GRADUATE STUDENT INSTRUCTOR COMMUNITIES OF PRACTICE: SUPPORTING LEARNING AND VALUE CREATION FOR NOVICE INSTRUCTORS IN HIGHER EDUCATION

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ABSTRACT

GRADUATE STUDENT INSTRUCTOR COMMUNITIES OF PRACTICE:

SUPPORTING LEARNING AND VALUE CREATION

FOR NOVICE INSTRUCTORS IN HIGHER EDUCATION

GINA M. NABOURS

Graduate Student Instructors (GSIs) are an integral part of the higher education system. Their presence causes a substantial impact on undergraduate student learning, making supporting GSI learning and growth as educators a focus of anyone tasked in supervising their instruction and charged with the success of the undergraduates they teach. Numerous studies have focused on a variety of GSI-related factors in an effort to better understand this unique demographic of educators. This study extends this research by using a situated learning framework (Lave and Wenger, 1991) involving communities of practice (CoPs) and value creation (Wenger et al., 2011) to determine the activities and experiences that most influence GSI professional learning, patterns that exist in these activities and experiences, and how they influence value creation within two GSI CoPs. Twenty-nine GSIs studying mathematics, statistics, or mathematics education participated in the study and provided data through multiple surveys and interviews. The GSIs mentioned 71 activities and experiences that were analyzed. The data suggest that supportive interactions significantly influence the professional learning that occurs within a CoP, the intended purpose of the CoP plays a role in the type of value GSIs place on their professional learning within a CoP, and there are distinctions in how first-and second-year GSIs create value for their professional learning within a CoP. I conclude with recommendations for both practitioners and the research community.

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Dedication

To Ethan, Cannon, and Riley – may you always be inspired to work hard and accomplish any goal you set, regardless of how lofty it may be.

I hope my “doctor kit” makes you proud.

Chapter 1: Introduction

Graduate Student Instructors, better known as GSIs, have been described as "a necessary evil" (Mackertich, 1970, p. 223) in the university system for decades, despite being part of higher education in the United States since as early as 1876 (Chase, 1970). This ill-fated depiction is due to the fact GSIs often enter the classroom with little to no formal training in education yet serve as a vital, cost-saving mechanism when staffing university classes and labs. Mackertich (1970) argued if "given unