happened directly following the third excerpt included in the informant findings. Right after Kristen informed Dr. Cell that the students were struggling with a certain concept and Dr. Cell responded with “good to know!”, Sarah positioned herself as a consultant and made a suggestion to Dr. Cell:

Sarah: I was just gonna ask if you could make a clarification about destabilization versus stabilization of microtubules cause that’s a major point of confusion

Dr. Cell: Really?

Lynn: I think because for on the exam stabilize means a little bit different thing than like how people normally think about stabilization

Dr. Cell’s response of “really” shows that their insights are new to her, and the curious and surprised tone in her voice communicated that she was open to the suggestion. Lynn’s clarification helped Dr. Cell to understand where the confusion might be coming from.

For Genetics, UTLAs were also positioned as consultants through e-mail communication. Due to limited time in the in-person preparation meetings, Dr. Genetics sent each exam to one or two UTLAs and gave them the opportunity to

review the exam and send questions or comments back via e-mail. She approached different UTLAs for each exam in order to spread out the extra effort required by this task, and was always clear that reviewing the exams was optional dependent on their time and interest. After agreeing to review the exam, the UTLAs would respond via e-mail with a list of questions or comments, typically related to confusing wording. Here is an excerpt from the e-mail sent to Brian with a copy of the first exam:

Are you willing to do a little copy editing on our exam for Friday? I've just finished a good draft and am hoping to print on Wednesday evening during my review session. Between now and then, I'd like to get feedback from one or two [UTLAs]. I've done this every semester and have averted some real disasters that could crop up during the exam or during grading because the copy editing brings fresh eyes. The copy I've attached has my intended answers in comments. Do you see any typos? Any ways to clarify wording? Any places where students may have a secondary interpretation of the question? What do you think of the difficulty overall? The points should be evenly distributed over topics, but let me know if it seems unbalanced. I know you have your own responsibilities, so if you're too busy to spend time on this that's ok!

In the e-mail Dr. Genetics credited the input of the UTLAs by mentioning "I...have averted some real disasters" and also made it clear that she was not requiring Brian's help and respected his time ("I know you have your own responsibilities..."). Brian responded with a list of questions and concerns, some of which were just related to formatting, but others that were suggestions for how the questions could be worded

more clearly. In interviews, Brian and other UTLAs that reviewed exams noted that they were always happy to help and excited to respond to Dr. Genetics request, and they appreciated that she recognized them for the extra effort.

At the end of the semester, Dr. Genetics also positioned her UTLAs as consultants in terms of gathering their input on the assignments to make improvements for the following semester. She asked for their opinions on what they felt the most efficient way to provide feedback would be, and they decided on creating a separate google form for each assignment that they could add their ideas to. In an interview, she noted “they've got a great perspective on what the students may or may not know or how they might read things that might be different from what we intend. So they're a great resource on that stuff but I try not to require them to give me feedback. Right. I try to make that like if you have the time and you want to do this I would appreciate that but they've already got a lot of work to do.” Thus, like with exams, Dr. Genetics might have limited how often she positioned her UTLAs as consultants in order to respect their time.

Both Dr. Cell and Dr. Genetics repeatedly thanked the UTLAs for their feedback and input, demonstrating that they respected and valued their ideas. UTLAs confirmed in interviews that Dr. Cell and Dr. Genetics took their opinions into account and were responsive to their suggestions. For example, one UTLA said about Dr. Genetics “I think she does a good job of like having you ...of like respecting your ideas and having you be a part of making this course better” and another UTLA said “were not just like her workers were more like working with her not like for her, so that's really nice.” Similarly, one UTLA said about Dr. Cell “she definitely like wants

to hear, she definitely enacts changes, so like it also doesn't feel like were just telling her things and she doesn't care, she definitely will actually make changes based on what we say and values our opinions" and another said "she...seemed like a really open person...she's always looking to improve...so I think that's made me really comfortable." The UTLAs' perception that their ideas were appreciated likely contributed to their willingness to act as consultants.

### **UTLAs as Co-Instructors**

In interactions with faculty, I considered UTLAs to be positioned as co-instructors when they were referred to as teachers, discussed working with students, or made collective decisions about teaching or grading. Being positioned as a co-instructor was different from being positioned as an informant or a consultant in that instead of just sharing information or advice with the instructor that the instructor was then responsible for implementing, as co-instructors, UTLAs discussed teaching and learning with the instructor as a team, and the team came to consensus or group decision about how they would all implement.

**Storyline: UTLAs help make grading decisions.** The UTLAs in both cases were responsible for working as a team to grade student exams, and both Dr. Cell and Dr. Genetics seemed to trust the UTLAs' judgment and give them freedom in determining appropriate partial credit for open-ended questions. For Cell Biology, the UTLAs each graded a separate portion of the exam, and in the meeting directly following the exam, the group met to "grade norm" before the UTLAs took their set

of exams home to grade on their own. Dr. Cell explained this process during their first meeting:

So with exams, I think I told you guys but for consistency sake because you guys are novices, which is not meant to be a criticism, the best way I know to handle this is we are all going to start grading together on that Thursday. Which means you get a slower start to grading but if I start you guys together at least for the first hour, A, it doesn't feel like you're alone and, B, that means that we can kind of norm a little bit so when you come up with weird answers you can kind of ask the group and come up with your rubric and partial credit for your page

By introducing this responsibility and the concept of grade norming in this way, she highlighted that grading was a collaborative process ("we are all going to start grading together"), but that she also trusted them to use their own judgment ("come up with your rubric and partial credit for your page").

Here is an example of how the conversation typically went during the grade norming meetings:

1. Kristen: [after reading student's answer out loud] No that doesn't really feel right to me
2. Dr. Cell: That's not a complete answer
3. Kristen: No
4. Dr. Cell: So the question is how much partial credit should we give?
5. Gabe: Wait for...ok...if they drew one phospholipid?
6. Kristen: They drew one phospholipid and their answer was...[reads answer]

7. Gabe: Ok so if they said...
8. Kristen: It's not a "like-attracts-like" thing that makes a bi-layer
9. Gabe: Yeah like it was very specified I feel like that cylinder will form the bi-layer and the conical shape will form the micelle
10. Kristen: Yeah that's true but it's not like they don't like ok I guess
11. Gabe: How many points is that question worth
12. Kristen: It's six points
13. Gabe: Maybe like dock one or two
14. Kristen: Take off two?
15. Gabe: That's just me
16. Dr. Cell: I would strongly suggest being generous
17. Kristen: Yeah
18. Lynn: I do feel like it's more impor...it's less important that it's "like-attract-like" rather than like you're shielding the hydrophobic tails away from the water
19. Kristen: Yeah they don't mention that
20. Gabe: Yeah for "like-attracts-like" means that water and the hydrophilic heads
21. Kristen: But they say "like-attracts-like" so the hydrophobic heads and hydrophobic tails match up to the others so they say the tails want to be near
22. Dr. Cell: To be a complete answer on that they would also have to include that it's an aqueous environment
23. Kristen: Yeah
24. Dr. Cell: That's the big missing piece if they're not gonna draw the bilayer

25. Kristen: Ok I think I'm gonna take off two points

The transcript shows the collaborative nature of the discussions around assigning points for partial credit and the evolution of the justification. Gabe and Lynn provided their input, even though it was Kristen's question to grade. Dr. Cell generally lets the UTLAs talk through the answer, and rather than tell them exactly how many points to assign, she just recommended that they are generous (line 16). Kristen, who originally brought the grading dilemma to the group, had the agency to make the ultimate decision about how many points to deduct (line 25).

The following week, the group also talked through what to do about the abnormally low exam score average. When looking through scores as the group tallied them, Dr. Cell stated, with a concerned tone, "Guys we need to do something about this...there is a serious mismatch between what I thought was a really great exam, is apparently not." As a group, they decided on making the required exam reflection worth 10 out of 3 points, so that students could earn up to 7 points extra credit, but only if they completed the reflection. The UTLAs felt strongly that the extra credit should be tied to the reflection assignment. For instance, Kristen stated "because then they have to do the exam [reflection] and I feel like there was a lot of mistakes on this exam like it would be valuable for them to go back and understand it especially for the experiments."

For Genetics, the UTLAs also met as a group to grade exams for a long afternoon directly following each exam. They completed all grading in person, together, sustained by ample snacks provided by Dr. Genetics. The grading sessions happened in a conference room, around a large table, which was different than their



typical meetings. The meetings felt comfortable, casual, and as if they were hanging out; I observed lots of laughs, jokes, and chatter. In interviews, UTLAs confirmed that the grading atmosphere was friendly and one UTLA noted that they “helped me not view Dr. Genetics so much as an authority figure.” Similar to grading discussions between Dr. Cell and her UTLAs, the Genetics UTLAs conferred with each other to discuss students’ answers to a question as often as they conferred with Dr. Genetics, and discussions about partial credit involved back and forth discussion with Dr. Genetics asking the UTLAs what they thought.

**Storyline: UTLAs are considered teachers.** UTLAs were positioned as co-instructors through discussing their experiences working with students, either in terms of planning for future work with students or reflecting on work with students that had already happened. In Case 1, the pedagogy seminar was ripe with conversations about working with students. When assigned readings every other week, UTLAs were required to write a reflection and include how what they read related to and influenced their job as a UTLA. In a meeting at the beginning of the semester, Dr. Cell told them “So what I'm hoping to get at is as you're reading these assignments and doing these reflections is that you're thinking about how this can impact the things that you are doing in the classroom and your interactions with the students.” Dr. Cell often encouraged the UTLAs to relate the topic of discussion to their future work with students, by asking questions such as “How would this impact your teaching?” or “So what can you take away from that as teachers?”

UTLAs were also positioned as co-instructors by being provided with choice and flexibility related to their work with students. Although Dr. Genetics gave her

UTLAs a suggested plan for teaching each week, she made it clear that the plan was flexible and let them know they could make their own decisions as teachers. For example, when discussing using Bendaroos, a learning tool, Dr. Genetics told her UTLAs “So you all have done Bendaroos before and you know that some students really like them and some students really dislike them. So I would say make sure that all the students spend a little bit of time on it, but if your section seems really over the Bendaroos...you can move along to the practice problems.” As one UTLA said in an interview, “she definitely understands we're responsible and we will get everything done...and she gives us a little bit of flexibility.” She trusted their expertise as experienced UTLAs to make decisions about what was best for their individual groups of students.

Sometimes, being positioned as a co-instructor overlapped with being positioned as a learner, in that Dr. Cell and Dr. Genetics recognized UTLAs as teachers, but as novice teachers learning to work with students. For example, after the Cell Biology UTLAs discussed the challenge of not knowing all of the answers to questions that students ask them and feeling as if they are not fulfilling their role, Dr. Cell reassured them that this challenge is not unique to them:

You guys are talking about two really difficult things that I think all teachers have to deal with, which is we don't know everything...Like even me I have a PhD I don't know everything. So how do you deal with you don't know everything and sometimes feeling frustrated that you just can't get the students to understand. And those things I think happen just about for every teacher no matter how experienced can come along because we don't know everything.

We can't know everything. So I just wanted to circle around and say this is not unique to you guys and this is not because you guys are novice teachers. This happens to all of us.

By admitting that she, and other teachers, face the same challenge, and by using the words “we” and “us”, she positioned the UTLAs as part of a group that she is a part of as well: teachers.

### **UTLAs as Co-Creators**

At times, UTLAs were provided opportunities to develop instructional materials along with the faculty member, or on their own with support and feedback from the faculty member. The rights associated with positioning UTLAs as co-creators went beyond consulting with the faculty and sharing input, to actually playing a role in creating instructional materials. UTLAs were positioned as co-creators when the faculty instructors asked them to plan lessons, develop lecture or review material, and write exam questions. Often, positioning as co-creators overlapped with other positions, as seen in the examples below.

**Storyline: UTLAs can help to create instructional materials, including exams.** Both Dr. Cell and Dr. Genetics asked their UTLAs to create, or help them create, materials to be used in the course. For Cell Biology, the UTLAs helped to brainstorm exam questions and by the end of the semester, wrote one themselves as a group. Dr. Cell also gave her UTLAs the opportunity to write a lesson plan, create presentation materials, and teach the lecture class for a topic of their choice.

When reviewing draft exams as a team, Dr. Cell went beyond just getting feedback on the questions that she wrote, to asking the UTLAs to provide her ideas for additional questions or develop questions themselves. When the group reviewed the draft of the first exam, Dr. Cell stated at the beginning of the meeting, “and if we need to come up with another question then I’m hoping...we can work together on another exam question.” After talking through the general format of the exam and how they would approach reviewing it together, she reiterated “Long story short, this is why we do this so I can screen both for grading problems cause you guys are going to be grading these but also as students to see if I came up with a bad question and also where you think we need to add on if we could come up with something together that would be great!” By repeatedly, and enthusiastically, suggesting they come up with a question together, she positioned them as co-creators, while also positioning them as co-instructors (“both for grading problems cause you guys are going to be grading these”), and informants or consultants (“to see if I came up with a bad question”).

Later on in the meeting the group had the conversation about adding on an additional exam question:

1. Dr. Cell: Is there any other concept that I haven’t hit?
2. Ann: I think you should have something with Western blot
3. Kristen: Yeah I agree. There was the one experiment where you could use Western blot but I don’t even think...
4. Ann: Yeah I feel like people shy away from that because they don't really understand it as much you know how you target they don't really understand

the words when you target a specific protein. ‘Cause I know the worksheet a lot of people got hung up on the back because they were still looking for the kinase I think it was

5. Lynn: Yeah
6. Ann: Instead of like the actual target protein so you were emphasizing before that if they use a western blot they got to know what they're looking for
7. Dr. Cell: mmhmm
8. Ann: or what they're targeting their antibody against. Either like they should draw a western blot and know that the thickness the difference in the thickness that they draw their little bands has meaning to it and so like yeah I think western blot would be good
9. Dr. Cell: Ok. So keep an eye on your email tomorrow. As soon as I get the fixed version I will email it to you guys for any other comments.

In line 1, Dr. Cell opened the conversation by asking if there were any other concepts missing from the exam, which provided the UTLAs with the authority to make suggestions, demonstrating that she respected their judgment about what content was relevant for the course and this particular assessment. In line 2, Ann positions herself as a consultant by making a suggestion, and in line 4 positions herself as an informant by talking about students' performance on the worksheet. After considering Ann's suggestion, which she reiterated in line 8, Dr. Cell noted that she would revise the exam and share a new version with them for additional comments (line 9). Although UTLAs were originally positioned as co-creators at the beginning of the meeting (“if we could come up with something together that would be great!”), they ended up

being positioned more as informants and consultants, because the group did not end up drafting the problem together.

For the third exam, the Cell Biology UTLAs worked together to develop a question entirely on their own. The transcript below demonstrates how Dr. Cell introduced this opportunity to the UTLAs and their enthusiastic response:

1. Dr. Cell: ...for exam 3, you guys now have two exams worth of experience grading down in the trenches, so consider writing a question and I can give you [the other instructor's] exam from last year, or working together to write a question or to improve one of my questions
2. Gabe: Like the whole page or just a subsection
3. Dr. Cell: Either! What would you like to try?
4. Gabe: I feel like if we all came up with the whole page I'd appreciate that
5. Kristen: That'd be fun
6. Lynn: Oh yeah
7. Dr. Cell: Do you guys want to work on a question together?
8. All: Yeah!
9. Sarah: Yeah we'd be able to create the ultimate exam
10. Dr. Cell: Do you want to do that on cell signaling?
11. Kristen: Yeah! [laughs] cause we'll like lecture on part of it
12. Ann: Yeah yeah
13. Dr. Cell: So as you're planning out your lesson plans and as you're getting ready to go through this, think about what you might include into a question and we can all work on that together. But I wanted to give you guys a chance

to think about designing your own question, with the support of everyone in the group, now that you also know how hard it is to grade some of these.

A few meetings later, after the group had drafted a question and sent it to Dr. Cell to review, the group met to go over the exam before giving it to the students. Dr. Cell had some concerns with the way the question was written, so the group had a discussion about how to better clarify the question:

1. Gabe: and that was really pulling from Kristen's power points and the videos where they described the four and how she had the analogies
2. Dr. Cell: Yeah, I still, I'm not sure I would come to that conclusion based on the information you gave. Like I would give a completely different answer. I don't know...what do you guys think?
3. Lynn: Maybe if you put based on the KD of the ligand what would be the mechanism? If we put that frame of the KD?
4. Kristen: But that's in the last part I think somewhere in the middle of the question I get a little lost
5. Lynn: Yeah that's what I'm saying put the KD before the mechanism
6. Dr. Cell: So... because I gave you three different receptors
7. Sarah: [to Gabe] so you're looking for [inaudible] versus...and things like that...when you ask for the mechanism right?
8. Gabe: Yeah and I felt that they should know the connection between high affinity low affinity and the type of signaling
9. Lynn: maybe you [looking at Gabe] can ask which ...if the ligand...which receptor would the ligand bind to for endocrine signaling

Gabe had written the original draft of the question, based on the lesson that Kristen and Ann taught. Dr. Cell expressed concern with the way the question was written (line 2) but conferred with the other UTLAs by asking “what do you guys think?” As a group, they talked through what Gabe intended for the question and possible ways to re-word the question. By making eye contact with him and asking about his intentions, the group continued to credit him as the writer of the question.

In the Genetics course, the UTLAs were positioned as co-creators when they were given the opportunity to collaborate to develop their own review presentation for each exam. She also always asked them to choose topics for practice questions to give students during their review sessions:

1. Dr. Genetics: Ok good we'll, so we have to pick another question for this week then too right because we're doing exam review this coming week.  
Umm...do you guys have thoughts on what kind of question would be good?  
What would you like to do?
2. Alex: Maybe a pedigree since we didn't do any of those
3. Dr. Genetics: A pedigree?
4. Brian: At least my kids struggled with number of chromosomes and number of DNA
5. Ian: Ohh yeah
6. Brian: like even after explaining
7. Alex: Yeah
8. Brian: like they did not get that
9. Dana: Mine struggled with haploid diploid



10. Alex: Mine too

She stated “we” have to pick a question and asked the UTLAs for their thoughts. Alex offered a suggestion to the group and then several UTLAs chimed in with information about what topics their students struggled with. This example demonstrates an overlap between being positioned as co-creators (line 1) and UTLAs positioning themselves as informants (lines 4-10). The UTLAs used evidence of what students struggled with to inform their co-creation of a practice problem.

In addition to playing a role in creating the review materials, Dr. Genetics occasionally positioned her UTLAs as co-creators by letting them know that she was open to hearing their ideas for new assignment topics. For example, “If you've thought of something you think would make a really good group, you can let me know, like this weekend, and I can try to see if I can find a paper for it.” However, according to interviews with Dr. Genetics, the UTLAs did not always take up this position and follow through with sharing their ideas.

The examples presented above illustrate in detail the five ways UTLAs were positioned in the data; I summarize the positions and associated acts and storylines in Table 4.2.

**Table 4.2. Summary of UTLA position and associated acts and storylines**

<b>Position</b>	<b>Storyline</b>	<b>Acts</b>
UTLA as learner (Faculty instructor as teacher)	Faculty instructors are more expert in both content and pedagogy than UTLAs.	UTLAs raise hands to answer and ask questions; Faculty member explains biological concepts or pedagogy; Faculty member facilitates discussion around biological concepts or pedagogy

UTLA as informant (Faculty instructor as information seeker)	UTLAs serve as a communication channel between faculty instructors and students in the course because of their approachability and access to students.	Faculty instructor asks questions such as “How are things going?”; UTLAs report on experiences with students
UTLAs as consultant (Faculty instructor as advice seeker)	UTLAs can provide advice and make suggestions to the faculty instructor based on their student perspective and experiences.	Faculty instructor asks UTLAs to review draft assignments or exams in person and over e-mail; Free flowing and collaborative conversation, building off each other’s suggestions
UTLAs and faculty as co-instructors	UTLAs help make grading decisions. UTLAs are considered teachers.	Collaborative group discussion around grade norming; Faculty instructor refers to UTLAs as teachers; Faculty instructor notes flexibility and autonomy in UTLAs’ work with students
UTLAs and faculty as co-creators	UTLAs can help to create instructional materials, including exams.	Faculty instructor gives UTLAs the opportunity to develop instructional materials and exam questions; Collaborative group discussion to create together

## Discussion

The in-depth exploration of two cases of UTLA-faculty instructional partnerships presented here revealed that UTLAs may be positioned in a variety of ways in interactions and communication with faculty instructors. By analyzing data from an entire semester of UTLA-faculty interactions for two different cases, I determined UTLAs may be positioned as student, informant, consultant, co-instructor, or co-creator. By presenting different UTLA positions, I offered a more dynamic, nuanced view of UTLA-faculty partnerships and showed that despite each

case having relatively consistent interactional norms, there was still fluidity in how the UTLAs were positioned.

Although here I presented each of these positions separately, they are not necessarily mutually exclusive. Meaning, UTLAs moved between positions or could be positioned in multiple ways at the same moment. For example, UTLAs sometimes transitioned from being positioned as informants to positioning themselves as consultants. Also, UTLAs were sometimes positioned as students while also being positioned as co-instructors when the faculty member taught them about pedagogy or explained their teaching role. The described storylines and example speech acts associated with these different UTLA positions were meant to be illustrative, but not all-encompassing. There are other potential storylines and many more speech acts that were not included in this chapter, for the sake of brevity.

Positioning theory posits that positions are mediated through discourse, so this study attempted to reveal some of the more overarching discourse patterns associated with UTLA positioning. Most of the times, faculty determined UTLA positioning by asking questions or giving explicit directions. For example, “how are things going?” more often positioned UTLAs as informants while “What do you guys think?” more often positioned UTLAs as consultants. However, the data also revealed that UTLAs will position themselves in certain ways at times, potentially because they have gained the implicit sense that position was appropriate in that moment based on the interactional norms.

One could infer that I presented the UTLA positions in order from least to greatest level of collaboration with the faculty instructor, or least to most UTLA

power, but in doing so I do not intend to rank the positions in terms of desirability. Positioning UTLAs as co-instructors or co-creators does allow for UTLAs to have more power in the instructional process, which is something to strive for. However, positioning UTLAs as students may still at times be appropriate and beneficial and should not be seen as problematic. For instance, both Dr. Cell and Dr. Genetics positioned UTLAs as students to help provide them with the guidance, structure, and support they needed to be adequately prepared to work with students. A collaborative instructional partnership does not necessarily require that UTLAs and faculty have equal power; rather, UTLAs and faculty should work together to negotiate power fairly and appropriately based on time, experience, ability, and goals in that moment (Cook-Sather, et al, 2014).

Other scholars have attempted to characterize UTLA-faculty partnerships or student-faculty partnerships, and my findings help to expand upon these characterizations by providing a more detailed account of UTLA-faculty interactions and the variety and fluidity in UTLA positioning. Scholars have noted the role of students as consultants and co-creators in the literature on student-faculty partnerships (Bovill et al., 2016; Bovill et al., 2011), and will sometimes use these terms to label a UTLA's role. My data show that UTLAs may be positioned to fulfill the rights and duties associated with these roles, even if not labeled in this way. Considering UTLA positioning rather than labeling UTLA roles in fixed ways may be more appropriate and useful to understand the variance in the rights and duties they enact. As van Langenhove and Harre (1999) put it, "the concept of positioning can be seen as a dynamic alternative to the more static concept of a role" (p. 14).

Sabella et al. (2016) presented the characterizations of mentor-mentee, faculty driven collaboration, and collaborative partnerships between LAs and faculty. In mapping the interactional norms for Case 1 and Case 2 onto these characterizations, I would characterize Case 1 as collaborative and Case 2 as faculty driven collaboration. However, typifying UTLA-faculty partnerships might limit our understanding of the complexity of those partnerships and fail to notice the variation in how UTLAs are positioned, even in a generally collaborative partnership. In terms of Sabella et al.'s (2016) characterizations of LA-faculty partnerships, UTLAs positioned as students aligns with the description of mentor-mentee, while informant and consultant aligned mostly with faculty driven collaboration, and co-creator aligned mostly with collaborative. Thus, even if Case 1 is considered a collaborative partnership and Case 2 is considered faculty-driven collaboration, there may be moments where these partnerships appear as mentor-mentee partnerships. The findings I presented here suggest that considering different, moment-by-moment characterizations and positions, and the prevalence of those positions, might help to create a more accurate depiction of UTLA-faculty partnerships.

The data revealed some general patterns in terms of prevalence of UTLA position in the different cases as well as how UTLAs were positioned at different points or based on changing meeting goals. In Case 1, the various positions were all fairly prevalent. As far as prevalence at different points in the meetings, UTLAs were much more often positioned as students during the pedagogy course as compared to the preparation meeting time, likely because it was a credit-bearing course, the UTLAs completed assignments, and Dr. Cell had a prepared curriculum and agenda

to guide the sessions. On the other hand, UTLAs were commonly positioned as informant, consultant, or co-creator during the Cell Biology preparation meetings. In Case 2, the UTLAs were most often positioned as students, which is ironic because they had a more authoritative role in terms of working with students than the UTLAs in Case 1. Perhaps, the more authority UTLAs have in terms of teaching, the more faculty might feel the need to focus on logistics, support, and preparation. Dr. Genetics certainly valued consistency and aimed to provide her UTLAs with sufficient guidance necessary to teach their own discussion sections, but these goals left less time for UTLAs to be positioned as consultants or co-creators. In both Case 1 and Case 2, interactions where UTLAs were positioned as consultant and co-creator were largely centered around assignment and exam design.

### **Respect, Reciprocity, and Responsibility in UTLA Positioning**

The guiding principles of student-faculty partnerships, respect, reciprocity, and responsibility (Cook-Sather et al., 2014), served as a lens to better understand UTLA-faculty interactions and were evident throughout the data. Even when UTLAs were positioned as students, the faculty recognized their need for support to fulfill their responsibilities working with students and respected them as developing professionals by teaching them about pedagogy. The reciprocity of open communication and bi-directional conversation were more common when UTLAs were positioned as consultants, co-instructors, or co-creators, but was evident across all positions. By positioning UTLAs as consultants or co-creators, Dr. Cell and Dr.

Genetics respected the UTLAs' diverse ideas and also implicitly recognized their own responsibility as learners. Overall, respect, reciprocity, and responsibility were present regardless of position, but they manifested in various ways and to various extents.

In considering these constructs, I do not mean to communicate that we can simply say that partnerships either do or don't exhibit these qualities, or that they can be measured on a scale from less to more. Rather, respect, reciprocity and responsibility might manifest in different ways in different scenarios. For example, Dr. Genetics was sometimes wary to ask UTLAs to provide feedback or add to their responsibilities, because she respected their time and wanted to avoid over-working them. So, faculty might perceive a trade-off between respecting UTLA time and respecting and valuing their expertise as potential co-creators of exams or activities. In terms of responsibility, I could argue the Genetics UTLAs had more instructional responsibility in the sense that they ran their own discussion sections, but they don't play a large role in the lecture, which could be considered the core of the course. The Cell Biology UTLAs didn't have full responsibility for any component of the course, but they substantially helped with lecture. Thus, the instructional responsibilities between the Cell Biology and Genetics UTLAs differed, but there wasn't necessarily more or less responsibility in either case. Just like with positioning, the manifestation of respect, reciprocity, and responsibility in UTLA-faculty instructional partnerships is more nuanced than just acknowledging that they are present.

## **Limitations**

This study has several limitations that impact the applicability and generalizability of the findings. This study only explored two cases of UTLA-faculty interactions, at one university, in one discipline, over the course of one semester. Although data collection for each case was thorough and these contexts provided rich examples of the variance of UTLA-faculty interactions and UTLA positioning, they are by no means generalizable or representative of all UTLA-faculty interactions and meeting spaces. Two cases, as opposed to just one, allowed for understanding of slightly different contexts, but these two contexts don't encompass all possible contextual factors. When considering the impact of this study, one must consider that the findings of this study only present a small snapshot of UTLA-faculty interactions and limited examples of how UTLAs might be positioned. I included detailed descriptions of each research setting so that one may draw out potential similarities and differences between these cases and others and better determine implications for different contexts.

## **Implications: Creating Collaborative Instructional Partnerships**

This chapter reveals various implications for those that are interested in establishing or supporting UTLA-faculty instructional partnerships. Faculty members can reflect on how they are positioning their UTLAs and whether or not this positioning aligns with positioning that is more prevalent in collaborative partnerships. UTLAs can reflect on how they are being positioned or how they are



positioning themselves, and challenge positioning that might be limiting their involvement in the instructional process. Both may consider if and how respect, reciprocity, and responsibility are expressed in the partnership. However, various contextual factors, some of which might be outside of the faculty or UTLA control, certainly impact UTLA positioning.

### **Comparing Across Cases: The Potential Impact of Contextual Differences**

There were a number of factors and contextual features that may have impacted how UTLAs were positioned in the two cases presented here. Although I do not intend to communicate any causal claims, I provide insight into possible effects of a few of the many potential factors. I suggest that instructor experience, UTLA role, UTLA pedagogical training, and format and structure of meetings seemed to impact how UTLAs were positioned. I expand upon the perceived impact of each of these factors and compare differences across the two cases.

**Instructor experience with the course.** In the semester during which this study took place, Dr. Cell and Dr. Genetics had different levels of experience with the courses they were teaching. Fall 2018 was Dr. Cell's first time teaching the Cell Biology course for the ILS program; thus, she may have been more open to critique, input, co-creation, and collaborative problem solving. The Cell Biology UTLAs had all taken the course prior, and there were times when Dr. Cell explicitly asked for their advice based on their experience having been students in the course. In contrast, Dr. Genetics had taught the course for several semesters, and had been the one to

create the GeneLab materials that the UTLAs were using in their teaching. Thus, the UTLAs may have viewed Dr. Genetics as more of an expert on the course and viewed the course as more established. Instructor experience and history with a course may impact how often UTLAs or faculty open up space for making suggestions or discussing improvements.

**UTLA role.** The UTLAs for the two cases performed very different roles in terms of working with students. In both cases, UTLAs led office hours and helped to grade assignments and exams. However, in terms of working with students in class, in Case 1, the UTLAs facilitated small group discussion during the large lecture taught by Dr. Cell, whereas the Genetics UTLAs led their own discussion sections paired with but separate from the lecture course taught by Dr. Genetics. In Case 1, during the moments when students in the class worked on discussion questions, the UTLAs and Dr. Cell took on very similar teaching roles in that they all walked around and facilitated discussion. Since the Cell Biology UTLAs worked in class with Dr. Cell, Dr. Cell may have been more likely to position them as co-instructors in discussing their teaching during meetings. The Genetics UTLAs did not teach alongside Dr. Genetics, rather, they taught separately and independently. This separation may have limited how often they were positioned as co-instructors and increased how often they were positioned as informants or consultants because they were the only ones with eyes into their classroom. Their more independent teaching role may also have led Dr. Genetics to position them more often as students, to ensure consistency across the different UTLAs. Varying UTLA roles and responsibilities may have a significant impact on how UTLAs are positioned in meetings with faculty.

**UTLA pedagogical training.** The UTLAs in Case 1 and Case 2 participated in different pedagogical preparation courses, the most noteworthy difference being that Dr. Cell taught the pedagogy course to her Cell Biology UTLAs during the semester in which this study took place. A significant portion of the data for Case 1 came from the pedagogy course meetings. The pedagogy meetings were structured around a curriculum, and the UTLAs were receiving course credit for their participation, so they were often positioned as students in that setting. However, through different activities and assignments, such as “analyzing student work” and “revising instructional materials” UTLAs were positioned as informants, consultants, and co-creators. Also, discussions around pedagogy supported by the readings and activities in the course often led to UTLAs being positioned as co-instructors. Since Dr. Cell was leading the pedagogy seminar, there were many additional opportunities for her to position UTLAs in more collaborative ways, and more time to establish rapport and close relationships.

In Case 2, the UTLAs had already taken their required pedagogy course in a prior semester, and Dr. Genetics was for the most part removed from that course. Therefore, for this study I was not able to explore to the same extent if and how their pedagogical training might have impacted how they were positioned. In interviews, the Genetics UTLAs commented that they did not find their pedagogical training course to be very helpful, but they did appreciate that it gave them a place to get to know other UTLAs and share challenges and concerns. Disconnect between pedagogical training and UTLA preparation meetings with faculty may limit how much UTLAs and faculty collaborate around instruction.

**UTLA-faculty meeting time, format, and structure.** Meeting location, room arrangement, and seating arrangement may influence how UTLAs interact with the faculty member and each other. By sitting around a table together, the Cell Biology UTLAs and instructor established a feeling of community, which may have encouraged more open discussion. The Genetics meetings were held in a classroom where the UTLAs sat in rows, sometimes hidden behind computer screens, and this set-up may have led them to feel less inclined to discuss instruction with each other and Dr. Genetics. However, Dr. Genetics still established a feeling of community by sitting alongside the UTLAs and encouraging them to sit close to each other or in small groups. Also, the group of Genetics UTLAs (11) was more than twice as large as the group of Cell Biology UTLAs (5), so inherently with more people there were more constraints on room arrangement and individual speaking time. Meetings with larger groups of UTLAs certainly require more management and are not as conducive to open discussion, but faculty members should still consider how they might be able to arrange the room and structure the conversation to give individual UTLAs a voice during preparation meetings.

Timing of meetings, and associated time constraints, also seemed to impact the ways UTLAs were positioned in these two cases. Because the Cell Biology preparation meeting was held in the evening, time was not typically constrained by subsequent engagements. The UTLAs and Dr. Cell seemed highly motivated to stay late and often lost track of time because they were so engaged in discussion with each other, especially around exam consultation and co-construction. Although I did not ask the participants about their willingness to dedicate additional time to the course,

based on working with the ILS LLP for many years, I argue that being a part of an LLP and the sense of community that comes with it was likely a motivating factor.

For Genetics, the meetings were highly structured and guided by the TWiG, which helped tremendously in terms of UTLA preparation, but limited the amount of open discussion. Since the Genetics meetings were held directly before the Genetics lecture course meeting, they were much more constrained by time. In interviews, Dr. Genetics repeatedly mentioned being limited by time and wanting to respect the time of the Genetics UTLAs. Therefore, there was less time for UTLAs to share feedback with the instructor and with each other, or for the group to talk collaboratively about student ideas and potential instructional improvements. To make up for time constraints, Dr. Genetics and her UTLAs used e-mail much more frequently. With time limitations, faculty working with UTLAs must consider how to balance explanation and giving directions with making time for collaborating on instructional decisions and opening up the conversation for feedback.

Overall, even though these cases differed, what I found to be most influential in terms of establishing the collaborative nature of these instructional partnerships was the recognized notion of a “teaching team.” UTLAs were never positioned as helpers or workers, but instead as novice colleagues with valid opinions, perspectives, and expertise. Even when positioning UTLAs as students, Dr. Cell and Dr. Genetics communicated a focus on UTLA professional development; rather than talking at the UTLAs, they were talking with them. Faculty should carefully consider how their words and actions, and the responsibilities that they designate to their UTLAs while

respecting their time and ability, communicate (or don't communicate) the notion of UTLAs as part of a "teaching team."

### **Future Directions**

This current study could be extended by digging deeper into the substance of UTLA-faculty discourse. Here, I explored how UTLAs were positioned, but did not analyze in depth *what* they discussed when they were positioned in those ways. This study began to reveal that different UTLA positions allow for varying types of UTLA feedback. In Chapter 5, I expand upon this current study by exploring the quality and substance of feedback provided by UTLAs in interactions and explore in what ways that feedback might be able to support instructors in better understanding where their students are at in their learning.

Additional studies could explore UTLA positioning using similar methods, but in different contexts, to better understand the variance in UTLA-faculty discourse and all of the factors that may influence those differences. For example, how does UTLA-faculty discourse differ when UTLAs and faculty meet one-on-one, or, on the other hand, with even larger groups of UTLAs? Or, how are UTLAs positioned when their roles are different, such as if they aren't responsible for grading? This research could also be extended to explore how UTLAs position themselves when working with students, whether this might be influenced by the discourse in UTLA-faculty meetings, and what implications this has for student learning.

## **Chapter 5: Examining the Substance and Quality of UTLA Feedback: Implications for Formative Assessment?**

**Abstract:** Undergraduate teaching and learning assistants (UTLAs) can help to implement more student-centered learning in undergraduate science courses, and through enacting their roles, UTLAs may provide valuable feedback to support formative assessment and thus improve teaching and learning. This chapter introduces the idea of a formative assessment “system” created through interactions between instructors, UTLAs, and students and then focuses on one aspect of the system by asking: What feedback might UTLAs provide to instructors? In this study, I characterize and present examples of oral and written feedback provided by UTLAs supporting two different introductory biology courses. An analysis of UTLA-faculty meeting transcripts and additional written communication over the course of a semester revealed that UTLAs often offered feedback related to course logistics and instructional materials. UTLAs also provided instructors with feedback on student attitudes and behaviors as well as student conceptual understanding. UTLA feedback was valuable for making adjustments to improve teaching and learning; however, UTLA feedback was not always related to or supported by evidence of student ideas. Thus, it was not always relevant for supporting formative assessment of student learning. This study is part of a larger project that aims to understand UTLA-faculty instructional partnerships and implications for formative assessment, and raises the question: Even if partnerships are collaborative and feedback is frequent, is that feedback substantive and does it support formative assessment of student learning?

## Introduction

In order to help support a shift towards more student-centered instruction in undergraduate science courses, instructors may appoint undergraduates as teaching and learning assistants (UTLAs<sup>3</sup>). During small-group work or other active engagement activities, UTLAs can circulate around the classroom to help guide student discussion, which can create more opportunities for student interaction and enable more students to participate actively in class (Cox, 2001; Groccia & Miller, 1996; Jardine & Friedman, 2017; Otero et al., 2010). The combination of increased active learning and peer guidance has proven to be very effective in multiple science disciplines (e.g., Eberlein et al., 2008; Gray, Webb, & Otero, 2010; Lewis & Lewis, 2005; Preszler, 2009; Wamser, 2006). UTLAs can also be a valuable source of feedback for the faculty they work with (Fingerson & Culley, 2001; Gosser & Roth, 1998; Hufford, 2011; Jardine & Friedman, 2017; Talbot et al., 2015), as they can gather information about student understanding, make suggestions for course improvements, and help faculty understand students' perspectives and ideas. Thus, UTLAs may help to support student-centered instruction in two related, yet distinct, ways: by facilitating student-centered activities and providing faculty with student-centered feedback.

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<sup>3</sup> I use the term “undergraduate teaching and learning assistants” (UTLAs) to refer to undergraduates who facilitate student-centered instruction in a lecture course or in mandatory recitation sections associated with a lecture course. The term “undergraduate teaching and learning assistants” and acronym UTLA are not common in the literature; I chose this term to cover the various terms that are used in the literature that fit my definition. The literature I review includes literature related to the “learning assistant” model (Otero, Pollock, & Finkelstein, 2010), the “peer led team learning” model (Gafney & Varma-Nelson, 2008), a “peer learning assistant” model (Groccia & Miller, 1996), and other literature that may use terms such as “undergraduate teaching assistants” or “peer facilitators.” I recognize that different terms may represent different UTLA roles and responsibilities; therefore, when describing specific UTLA models in the literature, I will use the term associated with that model. When synthesizing across models and terminology, I will use the overarching term UTLA.



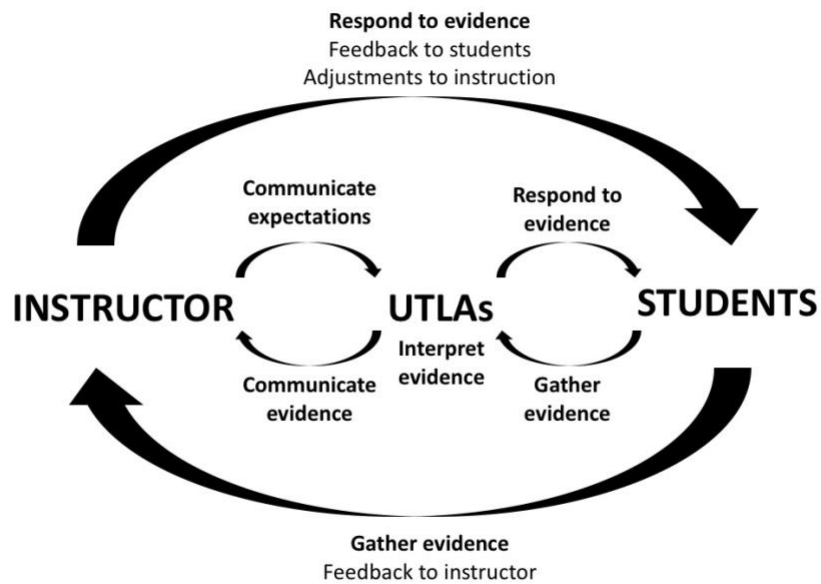
Given their roles supporting student-centered instruction and interacting with both students and faculty, UTLAs may be able to enhance formative assessment in undergraduate science courses. Formative assessment is generally considered to be a process through which evidence of student learning is gathered and teaching and learning is modified in response to that evidence (Black & Wiliam, 2009; Cauley & McMillan, 2010; Cowie & Bell, 1999; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). UTLA roles create additional feedback channels between instructors and students (Jardine & Friedman, 2017); therefore, the introduction of UTLAs into a course may create what I refer to as a formative assessment “system.” It is worthwhile to investigate the role that UTLAs may play in enhancing formative assessment in undergraduate science courses because formative assessment is considered an integral part of teaching and learning (Bell & Cowie, 2001) and is highly beneficial for student achievement and motivation (Black & William, 1998).

In summary, the literature suggests that UTLAs can help to implement more student-centered learning in undergraduate science courses (Cox, 2001; Groccia & Miller, 1996; Otero et al., 2010), and while fulfilling their roles provide valuable feedback to improve teaching and learning (Hufford, 2011; Jardine & Friedman, 2017). I aim to expand upon these notions suggested in the literature by introducing and exploring a conceptual framework for an instructor-UTLA-student formative assessment system. In this study, I specifically focus in on one aspect of the system by asking: What feedback might UTLAs provide to instructors (and how might that feedback support formative assessment of student learning)? I present examples of

oral and written feedback provided by UTLAs supporting two different introductory biology courses, gathered through in-depth case studies over the course of a semester. This study is part of a larger project that aims to better understand UTLA-faculty instructional partnerships and how UTLAs might support formative assessment, in order to reveal implications relevant for improving teaching and learning in undergraduate science courses.

### **UTLA-Mediated Formative Assessment System**

Formative assessment is generally considered to be a process through which evidence of student learning is gathered and teaching and learning is modified in response to that evidence (Black & Wiliam, 2009; Cauley & McMillan, 2010; Cowie & Bell, 1999; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). This process can be visualized as a feedback loop between instructor and student (Furtak, 2016), but UTLAs introduce the opportunity for two additional feedback loops: instructor-UTLA and UTLA-student (Jardine & Friedman, 2017). Therefore, the introduction of UTLAs into a course may create what I refer to as a formative assessment system (Figure 5.1).



**Figure 5.1. UTLA-Mediated Formative Assessment System**

The outer loop in the system, between instructors and students, represents the general conception of formative assessment amply described in the literature and defined above (Black & Wiliam, 2009; Cauley & McMillan, 2010; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). Literature describing UTLA roles in undergraduate science courses suggests potential for two inner loops, between UTLAs and students and between UTLAs and instructor, which I expand upon below.

### **UTLA-Student Interactions**

The UTLA roles of facilitating student discussion and small group work in lecture or recitation sections, evaluating students, and assisting students outside of

class may provide opportunities for UTLAs to gather and respond to evidence about student learning. The focus on UTLAs guiding, using probing questioning, eliciting student ideas, and providing feedback when working with students in class or in workshops and recitation sections (e.g. Otero et al, 2010; Gafney & Varma-Nelson, 2008) supports formative assessment. UTLA grading of student work (Popejoy & Asala, 2013; Presler, 2009) demonstrates an opportunity for additional formative assessment through written feedback. UTLA interactions outside of class (e.g. Close, Conn & Close, 2016; Kopp, 2000) also increased opportunities for UTLAs to provide personalized feedback to students. Additionally, UTLAs may receive training on pedagogy and learning theory that provides them with valuable skills to interpret student thinking (Jardine & Friedman, 2017; Otero et al., 2010; Philipp et al., 2016; Tien et al., 2004). Thus, UTLAs may possess distinctive skills, experiences, and opportunities essential for gathering evidence related to student learning and can communicate that evidence to faculty from the perspective of a pedagogically informed student in the course.

The literature provides evidence that UTLAs may engage in formative assessment when interacting with students. Some studies provided survey findings where students acknowledged that UTLAs provided them with feedback on their learning (Groccia & Miller, 1996; Finn & Campisi, 2015; Jardine & Friedman, 2017). Other studies included UTLA interviews and written reflections that demonstrated UTLAs feel that they prompt students to reflect and justify their reasoning (Close et al., 2016; Philipp et al., 2016; Tien et al., 2002). Research on UTLA interactions with students demonstrates that UTLAs “can positively influence the articulation of

reasoning in student discussions, especially if they use prompting questions and requests for reasoning” (Knight, et al., 2015, p. 10). Thus, in interactions with students, UTLAs may uncover student ideas relevant for formative assessment.

### **UTLA-Instructor Interactions**

When UTLAs meet regularly with course instructors for planning and reflection (Gafney & Varma-Nelson, 2008; Gosser & Roth, 1998; Otero et al., 2010; Sarquis et al., 2001), instructors may communicate expectations for UTLAs to provide feedback and UTLAs may communicate evidence of student learning, as represented in the feedback loop between UTLAs and instructor (Figure 5.1). Digital communication (Groccia & Miller, 1996; Sarquis et al., 2001; Tien et al., 2004) creates additional opportunities for instructors to communicate with their UTLAs. Some studies mentioned that UTLAs provided feedback on instruction or instructional materials (Finn & Campisi, 2015; Gosser & Roth, 1998; Kopp, 2000; Popejoy & Asala, 2013; Talbot et al., 2015). Gosser and Roth (1998) included a vague statement about the value of feedback that peer leaders provided to instructors: “Feedback and suggestions from the leaders about the problems under actual workshop conditions have been very useful” (p. 186). Similarly, Finn and Campisi (2015) briefly mentioned, “course instructors received feedback from the mentors” (p. 39). Talbot et al. (2015) mentioned that their UTLAs helped to develop some of the activities used by the instructors in lecture and “suggest active learning strategies that they have researched or developed and provide instructors with insight about what

concepts students are struggling with” (p. 25). Authors also noted that journal entries allowed instructors “to identify pedagogical issues and group concerns” (Sarquis, et al., 2001, p. 152) and “give the instructors a window into what is going on in each of the Workshop sections” (Tien, et al., 2004, p. 1314). UTLA feedback for instructors is valuable because UTLAs “view the teaching/learning process from very different eyes” (Allen & White, 1999, p. 300) and act as “allies who tell [instructors] what works and what does not” (p. 302).

Examples from the literature suggest that UTLAs may provide useful feedback to instructors; however, the literature only begins to unpack what the feedback included and doesn’t necessarily consider the factors that supported or constrained UTLA sharing of meaningful feedback. Here, I aim to better understand the substance of UTLA-instructor interactions and communication, which is necessary to develop a clearer understanding of the UTLA-mediated formative assessment system.

## **Methods**

### **Research Settings**

This study begins to explore the concept of a UTLA-mediated formative assessment system by analyzing feedback provided by UTLAs in the context of two different introductory biology courses at UMD during the Fall 2018 semester. These settings were purposefully chosen as part of a larger, multiple case study of UTLA-faculty partnerships in undergraduate science courses. Below, I describe the two

cases, including UTLA roles, UTLA-faculty meeting spaces, and other forms of communication and interaction between UTLA, instructor, and students.

**Case 1: Cell Biology in a Living Learning Program.** The Integrated Life Sciences Living Learning Program (ILS LLP) at UMD engages talented undergraduate students in research, coursework, and service in preparation for careers in science and medicine (Cooke, et al., 2016). To help foster collaborative, student-centered learning, all of the courses for the program, including a Cell Biology course that students take in their second year in the program, are supported by UTLAs. During Cell Biology class sessions, the UTLAs circulate around the room and support students while they work in pairs and small groups on guided activities and application-based discussion questions. The UTLAs also hold office hours to support students outside of class and grade homework assignments and exams.

In Fall 2018, the five UTLAs for the Cell Biology course met weekly with the instructor, who I refer to as Dr. Cell, to discuss upcoming activities, share insights about students, and provide feedback and support on instructional materials. Additionally, the UTLAs engaged in a pedagogy course focused on science education theory and practice during their first semester as a UTLA, which in Fall 2018 was taught by Dr. Cell. Through integration of practice, content, and pedagogy, the UTLAs developed the knowledge and skills to be effective peer educators (Otero, et al., 2010). In Fall 2018, all of the Cell Biology UTLAs were new to the course, so all were enrolled in the seminar except for one who was excused because she had experience with other education courses.

**Case 2: Introductory Genetics.** The introductory genetics course at UMD is a large (~200 student) lecture taught by one or more faculty members that meets three days a week, paired with a weekly application-based discussion section led independently by UTLAs. In the discussion sections, the UTLAs guide students through a series of computer-based activities that require them to apply analytical techniques commonly used by geneticists to investigate a gene of their choice. Additionally, leading up to exams, the UTLAs run guided review sessions during their discussion section. The UTLAs are also responsible for grading student work and holding office hours. In Fall 2018, I studied one particular genetics instructor, who I refer to as Dr. Genetics, and the UTLAs leading the discussion sections associated with her lecture section. Dr. Genetics met weekly with the UTLAs to discuss content, facilitation plans, successes, and challenges. In Fall 2018, there were 11 UTLAs working with the discussion sections associated with Dr. Genetics' lecture, and they had all served in the UTLA role in one or more previous semesters.

## **Data Sources**

As part of a larger, multiple-case study of UTLA-faculty instructional partnerships, I collected various forms of data on these two cases over the course of an entire semester. The data most relevant to address the research question in this study are the audio recordings of the weekly meetings between UTLAs and faculty. Additional data included observational field notes, written artifacts, and interviews. Data collection was flexible and responsive to ongoing analysis, in that collection of



artifacts, additional observations, and interview questions were informed by what I observed as the semester proceeded.

**Audio recordings of meetings.** I attended all scheduled, in-person meetings between faculty and their UTLAs and collected field notes as well as audio recordings at every meeting. For Case 1, meetings also included the UTLA pedagogy seminar, since the Cell Biology instructor was leading the seminar. During meetings, I acted as a participant observer (Merriam, 1998), in that my primary purpose was to observe, but I interacted with the participants as appropriate to build rapport and get a better sense of the situation. In total, there were about 25 hours of meeting audio for Case 1 and 7 hours of meeting audio for Case 2. I transcribed all audio recordings myself, using InqScribe, as close to the time they were recorded as possible.

**Written artifacts: Reflections, course assignments, and e-mails.** As part of the larger project, I gathered various types of written artifacts relevant to understanding the UTLA-faculty partnerships for each case. For this study, the relevant written data sources include UTLA reflections and e-mail communication between UTLAs and faculty. For Case 1, I collected all of the UTLAs' written submissions for their pedagogy seminar assignments, which included reflections on education literature as well as activities such as a student interview and suggestions for revising course materials. For Case 2, I collected the weekly handout that the instructor provided for each preparation meeting, which she referred to as the TWiG (This Week in Genetics). For both cases, the instructors forwarded me all e-mail communication between them and their UTLAs and I downloaded and compiled all of these exchanges.

**Interviews.** I also conducted interviews with both instructors and most of the UTLAs. I interviewed each instructor at the beginning and end of the semester. I also conducted one on one interviews with every UTLA that consented to be interviewed, 4 of the 5 UTLAs from Case 1 and 8 of the 11 UTLAs from Case 2. All interviews were semi-structured, in that I went in to the interview with pre-written questions, but asked follow-up questions based on responses. All interviews were audio-recorded and transcribed.

## **Data Analysis**

To answer the question “What feedback might UTLAs provide to instructors?” I used an open constant comparative coding method (Miles & Huberman, 2014; Strauss & Corbin, 1990). When coding for “feedback,” I defined feedback broadly as any instance where UTLAs provided information to the instructor related to what was happening in the course that could be used to make changes to the course. I considered Hattie and Timperley’s (2007) definition, that feedback is “information provided by an agent regarding aspects of one’s performance or understanding.” However, because of the unique role of the UTLAs working with both instructors and students, the information provided by the agent (UTLAs) to the instructor could be regarding the instructor’s performance or understanding OR student’s performance or understanding. Although I am most interested in feedback for the purposes of formative assessment, I chose to analyze the data for all types of feedback to gain a better sense of the overall quality and

substance of feedback and how often it was supportive of formative assessment of student learning.

I compiled all transcripts and written documents into NVivo to facilitate coding and triangulation of data sources. First, I reviewed analytic memos that I had written over the course of the data collection process to develop preliminary codes related to UTLA feedback. My initial list of codes included logistics, exams, activities and assignments, student attitudes, student behaviors, student opinions, and student ideas about concepts. Then, I read through each data source and coded for instances where UTLAs provided feedback. I started by going through the Case 1 meeting transcripts chronologically, then the Case 2 meeting transcripts, then the written artifacts and e-mails. As I began to code the data, I decided it was important to also code for type of feedback (evidence, interpretation, suggestion, and prediction) in addition to topic of feedback (e.g., student attitudes, student ideas) to differentiate between when UTLAs were merely sharing direct evidence about what students did or said to when they were going beyond by offering interpretations, suggestions, or predictions. Thus, I added the codes “evidence,” “interpretation,” “suggestion,” and “prediction” and each instance of feedback was coded for both type and topic. I also created codes beyond type and topic of feedback to tag specific feedback-related instances that I was finding in the data, such as “instructor asks for feedback” so that I could look for patterns in terms of how instructors went about requesting feedback and “UTLA personal student perspective” to note instances where feedback was based on the UTLAs’ personal experiences, as compared to their experiences working with students.

After I coded the data, I reviewed the codes to identify relationships and combine codes into broader themes. I combined “logistics” (which was defined as timing, procedures, and management), “exams,” and “activities and assignments” into one theme of “course logistics and instructional materials” because they were related to procedures, planning, and curriculum. I combined the codes “student attitudes,” “student behaviors,” and “student opinions” into one theme of “student attitudes and behaviors” because they all were related to what students were saying about the course or doing in the course separate from content or concepts. Then, I considered a third theme to be “student ideas and conceptual understanding,” which was its own code. I used these themes to organize and present my findings.

### **The Quality and Substance of UTLA Feedback**

The data revealed that UTLAs may provide instructors with feedback presented in a variety of ways on a variety of topics. The substance of UTLA feedback analyzed in this study fell into three main categories: (1) course logistics instructional materials; (2) student behaviors and attitudes; and (3) student ideas and conceptual understanding. Some feedback fit across more than one of these categories. For instance, one way that feedback may have fit into multiple categories was if the UTLAs provided feedback on how to alter instructional materials after providing feedback about the ideas students had when answering a specific question on that assignment. Still, I used these categories as a way to distinguish different foci of the UTLAs’ comments.

I also found that feedback existed across a spectrum in terms of the way it was presented. Meaning, in the most basic sense, feedback was presented as information about something that had happened, or direct reporting of something observed or heard. Yet, sometimes UTLAs went beyond sharing information by communicating interpretations, suggestions, or predictions. Below, I provide representative examples of UTLA feedback, and note instances where feedback provided by UTLAs was more interpretive, suggestive, or predictive.

### **Course Logistics and Instructional Materials**

The feedback that UTLAs provided to Dr. Cell and Dr. Genetics was most often about course logistics and instructional materials. Sometimes, the feedback included reporting how certain activities or assignments went, based on their observations or what students told them in conversation. Also, the UTLAs made suggestions for revisions of assignments and exam questions, based on experiences with students and/or their personal understandings and perspectives as former students.

Dr. Cell regularly requested her UTLAs' input about course assignments and logistics, noting in an interview that "they've had a chance to take the class before in a similar structure and format so they can give me feedback on materials and other things as things go along." Thus, she would sometimes ask the UTLAs for their opinions on activities or her proposed changes to activities. For example, Dr. Cell decided that instead of having the UTLAs act out and narrate a biological process as

had been done in the past, she would have the students in the class talk through the steps while the UTLAs acted out the process. She confirmed the plan with the UTLAs:

Dr. Cell: You guys think this is gonna go ok?

Ann<sup>4</sup>: Yes

Kristen: I think it's going to go really good. I like that [the students are] saying it. I think that's going to be so much better to understand where they're at.

Before and after this excerpt, they compared Dr. Cell's newly proposed idea to their experience as students in the class in former years. They talked about why the way the activity was run previously did not work, from their perspective as students, and confirmed that they agreed that Dr. Cell's new idea would work well and be more beneficial for students. Also, in saying "I think that's going to be so much better to understand where they're at" Kristen also shows an inclination to provide feedback on students' understanding.

Dr. Genetics also established an expectation that UTLAs would provide her with feedback on course content and activities early on. Even before the semester began, Dr. Genetics shared with her UTLAs some of the changes she was going to make to the course structure, including increasing the number of worksheets that students would complete in pairs in class, and asked for their thoughts. Several UTLAs responded with input, including Brian, who said:

I do agree with the idea that there should be more lecture worksheets because they often gave me, as a student in your class, a hint when I was lost and I

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<sup>4</sup> All UTLA names are pseudonyms.

needed to do extra studying to be able to complete test level questions. I like the idea of completing the worksheets in a group, given the fact most students do work with colleagues on them as well. It could be interesting to give them the choice of completing lecture worksheets within their section, which could push them to work with their GeneLab groups and become closer with that group. These last 2 semesters I have seen that students do not know who is in their group until it is the week before presentation, so this could push students to get to know others in their section and form study groups as well.

In his response, Brian referenced his personal experience in the course to back up why he agreed with her proposed change (“[the worksheets] often gave me, as a student in your class, ...”). He also shared insight based on working with students (“These last 2 semesters I have seen...”) and made a suggestion to improve the issue that he had noticed (“this could push students...”).

For both Cell Biology and Genetics, the instructors also asked UTLAs for their perspective on the outcome of activities and assignments after they happened, in order to get a sense of what could be improved for future semesters, or what might need revisiting for that semester. For example:

Dr. Genetics: Ok so how was mutation module? Was it good?

Group: Ehh [and other groans]

Dr. Genetics: No? What was wrong with it?

Ian: There were a lot of questions and then

Dr. Genetics: About?

Ian: About the alternate donor and alternate receptor

Dr. Genetics: Ok

Ian: And then the questions some of them were worded a little bit differently.

So like students kept getting confused by the wording.

Dr. Genetics: Ok well send me the wording things, definitely

Gabby: It was also pretty long. I didn't have anyone finish [others saying yeah, nodding]

Dr. Genetics: I thought it was so repetitive that it wouldn't be a problem. Was it not? [talking over each other about how most students didn't finish]

Cara: I think my students got confused with the repetitiveness because they were like is this different or the same as the last five questions I just answered.

Dr. Genetics: Ok

Cara: They just kept asking like is this the same

Dr. Genetics: Ok so maybe some better labeling

In this excerpt, the UTLAs were comfortable sharing that the module didn't go as well as planned. Dr. Genetics was interested to hear from Ian how he would alter the wording ("Ok well send me the wording things, definitely"). Also, she had assumed that timing would be fine ("I thought it was so repetitive that it wouldn't be a problem," but it turned out to run long, and Cara's insight helped her to understand why students took longer than expected to complete the activity. In an interview, Dr. Genetics noted "I'm always happy to get input from UTLAs about assignments preferably before we do the assignment but sometimes afterwards in preparation for future semesters." The UTLA Gabby shared in an interview, "...if something about the GeneLab assignments is weird we'll like tell her so it's definitely like open enough



to where we can communicate with her and feel like comfortable communicating with her if something's wrong or doesn't sound right or doesn't make any sense. So it's definitely like a collaborative thing.” She perceived that Dr. Genetics was very open to hearing their thoughts on the activities.

Towards the end of the semester, as part of their pedagogy seminar requirements, Dr. Cell asked the Cell Biology UTLAs to choose an assignment or exam questions from the course and write a brief description of what aspects of the assignment they would change and why. Then, the group shared their revision suggestions with each other in person and discussed. For example:

Gabe: So, I chose a question from the second midterm of cell bio...and this is the design your experiment one for the mutation and secretion proteins

Dr. Cell: Yeahhhh [uneasy]

G: I thought that this was almost asking the exact same thing as number one of the membrane trafficking worksheet

Dr. Cell: Yeahhh fair point

Gabe: yeah and I was very confused as to the answers I got and I think it might have been because the question says ‘choose which protein it is and propose an experiment and see if the mutant protein is the cause of the symptoms described in part D’ and I think students interpreted that as oh I need to maybe make the mutant protein fluoresce and kind of see if secretion was being affected because of that I think students might have been a bit mislead from that so that’s...that was my main...my main I guess change I would have made to the question

Dr. Cell: So how would you re-do it?

G: Maybe just not even relate the design an experiment to question D, but rather just say like ‘in general how could you do that... like how could you see if secretion is being blocked or altered in any way’ but...I feel like that kind of simplifies it a bit too much. I thought that if you did the worksheet pretty thoroughly, I mean it’s the first question right? I don’t know [laughs]

M: Yeah that was so...I don’t know we got a lot of interesting answers

Dr. Cell’s response when he started describing the exam question that he would change showed that she recognized there had been an issue with that question. Gabe provided his perspective for why students might have had difficulty answering the question and made suggestions for how to reword the question. In the written reflection that he turned in as preparation for this meeting and conversation, Gabe suggested “reinforcing the concept of VSVG to the students” and wrote

If I could make a change in instruction, I would maybe include a video about VSVG temperature sensitive screen as part of the mandatory videos to watch in the Monday video lectures. I think that the students might have been a bit overwhelmed by the fairly long introduction on the worksheet and might not have prioritized it when they studied. If VSVG was incorporated into the course as part of the online lectures, I feel that the students would be much more inclined to really understand it.

He also put suggested changes to the test question and his perception of what confused the students in writing, similar to what he described in the above transcript. Through these conversations paired with their written submissions, Dr. Cell gathered

detailed feedback on assignments that the UTLAs perceived to be the most in need of improvement, and she could use their suggestions to improve those assignments for future semesters.

Both Dr. Cell and Dr. Genetics also asked their UTLAs for feedback on their exams before giving the exam to students. In an interview before the start of the semester, Dr. Cell explicitly mentioned that she was expecting to get feedback on exams "...I want them to help give me feedback on the exams ahead of time and on the exam grading." Dr. Cell and her UTLAs discussed the draft for each exam as a group during their in-person meetings, after the UTLAs had a chance to look it over on their own and go through the questions themselves. When they came together for their meetings, they talked through the wording of specific questions as well as overall exam structure. For example:

Lynn: So, what about...maybe just be like what does the drug do? because I don't really know like what it means by microtubule dynamics. I feel like that would confuse me if I read the question. I don't really know what that means. I would just describe the shape of the graph like oh yeah it made the radiopolymerization zero...is that the answer you're looking for or are you looking for what the drug does?

Dr. Cell: Yeah what it does

Lynn: Ohh

Dr. Cell: So I could put

Lynn: If you don't put what it does, I think it might...it's just like...I don't know. What do you guys think? [to other UTLAs] Because if I see that I would just be like oh it makes the polymerization rate become zero.

Dr. Cell: Alright so what if I put in parentheses i.e. what is the drug doing to the microtubules [Lynn: mmhmm; other UTLAs nod] Would that be clear enough?

Kristen: Yeah, I think so

Lynn: I wasn't sure which answer you were looking for  
[pause, Dr. Cell writing on her draft exam copy]

Dr. Cell: And then for y I could also add what about the graph makes you think so

Kristen: Yeah cause that's what I was thinking the y is gonna get so many different things

Lynn: oh yeah [pause, Dr. Cell continues to write on her draft exam copy]

Dr. Cell: Alright you think that's enough clarification to get them closer?

Kristen: Yeah, I think it will narrow their answers for sure

Dr. Cell: Which is think is better for everyone

Kristen: [laughs] For sure

Lynn: It's just that...we don't know how like...sometimes it's too much reading but at the same time we want to narrow the answers

Dr. Cell: No I am happy for everyone's sake to make it a little bit clearer for everyone

Lynn made a suggestion for how the wording of the question could be altered to help mitigate confusion for the students. When she said “I feel like that would confuse me if I read the question” she was putting herself in the mind of a student taking the exam. She asked the other UTLAs what they thought, demonstrating that she saw the exam review as a collaborative effort, and that her perceptions might not be representative of all students. Dr. Cell shared a possible change and asked for their confirmation that it would make the question clearer. Kristen, Lynn, and Dr. Cell were in agreement that narrowing students’ answers would be “better for everyone,” as in both them, as the graders, and students.

Beyond discussing the wording of specific questions, the UTLAs also provided feedback on overall exam structure. Later on in the same meeting during which the group discussed the microtubule question, Dr. Cell asked their opinion about the exam holistically:

Dr. Cell: Other thoughts, ideas, comments? Do you think this is too hard too easy too long? I mean I cut down by one question, but it still might be a little long.

Kristen: It could be...I just don’t know where else to cut down though

Lynn: Yeah, I do feel like the questions can be a bit long but like you said like the MCATs

Sarah: Yeah ‘cause the more you cut the more points are going to be assigned

Lynn: Yeah, I don’t mean by like...

Kristen: And technically this question four each of your answers could be a sentence and you could get full credit. For all of these questions you could cut

down the amount you're writing and definitely still hit the important parts [Lynn: yeah] and I think question three will be good. I almost think that question four is really long [Lynn: yeah] so I almost think like this is like... a lot of them said last time they were like on good timing and then the longer questions were at the end so they had like thrown off their timing

Kristen, Lynn, and Sarah all partook in the conversation and noted the pros and cons of attempting to shorten the questions. Kristen made a comment about timing based on what students “said last time,” which led into a lengthier conversation about the ordering of the questions and whether or not it would be beneficial to provide students with the longer questions first.

Both Dr. Cell and the UTLAs noted the value in having the UTLAs review the exams before students took them. In the final interview, Dr. Cell stated “...they picked up a bunch of things, some things I thought were super obvious they said they thought would be difficult, and some things that I thought would be difficult they thought were super obvious.” The UTLA Lynn reiterated a similar point in her interview, “... cause we've taken exams so we can sort of think from the view of a student how a student could see it...but she doesn't like expect us to do it it's not like 'you have to look over these exams' we're just all like...we all want to make the exam as understandable as possible.” They both recognized that UTLAs provided a valuable student perspective on the exam questions.

Dr. Genetics and her UTLAs did not discuss drafts of her exams as a group in person. Rather, she sent each exam to one or two UTLAs and gave them the opportunity to review the exam and send questions or comments back via e-mail. She

approached different UTLAs for each exam in order to spread out the extra effort required by this task, and was always clear that reviewing the exams was optional dependent on their time and interest. After agreeing to review the exam, the UTLAs would respond via e-mail with a list of questions or comments, typically related to confusing wording. For example, in his response about the first exam, Brian wrote “Prompt confused me at ‘You make an F2 cross’ - at least it initially made me think of crossing the F2 to themselves...I would delete ‘You make an F2 cross’ and just start Question 21 with ‘In the F2 generation.’” In her response, Dr. Genetics noted that she would apply Brian’s suggestion. Dr. Genetics highlighted the value of their perspective in an interview, “...and they've got a great perspective on what the students may or may not know or how they might read things that might be different from what we intend. So, they're a great resource on that stuff.” The UTLAs said in interviews that they appreciated the opportunity to help.

In interviews, both the Cell Biology and Genetics UTLAs repeatedly noted a large part of their role was providing feedback on logistics, course format, and instructional materials. They also frequently commented on Dr. Cell’s and Dr. Genetics’ openness to hearing and applying that feedback. Faith, a Genetics UTLA stated

But I do really like how she always asks for our opinion... like what do you guys think about this do you have any ideas for how to make this better, improve this or something. And she’s not just like asking ‘cause she wants to be nice she actually uses those ideas...so yeah I think she does a good job of

like having you ...of like respecting your ideas and having you be a part of making this course better.

Similarly, Kristen mentioned, “she definitely wants to hear she definitely enacts changes so like it also doesn’t feel like were just telling her things and she doesn’t care like she definitely will actually make changes based on what we say and values our opinions.” The UTLAs’ feeling that their ideas were valued likely contributed to their willingness to provide feedback in this way.

### **Student Attitudes and Behaviors**

Beyond feedback on logistics, activities, and exams, UTLAs regularly provided insight into student perceptions and feelings about the courses, student behaviors in and out of class, and the possible impact of student attitudes on their performance. When Dr. Genetics started the meetings by asking how the previous week went, sometimes the UTLAs would respond by describing students’ behaviors or feelings towards an activity. For example:

Dr. Genetics: How was this week?

Group: Good

Dr. Genetics: Good start yeah? How were Bendaroos? Did you guys use them very much?

Gabby: Mmhm

Heath: Yeah

Dana: My students actually liked them



Dr. Genetics: Ok? They liked them?

Heath: Yeah. My students liked them

Dr. Genetics: I find that it's really variable between sections and between semesters.

Gabby: Last year didn't like them

Heath: Yeah last year some people stared at me and I was like you don't want to do this do you?

Dr. Genetics: ha ha ha well that's fine. Yup, ok well good.

Dr. Genetics asked the UTLAs about their experience using Bendaroos (manipulatives that bend, twist, and stick together to create 3D models) with the students, and they responded by sharing that their students liked them. Although this type of feedback might not be helpful in terms of catering the course towards the current students, Dr. Genetics took this feedback into account for future semesters.

Similarly, the Cell Biology UTLAs shared information about students' reactions to certain activities with Dr. Cell. In this case, the UTLAs shared when students had more negative feelings:

Kristen: Yeah people had a lot of negative thoughts about that worksheet...they're like I literally don't know what to do I don't get it...

Dr. Cell: Wow! Ok I didn't realize there was such a negative response.

Thanks for that feedback.

Other UTLAs agreed and then they discussed as a group why students were so frustrated by that specific assignment. Dr. Cell's response shows that Kristen's insight was new information for her, and by explicitly thanking Kristen she

demonstrated that she appreciated this kind of information. In an earlier meeting, when discussing another homework assignment that students struggled with, Kristen shared "...there was many a times I did these homework assignments very frustrated and feeling very lost so I totally understand where they're coming from." Later on in the semester, when Dr. Cell required her UTLAs to make suggestions for assignment revisions as part of the pedagogy seminar, Kristen reworded the worksheet to potentially alleviate some of the students' frustrations.

When discussing student performance on an exam, the Cell Biology UTLAs helped Dr. Cell to understand how student attitudes and behaviors might be impacting their performance. Based on her interactions with students, Kristen shared, "I don't think they studied the activities enough even though we told them a lot 'study the activities.' I don't think they did. I think they were like 'oh I'm just gonna go through the slides.' At least that's what people told me they did." Later on in the conversation, Ann made a suggestion for what Dr. Cell could do to address the behavior: "I think most of them are concerned more so about the grade and not more about what they're learning and I think if you kind of switch the emphasis to be like look like you guys are going to do well in this class if you like actually try to understand the information and engage with it as opposed to trying to memorize and get to the exam." Dr. Cell took note and made sure to explicitly address the behavior with students in class following this meeting.

The activities that the Cell Biology UTLAs completed in the pedagogy seminar provided opportunities for them to share information about student attitudes and expectations. To supplement a discussion about student expectations and mindset,

Dr. Cell required the UTLAs to interview a student or a few students in the course and ask them questions about their expectations and perceptions of the course. In his written account of the student interview he conducted, Gabe wrote:

The second part of [the student's] response that stood out to me was how she preferred traditional lecture over the current course format. She found that it was difficult to connect the lectures to the activities, and that all the assignments and activities were hard to keep track of...As someone who tends to stress about deadlines and missed assignments, I can also understand the feeling of being overwhelmed by all the different due dates. It isn't the first time I've heard about this issue from a student.

In this response, Gabe pointed out a frustration that a student had with the course, and confirmed that, as a student, he understood the frustration and noticed other students feeling similarly. When asked about his perception of the UTLA role in an interview, Gabe explicitly mentioned that he felt a large part of his role was to “provide feedback to Dr. Cell about how the course is going and help communicate any concerns the students might have to her as well...because as students we've been there before. We know it's a struggle. We know that sometimes it might seem like a lot of work or things seem like they're not working so that's something we can communicate to Dr. Cell.”

The UTLAs occasionally came to Dr. Cell and Dr. Genetics with information about specific students. UTLAs for both courses brought up who came to office hours and summarized the conversations for the instructors, especially when they felt there was a concern about a specific student's performance in the course. The Genetics

UTLA, Brian, told Dr. Genetics about a student who wasn't completing the in-class assignments and the reasoning why:

Brian: I had a student tell me this week he hadn't done any of the lecture worksheets because he can't find a group and he wants to do it alone and I said I don't think that's allowed.

Dr. Genetics: Yeah so I mean I've gotten a couple of emails from people like this...it's a little bit hard for me to understand...I mean I know the class is large but my hope was that people would sit and turn to the person next to them in discussion. I would be happy if you guys have great ideas about how to do this better in the future. I think working in groups is really important for these worksheets because the questions are meant to be kind of thought provoking even if they seem relatively simple...so I'm not interested in letting people work alone routinely.

Dr. Genetics' response showed that she was interested in hearing the UTLAs' suggestions for solving the problem, and that she was having a difficult time understanding the issue from her perspective. She also provided a rationale for why she wouldn't change the policy, so the UTLAs could communicate that reasoning to students.

The UTLAs for both courses played an important role of communicating issues that students might not share directly with the instructor and helping both students and instructors see the other's point of view. In his interview, Brian brought up how the student who wasn't completing the lecture worksheets might not have gone directly to Dr. Genetics to share his concern: "...like that one student who I said

he couldn't find a group at all for his lecture worksheet. I'm sure saying that to Dr. Genetics is kind of more intimidating... but to me I was just like alright I can bring it up to Dr. Genetics.” In an interview, Kristen said something similar about the role UTLAs play in sharing insights about students’ attitudes, behaviors, or expectations:

I think she also likes that we get feedback from the students that we can give to her that they might not necessarily say to her...I think sometimes they're like a lot more open with me about like oh were taking...like class is going too slow or like I don't want to spend so much time on activities or like I didn't think that test question was fair and things like that they probably wouldn't outright say to her so then we can kind of like gather their feedback and like filter it from like what it's like being a student...and like kind of send it up to her when we do think things that they're saying make sense or it's something that I'm hearing a lot from a lot of students

Dr. Cell and Dr. Genetics noted the UTLAs’ approachability as well. Dr. Cell shared in an interview, “...because they're peers, they're going to be a little bit more approachable than I would be to a certain extent...they're also like a first line to hear about when things are going wrong when students don't necessarily want to come to me.” The UTLAs and instructors both recognized that students were likely much more open with the UTLAs than they would be with the instructors and the UTLAs were also able to “filter” the feedback about student behaviors and attitudes that was most relevant to the instructor, from a student point of view.

## Student Ideas and Conceptual Understanding

In addition to feedback on logistics or student attitude and behaviors, UTLAs often shared feedback on how well students were understanding concepts being covered in the course. This feedback came from their experiences working with students in class and in office hours, as well as through grading student work. For example, after grading homework assignments, the UTLAs shared where they noticed students were losing points on the assignment. In the excerpt below, Ann shared with Dr. Cell and the group a question and concept that she noticed students struggled with based on her experience grading an assignment:

Ann: ...there were just people that to me seemed like they didn't get the question like especially like the in vivo question

Dr. Cell: Yeah they struggled with that one

Ann: I think...well honestly, I was one of the victims of this, not when I took the class, but understanding the concept of in vivo versus in vitro, because like I think a lot of people think in vivo just means living and in vitro just means dead so that's how they responded to that question

Dr. Cell: Ohhh

Ann: Yeah so then I was just like look at the answer key or review the difference between in vivo versus in vitro, but for most of the ones I graded that was their main problem

Dr. Cell: Ok well that will help me with the review session. I didn't realize that was a problem!

Ann elaborated by connecting what she noticed about the students' answers to her experiences with that same content. She used both her personal experience and experience working with students to interpret where the confusion was coming from. Dr. Cell noted that the information would be helpful for her review session and she had not realized the issue herself. In an interview at the beginning of the semester, Dr. Cell mentioned "If all the students are coming into their office hours with the same problems then they can tell me and I can use that information to go over problems in class or send out extra help," which confirmed that she was planning to get information about where students were struggling from the UTLAs and use that to make relevant changes to her instruction.

Similarly, at times, the Genetics UTLAs shared information about the concepts that students were finding difficult with Dr. Genetics. In the example below, the UTLAs used evidence of students' questions in office hours to work with Dr. Genetics to determine an appropriate practice problem for the upcoming review session:

Dr. Genetics: So we need a participation problem [passes out printed sheets with the problem to the UTLAs while speaking] um what I brought with me was some extra copies of something I've used in the past in lecture so we can consider this but I am open to something else it's just that this is already made [laughs] so if you like it it'd be great

Brian: I was gonna say at least for office hours this week it was all questions on lac operons

Cara: yeah me too

Dana: yeah

Brian: so [as he looks over the sheet]... actually this is a positive negative  
[inaudible]

Alex: This is good

Dr. Genetics: You like this?

Alex: yeah

Brian: yeah

Dr. Genetics: I like it I've done it in the past as an extra credit in lecture because I think they're so focused on the specific operons right now probably because the worksheet that they have due today but then what they need to think about is those generic operons as well right? And it's all part of the same mental ecosystem. Understanding the generic operons helps you understand the specific ones too.

Alex: Also, I don't know if we would add it on or make sure it's in the review Power Point or whatever but a lot of students deducing what kind of operon it is from like the paragraph like number three on the worksheet. They really struggled with that.

Dr. Genetics: Yeah, so I was thinking about that either in addition to or in replacement to this

Alex: I think in addition to

After Dr. Genetics initiated the conversation, Brian mentioned the concept that he noticed students were struggling with, and Cara and Dana agreed. The UTLAs confirmed that the problem Dr. Genetics had used in the past was appropriate to



review the content that students were finding challenging. Alex suggested an additional concept to review to provide even more support for students. This example demonstrated how the UTLAs not only shared information about what concepts students were having trouble with, but also participated in conversations about what changes to make to instruction in response. In an interview, Alex confirmed, “around exam review time is when we try to figure out what people might struggle with more.”

Often, the UTLAs went beyond sharing and interpreting evidence about student conceptual understanding by presenting suggestions for how the instructor could address areas of struggle. For example, based on their interactions with students in office hours, Kristen and Ann made a suggestion to Dr. Cell about how to better address a topic with students in class:

Kristen: We talked about this in office hours. We were asking them different ways...we had two people come to office hours this week...and we were asking them different ways and like they want to say cholesterol because it's something we talk about but we're like the thing to remember with cholesterol is fluidity buffer

Ann: Yeah that's what I was about to say I feel like you [to Dr. Cell] have to stress to them that cholesterol is a buffer because a lot of people think it's the same thing as just like inserting more fatty acids or I don't know

In this example, Ann builds off of what Kristen said about the discussions they were having with students in office hours, and makes a suggestion for a concept that Dr. Cell should clarify in class to address the students' misunderstanding.

As mentioned previously, both Dr. Cell and Dr. Genetics asked their UTLAs to provide them with feedback on their exams before they gave them to students, and this feedback sometimes included predictions about the ideas students would have in response to certain questions. For example, Lynn and Ann shared their concern about how students without lab experience might interpret a specific question:

Dr. Cell: So, is there a better way to word it?

Lynn: Maybe if you...I guess like I feel like if they don't have lab experience, they'll think that purifying protein means you're getting just a protein so they're gonna think that this is two different forms

Ann: Yeah that's what I was thinking. Before I thought it through.

Dr. Cell: So, what if I said you keep getting two different proteins purified?

Lynn: Yeah

Ann: Yeah

Dr. Cell: Ok

This conversation helped the team to come to consensus about how to improve the wording of the question for clarity, based on how student experiences might influence the way they understand the question.

Several of the activities that Dr. Cell assigned to her UTLAs as part of the pedagogy seminar requirements, such as 'planning out questioning' and 'analyzing student work,' provided structured opportunities for UTLAs to provide feedback on student ideas and conceptual understanding. In this brief excerpt, Dr. Cell facilitated a conversation with the group after the UTLAs had a chance to analyze student work in pairs:

Dr. Cell: Ok who would like to share? So, first what can you tell about their understanding from the question and then what kind of follow up would you have if you saw this person?

Ann: Ok so this is the nuclear transport assignment that they just turned in, and we were looking at the last part because that requires them to like come up with a hypothesis like their own opinion and this person I can tell that they have the general idea but the first part of it is kind of confusing

Kristen: They definitely have some understanding of what's going on, but I think they're trying...I think we needed to kind of talk it out a bit more.

They're putting down a lot of ideas and it's kind of getting a little convoluted

[Dr. Cell: ok] like the idea's there it's just not, I don't know if they 100%

[Ann: yeah like understand it] could regurgitate it like in a concise way. I think it's there they just need to figure it out.

This example shows how the activities and discussions start to move the UTLAs towards unpacking student ideas. However, Ann and Kristen's responses are more focused on evaluating the quality of the student's response rather than discussing the student's ideas. Throughout the transcript, they do not share any evidence from the student's response to back up their interpretation that the student has "the general idea" and "some understanding of what's going on." How does Kristen know the student has "some understanding of what's going on"? What makes the student's idea "convoluted"? The conversation is somewhat limited in terms of truly discussing student conceptual understanding.

There were other examples of UTLAs starting to evaluate the quality or accuracy of student ideas, but not discussing the substance of the ideas (Coffey et al., 2011). In the meeting following a class session where the UTLAs led group discussions with students, Dr. Cell asked, “How did it go?” Kristen responded:

I liked it. Yeah it was fun. I had them like talk amongst themselves at first and I like, they actually like really did it really well. Like I was kind of listening and I was like asking like checking in and seeing how they were doing and every time I would check in they weren't like doing it brief like they were really in depth going over them, so I thought it was like...because you kept coming in and they were still talking and still talking and I was like well there's no point in me cutting them off because I could hear them and like they were going very detailed. And then when we went over it their answers were really good and they asked good questions and they were answering each other's questions pretty well but then if they didn't get it, like I like...I think it went well. It was fun. I think my row got a lot out of it.

Kristen's response shows that she was considering the student's ideas by saying things like “they were going very detailed” and “their answers were really good.” But again, this conversation was a missed opportunity to really dig into the students' ideas. What made their answers or questions good? The discussion of student ideas is, in a sense, more focused on behavior.

Conversations around student ideas and conceptual understanding might be limited by the perception that the instructor and UTLAs already know what concepts

students might find challenging based on experience. In an interview, one Genetics UTLA shared:

So, I think she Dr. Genetics is aware, for the most part, about the topics that the students struggle with because it's like the same every semester. And because she teaches like kind of, she teaches the same content every semester, usually the same structure, same order, nothing drastic changes to where like students would start understanding one topic way more and one topic way less. So, from my understanding, she generally knows that already, but we bring it up in discussion the week after the exam review. We were joking about how no one could do a certain chi square problem. And she hears it but we...again I think it's generally understood because we've all been doing this for more than a semester.

This UTLA focuses on awareness of the “topics students struggle with,” which insinuates that what’s important in terms of feedback on student understanding is for instructors to have information about whether or not students understand a specific concept. The UTLA also seems to believe that instructors can make assumptions about current student understanding based on generalized or past experiences. It is completely sensible to assume that students will generally struggle with the same content as students in the past, and it is responsible teaching to use experience to guide instruction. However, this interview excerpt reiterates a potentially problematic perspective that simple assertions about student understanding, as opposed to considering the ideas of students in the moment, are sufficient to redirect instruction.

## Discussion

The examples presented here support the claim that UTLAs may be able to provide various types of feedback useful for improving teaching and learning, as many others have argued (Fingerson & Culley, 2001; Finn & Campisi, 2015; Gosser & Roth, 1998; Hufford, 2011; Jardine & Friedman, 2017; Talbot, Hartley, Marzetta, & Wee, 2015). This study built upon this previous work by providing actual examples of UTLA feedback, which allowed for a deeper understanding of the content of that feedback and the various ways in which it is valuable in terms of improving teaching and learning. These concrete examples also helped to reveal the ways in which instructors can open up opportunities for UTLAs to provide feedback, what those conversations might look like, and what meeting features might support or constrain UTLA sharing of different types of feedback.

In the two cases I explored for this study, the UTLAs provided feedback about student understanding of content, student behaviors, and student attitudes about the course. The UTLAs also made meaningful, actionable suggestions for course and activity improvements based on evidence and their perspective as pedagogically informed former students in the course. All types of feedback were beneficial in terms of better understanding students and what was going on in the classroom. However, the feedback on student ideas and conceptual understanding most useful to support formative assessment of student learning was limited in that it was more focused on assertions than analyzing student ideas.

UTLAs can assess student understanding, expectations, and behaviors in a way that the instructor cannot because they have recently taken the course. Beyond

just increasing instructor access to evidence about student learning, the examples here demonstrate that UTLAs are able to provide enhanced interpretation of that evidence from the perspective of a student. Additionally, students may open up to them in ways that they might not open up to an instructor; students may feel that they can better identify with the UTLAs and thus may feel more comfortable being wrong, admitting challenges, or criticizing the course. For all of these reasons, UTLA feedback and insight is invaluable to instructors that aim to improve teaching and learning in their courses.

In this study, the UTLAs were also able to make detailed, actionable suggestions for assignment and exam revisions, based on experiences working with students and their former experience in the course. Both Dr. Cell and Dr. Genetics relied heavily on their UTLAs to give them feedback on activities and exams, before and after utilizing them in the course. The UTLAs' suggestions may be valuable to instructors because they were able to interact one-on-one with students to see where students struggled, and they were able to use their prior experience in the class to relate to student struggles and make meaningful suggestions for revisions.

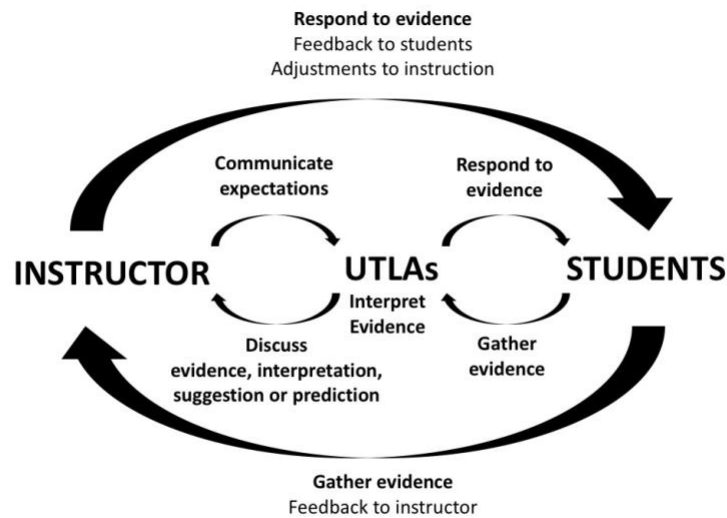
### **Reconsidering the Formative Assessment System Framework**

Earlier in the study, I introduced a normative framework for a UTLA-mediated formative assessment system, based on considering the literature about UTLAs in undergraduate science courses in light of general definitions for formative assessment. This study focused in on one aspect of the framework, the feedback loop

between UTLAs and instructors. Based on the findings from this study, I propose a version of the framework that extends the description of UTLA-instructor interactions. Rather than limit the arrow from UTLA to instructor to “communicate evidence” I felt that it was necessary to highlight that UTLAs did more than share information with the instructor about what was going on in the course. They also shared interpretations and used evidence and personal experiences to make suggestions or predictions. At times, this communication was bi-directional, in that UTLAs and faculty worked together to co-interpret evidence or come up with suggestions and predictions. I made changes to the original diagram (Figure 5.1) to create an updated diagram (Figure 5.2) where instead of “communicate expectations” it reads “discuss evidence, interpretation, suggestion, or prediction.” Since this study only focused on feedback that UTLAs provide to instructors, the rest of the diagram remains normative.

I expand upon the other arrow from instructor to UTLA, communicate expectations, in a previous study (Chapter 4) where I explore how UTLAs are positioned in interactions with faculty. Based on that study, I found UTLAs may be positioned as students, informants, consultants, co-instructors, and co-creators. These positions are tied to different rights and responsibilities for the UTLAs, which may have varying implications for UTLA feedback. I draw further connections between these two studies in Chapter 6.





**Figure 5.2. Updated UTLA-Mediated Formative Assessment System**

### **Feedback for the Purposes of Formative Assessment of Student Learning**

The feedback that UTLAs provided was valuable to the faculty in this study in many ways; however, not all of the feedback was necessarily relevant for deep formative assessment of student learning. For this work, I considered formative assessment to be a process through which evidence of student learning is gathered and teaching and learning is modified in response to that evidence, a definition that is aligned with a long line of education research (Black & Wiliam, 2009; Cauley & McMillan, 2010; Cowie & Bell, 1999; Huhta, 2010; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo & Furtak, 2006). Deep, quality formative assessment depends on gathering, interpreting, and responding to evidence about student thinking (Coffey et al., 2011); but, not all of the types of feedback and examples provided by the UTLAs in this study were related to student thinking. More often, the feedback from UTLAs

was focused on logistics or student behaviors. Thus, feedback for the purposes of deep formative assessment of student learning was limited.

Even when the UTLAs shared feedback on student ideas and conceptual understanding, the evidence they shared was often vague or shallow rather than focused on unpacking student ideas. The examples provided demonstrated how UTLAs began to share information about student thinking, but that the conversations around student ideas were not expanded upon. The UTLAs seemed to believe that asserting whether or not students understood a concept, or reporting on students' ideas about a concept, was sufficient for informing and redirecting instruction. Recognizing the topics that students struggle with and revisiting those topics is not the same as unpacking students' ideas about those topics, interpreting why they might be struggling with those particular concepts, and considering how to redirect instruction to attend to their conceptions. Deep formative assessment should include using details about the substance of students' thinking as a basis for discussion about changes to future instruction (Coffey et al., 2011).

### **Implications: Supporting a Formative Assessment System**

This study helped to elucidate factors that might support or constrain UTLA sharing of useful feedback with instructors. First and foremost, faculty working with UTLAs should both implicitly and explicitly communicate that they are interested in and appreciate UTLA feedback. Both Dr. Cell and Dr. Genetics established norms for openness by asking and thanking UTLAs for feedback. They also showed UTLAs

that they respected and valued their insight and perspectives by applying their feedback. In a previous study (Chapter 4), I explored the different ways that UTLAs might be positioned in interactions with faculty and discussed the outcomes of different positioning. For a feedback loop to function, UTLAs must be positioned so that their established rights and responsibilities include providing feedback to instructors. Also, positioning UTLAs in different ways might allow for different types of feedback, such as positioning UTLAs to provide evidence versus positioning them to provide suggestions.

Faculty must also keep in mind that UTLAs may be resistant to share feedback because it deviates from the traditional divide between teacher and student (Shor, 1992). Open communication between faculty and UTLAs requires reconsideration of traditional ideas about student and faculty roles and power. Students and faculty both hold assumptions about power, and these assumptions can impact the ways in which they interact (Cook-Sather, et al., 2014). If faculty recognize UTLAs as collaborators (Davenport et al., 2017; Sabella et al., 2016) and members of a community of instructors (Close, et al., 2016), UTLAs may be more willing to provide honest and useful feedback.

It is also important to consider the function that pedagogical training and support might have played in the quality, substance, and frequency of UTLA feedback in these cases. In Case 1, the pedagogy seminar was purposefully designed to provide significant structures and cues to encourage the UTLAs to gather and communicate some of the types of feedback seen in the data. Like other models in the literature (Gafney & Varma-Nelson, 2008; Otero et al, 2010), the seminar focused on

UTLAs guiding, using probing questioning, and eliciting student ideas. In this study, activities such as the “UTLA-student interview” and “analyzing student work” proved to be useful for gathering and communicating evidence about student behaviors and student learning. Asking UTLAs to revise instructional materials was also very useful for improving course assignments because it provided UTLAs with a structured opportunity to share actionable suggestions for assignment revisions and required them to use evidence to defend their suggestions.

For Case 2, I was not able to observe their pedagogical preparation course, but based on an interview with their pedagogy course instructor, the course focused more on presentation skills and logistical concerns relevant to leading a discussion section. Training on pedagogy and learning theory, especially when catered to the specific discipline, may play a large role in providing UTLAs the necessary skills to interpret student thinking (Jardine & Friedman, 2017; Otero et al., 2010; Philipp et al., 2016; Tien et al., 2004) and programs should consider how well their UTLA pedagogical training is preparing UTLAs to provide insight into student ideas.

Beyond the pedagogical support for Case 1 being designed to encourage feedback, the Cell Biology case was unique in that Dr. Cell was both the Cell Biology course instructor and the pedagogy course instructor. By filling both roles, she could incorporate structures directly into the pedagogy course that would be useful for gathering feedback and she could take advantage of additional time with her UTLAs. This distinct situation was made possible by multiple factors. Dr. Cell was an administrator for the living-learning program, so she could dedicate more time to programmatic needs. Also, more notably, Dr. Cell had extensive experience with

education research and “teacher training” through a previous position in faculty development. It is not typical for science course instructors to have this level of experience with education research, nor is it necessarily feasible, time-wise, for course instructors to also be the ones to support the pedagogical development of their UTLAs. When considering the findings from Case 1, these factors should be taken into consideration.

Although the examples of UTLA feedback from Case 1 were influenced by the course instructor running the UTLA seminar, there are still implications for instructors or programs that may not have the time or resources to lead a similar seminar themselves but are interested in comparable outcomes. Instructors may still allow for and encourage UTLA feedback by purposefully incorporating activities and open discussion into their preparation meetings or digital communication (Davenport et al., 2017). Without carefully designing preparation meeting activities and establishing room for open discussion, instructors may lose out on opportunities to gain valuable insight and feedback from UTLAs.

As mentioned in the discussion, in both Cases, even with strong pedagogical preparation, UTLA feedback on student conceptual understanding was relatively shallow. Limitations on the amount of time UTLAs and faculty had together for meetings may have been one reason that conversations about student ideas were not drawn out. More likely, though, additional time would not solve the issue entirely. These types of conversations are not necessarily second nature, rather, they may require significant training for both the instructor and student on responsive teaching, or in other words, drawing out, interpreting, and responding to student ideas (Levin,

Hammer, Elby, & Coffey, 2013; Levin, Grant, & Hammer, 2012; Robertson, Scherr, & Hammer, 2016). Instructors and UTLAs should frame the conversation around student ideas in ways that move beyond assertions to discussing student reasoning.

### **Future Directions**

This study only began to explore one aspect of the concept of a UTLA-mediated formative assessment system; thus, there are many opportunities for future research in this area. Although complex, it would also be beneficial to study a case, or cases, of the UTLA-mediated formative assessment system in its entirety. Meaning, how do all of the feedback loops and communication channels between UTLAs, instructor, and student interact and influence each other? Besides feedback that the UTLAs provided based on their prior experiences, most of the feedback from UTLAs to instructors was based on their interactions with students. So, studying UTLAs' interactions with students and noting which information does or doesn't make it back to the instructor, or how certain information is translated or interpreted by the UTLAs before it is communicated, would help to better understand the system. Also, the end goal of formative assessment is to modify teaching and improve learning in response to feedback. Thus, studying if and how instructors apply feedback provided by UTLAs and the potential impact of those modifications is imperative to understand outcomes of the formative assessment system.

Future research could also consider how pedagogical training and pedagogy course instructors fit into the system or influence the system. In terms of better

understanding the UTLA role in formative assessment of student learning, future research could investigate more thoroughly the outcomes of different pedagogy course activities, assignments, and discussions and the impact they might have on the UTLA ability to attend to student ideas. Beyond pedagogy course curriculum, a complete understanding of a formative assessment system may require consideration of whether and how separate pedagogy course instructors interact and communicate with the science course instructors. It is possible for UTLAs to regularly discuss evidence relevant for formative assessment of student learning in a pedagogy course, but the discussion could easily end there and never make it back to the science course instructor, to whom the information is most relevant.

Also, this study only considered two UTLA contexts, in one discipline, at one university, so utilizing the framework to study other contexts is necessary to better understand its applicability across contexts. Additional exploration the UTLA-instructor feedback loop in a variety of contexts could help to better understand how different factors might impact the system, such as variance in UTLA pedagogical preparation, variance in UTLA roles, and variance in the nature of UTLA-faculty interactions and relationships. This research was meant to be exploratory; thus, there are copious ways to expand our understanding of UTLA-faculty interactions and a UTLA-mediated formative assessment system. I hope to continue with this line of research in my future work, and I hope that others that work with UTLAs in a variety of contexts provide their insights as well.

## **Chapter 6: Conclusions**

### **Summarizing the Research**

In this dissertation, I offered new ways to conceptualize the role of UTLAs in undergraduate science courses and provided empirical evidence to better understand UTLA-faculty instructional partnerships. This research was grounded in the notion that integrating UTLAs into undergraduate science courses, or undergraduate courses in general, is valuable for teaching and learning in many ways. Decades of national reports and research argue for an increased focus on active, student-centered learning in undergraduate instruction, both in science (American Association of the Advancement of Science, 2011; Freeman et al., 2014; National Research Council, 1996, 1999, 2003, 2009, 2012; National Science Foundation, 1996; Springer et al., 1999; Wood, 2009) and more generally (Barr & Tagg, 1995; Kuh, 2008; Kuh et al., 2010). UTLAs help to facilitate these more active learning environments through peer-to-peer learning (Cox, 2001; Gafney & Varma-Nelson, 2008; Otero et al., 2010) and research has demonstrated a variety of benefits for students in UTLA-supported courses (Knight et al., 2015; Otero et al., 2010; Preszler, 2009) and for UTLAs themselves (Jardine & Friedman, 2017; Tien et al., 2004). A major reason UTLA supported courses are so effective is that UTLAs can provide instructors with valuable feedback to improve teaching and learning (Fingerson & Culley, 2001; Finn & Campisi, 2015; Gosser & Roth, 1998; Hufford, 2011; Jardine & Friedman, 2017; Talbot, Hartley, Marzetta, & Wee, 2015).



My research went beyond studying outcomes of UTLA-supported courses to studying the processes and interactions behind those outcomes, which was largely missing from the literature. I presented a conceptualization of a UTLA-mediated formative assessment system (Figure 1.5), to support the visualization of all the interactions and feedback loops between instructor, UTLA, and student in courses supported by UTLAs. Other researchers have characterized UTLA-faculty partnerships and noted that types of collaboration and communication vary (Davenport et al., 2017; Sabella et al., 2016). However, previous research did not look closely at the interactions between UTLAs and faculty at the level of moment-to-moment UTLA positioning or consider what exactly the “useful feedback” that UTLAs provide was about. Therefore, to offer a more comprehensive understanding of UTLA-faculty partnerships and UTLA feedback, I focused in on one aspect of the formative assessment system, the UTLA-instructor interactions, and asked: How are UTLAs positioned and what feedback do they provide?

In order to answer my research questions, I conducted in-depth qualitative case studies of UTLA-faculty instructional partnerships for two introductory biology courses over the course of an entire semester. Over the Fall 2018 semester, I attended all of the meetings between UTLAs and faculty and collected field notes and audio recordings. In addition, I interviewed the faculty instructors and UTLAs, gathered e-mail communication, and collected additional documents, including syllabi, meeting guides, and UTLA written reflections. I conducted initial data analysis throughout the data collection process; I transcribed all audio recordings by hand, wrote memos regularly, and brought my early interpretations to research group meetings. At the

conclusion of the semester, I compiled all data sources and added them to NVivo 12 for more systematic qualitative analysis. I applied an open constant comparative coding method (Miles & Huberman, 2014; Strauss & Corbin, 1990) to address my research questions. Meeting transcripts served as my main data source, while the additional data sources played a role in triangulation. I attended to issues of validity and reliability through triangulation, member checking, long term observation, peer examination, attention to researcher bias, and overall clarity, transparency, and presenting an explicit chain of reasoning (Merriam, 1998).

In Chapter 4, I investigated “In what ways are UTLAs positioned in UTLA-faculty interactions?” Analysis of UTLA-faculty meeting transcripts, supported by field notes, interviews and written documents, revealed that UTLAs may be positioned in a variety of ways in interactions and communication with faculty instructors, and that positions were fluid, momentary, and contextual. I presented examples to demonstrate how UTLAs were positioned as students, informants, consultants, co-instructors, and co-creators. Chapter 4 included an extended discussion and implications section, but I highlight a few key takeaways here. I hope to have demonstrated that different UTLA positions have different purposes and outcomes, and that collaborative instructional partnerships may involve UTLAs being positioned in a number of ways, as opposed to only as co-instructors or co-creators. At times UTLAs may be positioned as students learning content or pedagogy to support their development and preparation as instructors. A collaborative instructional partnership does not necessarily require that UTLAs and faculty have equal power; rather, UTLAs and faculty should work together to negotiate power fairly and

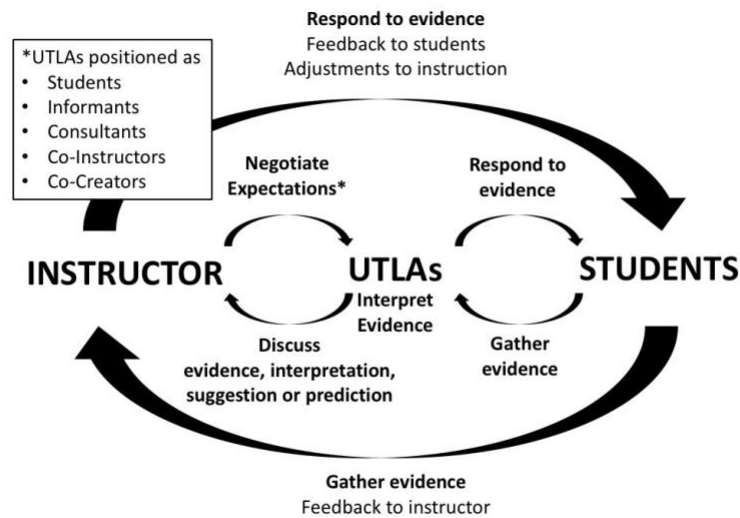
appropriately based on time, experience, ability, and goals in that moment (Cook-Sather, et al, 2014). Considering variety and fluidity in UTLA positioning, and the outcomes of different positions, helps us to understand the complexity and nuances behind what may appear to be more fixed labels or rankings, such as Sabella et al.'s (2016) characterizations of partnerships as mentor-mentee, faculty driven collaboration, and collaborative. Also, while being cautious to make any causal claims, I argued that positioning was impacted by a variety of factors, including but not limited to instructor experience, UTLA role, pedagogical training, and format and structure of UTLA preparation meetings.

In Chapter 5, I considered “What feedback might UTLAs provide to instructors (and how might that feedback support formative assessment of student learning)?” An analysis of UTLA-faculty meeting transcripts and additional written communication over the course of a semester revealed that UTLAs often offered feedback related to course logistics and instructional materials. UTLAs also provided instructors with feedback on student attitudes, behaviors, and perceptions as well as student conceptual understanding. Like Chapter 4, Chapter 5 included a more thorough discussion and implications section related to this question, but I reiterate a few main points here. First, the feedback and insight that UTLAs offer is invaluable and unique for several reasons. They interact with the students in additional ways beyond what the instructor would, in class, in office hours, and potentially informally outside of class in other spaces. Students may be more likely to open up to UTLAs and share things that they might not share directly with an instructor because they can identify with the UTLAs. Also, because UTLAs are still students themselves and

recently took the course, they can provide an informed student perspective, interpret what students are sharing, and make suggestions, and predictions. Second, UTLA feedback was valuable for making adjustments to improve teaching and learning; however, UTLA feedback on student conceptual understanding was relatively shallow, and consisted more of assertions than deep unpacking of student ideas. Thus, feedback was not very supportive of deep formative assessment of student learning (Coffey et al., 2011) or instructional revision in response to student thinking.

Instructors should consider what type of feedback they are asking for from their UTLAs and how often they focus on student learning compared to logistics. Third, UTLA pedagogical training and support can play a large role in providing structured opportunities for feedback and preparing UTLAs to draw out, interpret, and respond to student ideas, and should be designed to support formative assessment of student learning.

Although I explored UTLA positioning and UTLA feedback separately, Chapter 4 and Chapter 5 are highly connected. Considering both UTLA positioning and UTLA feedback simultaneously, I present a more comprehensive diagram of the UTLA-mediated formative assessment system (Figure 6.1) that incorporates the findings from both chapters. The rest of the diagram, outside of the instructor UTLA loop, remains normative; this study did not collect direct evidence related to those interactions (UTLA-student and instructor-student) and I cannot make concrete descriptive claims about what occurs in those interactions.



**Figure 6.1. Positioning UTLAs in a UTLA-Mediated Formative Assessment System**

Both Chapters analyzed UTLA-faculty interactions, but I view Chapter 4 as considering the *how* UTLA-faculty interactions play out and Chapter 5 as considering the *what* is discussed in those interactions. With such an extensive amount of data, it would have been challenging and limiting to try to answer both questions in one paper. However, I see the potential for an additional follow-up question tying the two papers together: Are there noticeable patterns in terms of what feedback is communicated when UTLAs are positioned certain ways? I could approach answering this question more systematically through an entire additional study, which I may do in the future, but I offer some general statements here based on my knowledge of the data. When positioned as informants, UTLAs most often provided evidence related to student behaviors and attitudes or logistics. When UTLAs were positioned as consultants and co-creators, the conversations centered around assignment and exam revision or design, and UTLAs sometimes brought in evidence

of student learning to make informed suggestions. Conversations about student ideas and conceptual understanding were most common when UTLAs were positioned as students learning pedagogy or as co-instructors. Still, these patterns were loosely followed, and I would not argue that a specific way of positioning UTLAs always leads UTLAs to share specific types of feedback.

I knew before beginning this project, but realize even more now, that studying UTLA supported courses is incredibly complicated. The formative assessment system framework that I present demonstrates that there are various points of interaction to consider, and that they all influence one another. Beyond the presented system, which is already somewhat complex, there are so many factors, at many different scales, that might have an impact on the interactions between instructors, UTLAs, and students. In Chapter 4 I discussed how differences in instructor experience, UTLA role, pedagogical training, and meeting format and structure may have impacted the findings and variance between the two cases. However, there are certainly many more factors to consider, some of which might be harder to determine. Based on this research and other experiences working with UTLAs, I have gathered that institutional, programmatic, and departmental requirements and culture; the experiences, goals, and expectations of faculty and students; and budgets may influence UTLA-faculty interactions in different ways. It is beyond the scope of this study to try to map those factors on to the diagram.

## **Additional Considerations and Connections to the Literature**

Earlier in the dissertation, I introduced Cook-Sather, et al.'s (2014) definition for student-faculty partnerships in teaching and learning: “a collaborative, reciprocal process through which all participants have the opportunity to contribute equally, although not necessarily in the same ways, to curricular or pedagogical conceptualization, decision making, implementation, investigation, or analysis” (p. 6-7). I believe that both of the cases that I explored in this research align with aspects of this definition, but in different ways. The instructors and UTLAs repeatedly used the word “collaborative” to describe their interactions, and reciprocity was apparent in that the UTLAs and faculty exchanged feedback, suggestions, and support to improve the teaching and learning process. As the instructors of the course, Dr. Cell and Dr. Genetics were clear leaders, so contributions from UTLAs were not at the same level, but all UTLAs had the opportunity to contribute equally. UTLA-faculty partnerships were much more focused on decision making, implementation, and curricular or pedagogical conceptualization, than on investigation or analysis. UTLAs were not positioned as co-researchers in either case, which may be something to suggest or strive for in the future.

Although this research didn't focus on the personal outcomes of the partnership for the UTLAs and faculty involved, I wanted to highlight that many of the same benefits of student-faculty partnerships documented in the literature were evident in these cases. These UTLA-faculty partnerships created opportunities for more significant student-faculty interactions, which are a key component of effective undergraduate instruction and student sense of belonging (Chickering & Gamson,

1987; Kuh, 2008; Tinto, 1993). The UTLAs also noted a deeper understanding of the challenges and complexity of teaching (Cook-Sather, 2011a). Dr. Cell and Dr. Genetics demonstrated greater understanding of students and continuous reflection (Bovill, 2014b; Cook-Sather et al., 2014; Cook-Sather, 2008, 2011a, 2014; Felten et al., 2013) as well as a sense of excitement with their teaching (Bovill, et al., 2011; Cook-Sather, 2014). These partnerships required faculty and UTLAs to reconsider their assumptions about power and who is “expert” (Delpish, et al., 2010; Mann, 2008). These outcomes demonstrate that benefits of UTLA-faculty instructional partnerships go beyond improving learning for students in the course.

### **Methodological Significance**

This research expands the idea of what methodological approaches are appropriate and valuable in research on UTLAs and student-faculty partnerships, or dare I say in higher education in general. As mentioned in chapter 2, much of the empirical literature on student-faculty partnerships used interviews and/or written reflections to explore partnership features and outcomes (e.g., Carey, 2013; Cook-Sather, 2008, 2009, 2011 2014, 2015; Bovil, 2014; Mchenry, Martin, Castaldo, & Ziegenfuss, 2009), but the literature was missing an in-depth account of what happens between students and faculty in real-time gained through case study and ethnographic methods. Similarly, literature on UTLAs in undergraduate science rarely employed observational or ethnographic methods, and the studies that did studied UTLA interactions with students (e.g., Knight et al., 2015). Besides Davenport and



colleagues (2017), who analyzed video of LA-faculty preparation sessions using an observation tool that they developed, prior to my project, the use of in-depth observation to study UTLA-faculty interactions, especially over an extended period of time, and the extensive empirical examples that are afforded by this approach, were missing from the literature.

By utilizing these types of qualitative methods, this research provided an insider perspective on part of a process: What really goes on when UTLAs and faculty meet? Almost all of the literature on student-faculty partnerships and UTLAs in science courses was focused on outcomes, rather than process. I hope that this research demonstrates the value of looking deeply into what goes on to produce certain outcomes. Not just in this research, but in general, qualitative case study and ethnographic methods are valuable to understand the how and why behind outcomes so that others can best re-create similar outcomes. This type of research certainly requires sacrificing breadth for depth, but I believe depth is necessary to truly understand situations. My hope is that this research demonstrated the value of in-depth qualitative case study, the usefulness of ethnographic methods, and the importance of studying processes in order to understand outcomes in teaching and learning in higher education.

### **Overall Limitations**

This research was limited in various ways. Since this was an exploratory study in an under-researched area, I chose to focus on depth over breadth. With time and

resource constraints as a researcher, I chose to focus on two cases. Although these cases were purposefully chosen and predicted to be information rich (Patton, 1990), I limited myself to choosing cases that I was familiar with and had already developed a rapport. There are many other faculty instructors who work with UTLAs on this campus, let alone at other universities, that I could have chosen to study. Every case is unique and there is much more to be learned from studying additional cases.

In terms of scope, these two cases only begin to cover a range of contexts in which UTLA-faculty interactions happen. These cases were both in introductory biology. Both Dr. Cell and Dr. Genetics are relatively young and female. The Cell Biology course was a particularly unique case in that the course is part of an LLP and Dr. Cell was both the course instructor and pedagogy seminar instructor. Typical UTLA programs do not share either of these features. Also, the UTLAs for both of these cases were in paid positions that involved grading, but many other UTLA programs award credit to UTLAs rather than financial support, and for that reason the UTLAs might not play a role in grading. Some UTLA programs actually recommend against involving UTLAs in grading (Gafney & Varma-Nelson, 2008) to avoid students viewing UTLAs as authority figures. With more time and resources, I would have pursued studying a third case, or even more, in a different discipline, with an instructor of a different identity, or in which the UTLAs had different roles and responsibilities.

Although I employed many strategies to ensure valid and reliable results, validity and reliability was still limited. As a solo researcher, the data collection and analysis were done mostly independently; thus, the research does not benefit from

inter-researcher checks and confirmations beyond several presentations at research group meetings. My prior engagement with the instructors and the courses helped me to engage deeply and establish rapport quickly, but also likely biased my observations and conclusions. In some sense, I felt as if I had to tell a positive story, and I was more likely to look for what instructors were doing to support collaborative partnerships and ignore some of the factors or actions that had more negative effects.

Lastly, this work is limited in that the two cases were chosen as exemplars, in that I knew that I would observe UTLAs providing feedback frequently and that respect, reciprocity, and responsibility would be apparent. The cases do not necessarily represent the “average” UTLA-faculty instructional partnership. This limitation raises the question of whether or not studying exemplar cases is sufficient, or if research benefits more from studying situations that may be more nuanced or demonstrate negative outcomes. As a researcher utilizing qualitative case study methods, I would feel less inclined to study a context if I knew I wouldn’t be able to tell a positive story, especially because it is challenging to ensure confidentiality when doing qualitative case study. However, I must consider what I might be missing out on understanding by avoiding studying the situations that I might have to be more critical of.

### **Practical Implications & Suggestions**

Throughout this chapter and the previous chapters, I presented conclusions and implications, but here I make more concrete practical suggestions for faculty,

educational developers, and UTLAs, based on this research and my experience working with UTLAs and faculty more broadly. In presenting these recommendations, I also want to highlight that despite this work being framed by literature in undergraduate science education, the recommendations are potentially valuable for faculty, educational developers, and UTLAs in other disciplines and more generally.

### **Suggestions for Faculty**

For faculty who are already working with UTLAs in some capacity, I provide suggestions for how to restructure interactions with UTLAs to be more collaborative and beneficial in terms of gaining useful feedback to improve teaching and learning. First, faculty should reflect on how respect, reciprocity, and responsibility (Cook-Sather, et al., 2014) are enacted in their partnerships with their UTLAs. In Chapter 2, I provided a table that defined these constructs and described what they might look like in the context of a UTLA-faculty partnership. Similar to the “Preparation Session Observation Tool” developed by Davenport, et al. (2017), faculty can use this table as a guide or reflective tool.

Faculty should also think carefully about how to set up collaborative interactional norms for meeting spaces. They should consider the tone and word choice used during meetings and whether or not meeting norms communicate the notion of a teaching team. Both Dr. Cell and Dr. Genetics frequently used words that communicated group effort, such as “we,” “us,” and “together,” which likely helped

to create the culture of collaboration that UTLAs described in interviews. Questions that communicate care, concern, and respect for UTLA ideas, such as “how are things going,” “other comments or questions?,” and “does that sound reasonable?” supported an atmosphere of open discussion. Monitoring power dynamics between UTLAs is also important; faculty must be careful not to privilege or marginalize specific voices or treat UTLAs as one collective voice (Cook-Sather, et al., 2014). Without carefully designing preparation meeting activities and establishing room for open discussion, instructors may lose out on opportunities to gain valuable insight and feedback from UTLAs.

The formative assessment system framework I have presented can help faculty to think about the types of feedback they get from their UTLAs and how they can communicate and negotiate expectations for more substantive discussions relevant for formative assessment of student learning. Overall, faculty should work with their UTLAs to develop clear expectations for what the instructional partnership should look like, and the intended outcomes for UTLAs, faculty, and students.

Faculty that are not already working with UTLAs in their courses, but are interested in integrating UTLAs to support more student-centered learning, should take the time to consider how they will position UTLAs in interactions and how much they will involve UTLAs in instructional decisions and conversations. Faculty should not impose partnerships on students (Tabak, 2012) or “use” UTLAs solely for their benefit (Fielding, 2004; Fine et al., 2007; Lodge, 2005). They should think through the goals and intended outcomes for everyone involved, including the UTLAs, and provide UTLAs with appropriate support and mentorship. This research demonstrated

that the way UTLAs are positioned by faculty impacts the outcomes of those interactions and that when positioned in certain ways, UTLAs can provide invaluable insight and feedback. UTLAs should not just be recruited with the sole purpose of helping faculty implement more active learning, but they should be considered as part of an instructional team.

### **Suggestions for Educational Developers**

Although some faculty take on establishing instructional partnerships on their own, educational developers play a large role in establishing UTLA programs, supporting faculty that work with UTLAs, and providing pedagogical training for UTLAs. Thus, they should consider both how they are supporting faculty and how they are supporting UTLAs. Educational developers can support instructional partnerships between UTLAs and faculty by talking with faculty about how they are positioning UTLAs in instructional partnerships using the frameworks I have presented here and the outcomes of this research. Developers can also play a role in holding faculty accountable for meeting regularly with UTLAs and encouraging faculty to involve UTLAs in the instructional process. Educational developers may even create spaces for faculty and UTLAs to get together and facilitate conversations between faculty and UTLAs. Much like UTLAs create bridges between faculty and students, educational developers can create bridges between faculty and UTLAs.

Beyond supporting more fruitful and collaborative interactions between UTLAs and faculty, educational developers play an important role in developing and

running pedagogical support and training for UTLAs to best fulfill their roles. Instructors working with UTLAs are not necessarily pedagogical experts, like Dr. Cell was, and may not feel adequately prepared to lead pedagogical training for UTLAs. Even if they were, leading a pedagogy course requires extra time and can be hard to maintain. Throughout my doctoral program, I have co-led and led several different pedagogy courses, including one specific to Organic Chemistry, the pedagogy seminar for the ILS LLP, and a more general course for UTLAs across disciplines offered through the Teaching and Learning Transformation Center (TLTC). I argue that pedagogical preparation focusing on facilitating student discourse and formative assessment helps UTLAs provide more meaningful feedback, both to instructors and to students. The quality and substance of pedagogical support available to UTLAs depends on a number of factors, including program, department, and institutional resources, educational expertise, and time.

When it comes to pedagogy course design and implementation, there are certainly tradeoffs related to how general versus specific the focus, the number of UTLAs enrolled, and topics covered. Larger UTLA preparation courses with greater institutional support, such as the peer mentor program at TLTC, benefit the campus greatly because they provide pedagogical support from education experts to a large number of UTLAs and allow for more UTLA-supported courses in departments or programs that don't have the expertise or resources to run their own pedagogical training. However, in scaling, programs become more generalized and removed from the classroom, with less focus on discipline-based education research or discipline specific pedagogical knowledge. This generalization in pedagogical training might

limit how well UTLAs are prepared to implement reformed pedagogy or engage in formative assessment of student learning in their discipline. The ILS LLP studied here was able to develop and offer an individualized pedagogy seminar, taught by the course instructor herself, because of additional resources available to the program, which is not typical. Still, programs with particular values and goals should consider how to provide UTLAs with discipline-specific and role-specific preparation and practice to ensure that UTLAs develop knowledge and skills necessary to best support student learning. Educational developers must consider: What are we sacrificing when we scale up and generalize UTLA preparation? How do we make up for those sacrifices? Who is responsible for providing UTLAs with more discipline specific preparation?

### **Suggestions for UTLAs and Future UTLAs**

I sincerely hope that this work also helps UTLAs recognize the valuable role they play in improving teaching and learning through working with students and sharing their insights and perspectives with faculty. I encourage UTLAs to engage with students and build rapport so that students are more likely to share their honest feelings and admit where they might be struggling. In working with faculty, UTLAs should feel empowered as instructional partners and ask in what ways they can get involved in the instructional process. UTLAs should choose to work with faculty who respect their opinions and challenge those that aren't open to receiving feedback or collaborating.



## **Moving Forward**

### **Future Research Directions**

I look forward to continuing to research UTLA-faculty interactions and the role of UTLAs in improving teaching and learning more generally. I described specific future directions at the ends of Chapters 4 and 5, where I essentially stated that with ample time and resources, I would hope to explore similar questions to those that I explored in this study, but in different contexts, in order to confirm, contradict, and expand upon these findings. More generally though and without studying additional cases in-depth, I am interested in seeing how what I have learned through this research might apply to different contexts. Through surveys, observations, and interviews with UTLAs, faculty, and students in a variety of contexts (including outside of science), I would hope to gather a broader sense of where, when, and how UTLAs might be positioned in the ways described in this study, if UTLAs in other contexts provide similar types of feedback, and what other factors might impact UTLA-faculty instructional partnerships. I am also particularly interested in the impact of different forms of pedagogical preparation on UTLA positioning or UTLA feedback.

In addition, I believe that it is important to engage UTLAs themselves in this research and I wonder what questions they might be interested in exploring. I am interested in working with UTLAs as co-researchers (Werder & Otis, 2010) in any or all steps of the research process, including data collection, analysis, and writing about their interactions with faculty and students from their perspective. UTLAs could play

an especially important role in studying UTLA-student interactions and their outcomes, perhaps by conducting peer observations, collecting video or audio data of each other working with students, or surveying and interviewing students.

### **Future Practical Applications**

As an educational developer, I plan to apply what I have learned here to my work with both faculty and UTLAs. I have already been able to apply some of what I have learned through my research to my work with the TLTC's peer mentor program. For faculty, I have helped to develop an online community platform that includes guidelines to help instructors reflect on their level of collaboration and communication with UTLAs at various points in the semester. For example, I provided guided questions that pair with topics being covered in the pedagogy course that their UTLAs are taking and encouraged instructors to help UTLAs collect mid-semester feedback. More broadly, I am working on establishing instructional partnerships as a programmatic expectation. I have also introduced the UTLAs to the formative assessment system framework in our pedagogical training and asked them to consider the various ways they communicate evidence, interpretations, suggestions, and predictions to the faculty they work with. In the future, I hope to develop even more structured support for facilitating UTLA-faculty partnerships and encourage similar programs on this campus and other campuses to do the same. I recognize that as an educational developer, with insight into UTLA-faculty interactions, I play an important role in facilitating more meaningful interactions.

I close this Chapter, and the entire dissertation, with an anecdote that I believe truly captures my longstanding interest in students as instructional partners. When introducing me, Dr. Cooke will often tell others about our history working together over the last decade. When he tells our story, there is one particular part of his story that stands out to me. He always mentions one student in the class that I worked with back when I was a UTLA in 2010 that raised his hand and said, "You could do this better." Then, Dr. Cooke proudly describes how he changed the activity based on the student's suggestion. When I think about all of my experiences with various undergraduate science faculty, especially Dr. Cooke, I am continually impressed by the openness, respect, and trust that some of these faculty have for students. I hope that going forward my research will add to the literature in valuable ways, but more importantly, that it will encourage faculty to trust and respect undergraduates as instructional partners. Everyone benefits when we narrow the divide between faculty and student.

## **Appendix A: Syllabus Components for Teaching and Learning in the Life Sciences, the Case 1 Pedagogy Course**

### **Course Description**

This course is meant to guide and support the undergraduate teaching assistants (UTAs) for the Integrated Life Sciences (ILS) honors living-learning program. UTAs will develop a greater understanding of teaching and learning in the life sciences, with a focus on the academic values of ILS, by exploring education research and theory, discussing learning strategies and techniques, and reflecting on their practice.

### **Course Goals**

#### **Teaching Skills and Strategies**

UTAs will become reflective, collaborative practitioners who are skilled at applying theory to practice. They will understand and utilize various pedagogical techniques for helping students develop more sophisticated ways of engaging in life sciences content.

#### **Metacognition**

UTAs will use the experience from an alternate perspective to develop an awareness and understanding of their own thought processes and what learning strategies they can apply to their own learning.

#### **Informed ideas about teaching and learning**

UTAs will engage in discussion around teaching and learning, gain an understanding of the nuances of teaching from the perspective of the instructor as well as education researchers, investigate teaching and learning systematically and scientifically, and explore their interest in teaching.

### **Course Objectives**

Throughout and by the conclusion of the course, UTAs will:

- Analyze and evaluate claims from research literature related to active learning, learning theory, and how students learn in the life sciences
- Apply ideas from discussions and literature to teaching in the context of the UTA role
- Develop facility with figuring out if students are learning and understanding (formative assessment practices)
- Reflect critically on their own teaching and the UTA experience, with a focus on addressing student issues related to both content and mindset

Type of assignment	Points per assignment	Number of assignments	Total points
Reading Responses	10	5	50
Activities	5	7	35
Final Reflection	15	1	15
Total			100

### Calendar—Subject to Change

Week	Topic & Activities	Assignments Due
<b>1</b>	Introductions; Goals and Expectations	
<b>2</b>	UTA Role; What makes good UG education?	<b>Reading response #1:</b> Chickering and Gameson, AND either Wood, 2009 OR Doyle Chapter 4.
<b>3</b>	Questioning vs. Explaining	<b>Activity #1:</b> Planning Out Questioning
<b>4</b>	Active learning	<b>Reading response #2:</b> “Are lectures unfair”
<b>5</b>	Student Ideas	<b>Activity #2:</b> Analyzing Student Work
<b>6</b>	Feedback/Formative Assessment	<b>Reading response #3:</b> Cauley & McMillan, 2010
<b>7</b>	Reflection as a Tool for Learning	<b>Activity #3:</b> Mid-Semester Self-Reflection
<b>8</b>	Designing a lesson	<b>Activity #4:</b> Lesson plans
<b>9</b>	Student Attitudes, Motivation, and Mindset: Effects of Student Expectations	<b>Activity #5:</b> Share lesson plans
<b>10</b>	Student Attitudes, Motivation, and Mindset: Learning Goals vs. Performance Goals	<b>Reading:</b> Dweck Video <b>Activity #6:</b> Student interview
<b>11</b>	Metacognition, Learning Strategies, and Self-Regulated Learning	<b>Reading response #4:</b> Sebesta & Speth, 2017
<b>12</b>	Exploring Issues in STEM Education	<b>Reading response #5:</b> your choice!
<b>13</b>	UTAs as a Mechanism for Improving Instruction	<b>Activity #7:</b> Revising Instructional Materials
<b>14</b>	Reflecting on Our Growth as Teachers and as Learners; Final wrap-up	<b>Final Self-Reflection</b>

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## **Appendix B: Interview Questions for Faculty Instructors**

### **Prior to start of semester:**

1. What role do UTLAs play in your course?
2. What are your expectations for your UTLAs?
3. What do you think the UTLAs expect from you?
4. How long have you had UTLAs supporting your course?
5. How do you structure your meetings with UTLAs? What do you see as the purpose of those meetings?
6. When, where, and how do you communicate with UTLAs? What information do you share with them? What do they share with you?

### **At the end of the semester:**

1. How do you think this semester went?  
For Dr. Cell: Considering it was first semester teaching the class  
For Dr. Genetics: How did it compare to previous semesters? Considering all UTLAs were returners and you were teaching the lecture course as well as coordinating discussion, and the group was smaller?
2. How do you feel the UTLA preparation meetings went?  
For Dr. Cell: How was teaching the pedagogy course along with working with those students? What do you think might be the pros and cons of you filling both of those roles?
3. How do you feel about your UTLAs' performance with students this semester?  
For Dr. Genetics: You seem to have spent a great deal of time debriefing mid-semester feedback with them—how do you think they took to that?
4. How would you describe the nature of your relationship with your UTLAs this semester?
5. Were you surprised by anything this semester?

## **Appendix C: Interview Questions for UTLAs**

1. Tell me about your yourself...what is your year/major? What made you choose to be a UTLA? What do you like/not like about it?
2. How would you describe your role as a UTLA for this course? What do you think the instructor expects of you? What do you think students expect of you?
3. Tell me about the UTLA preparation meetings. What do you see as the purpose of these meetings? What do you gain from these meetings?
4. How would you describe your relationship with the instructor? How well did you know the instructor before being a UTLA?
5. (If not already addressed in previous questions): When, where, and how do you communicate with the course instructor? What is that communication like? What information do you share with the instructor?



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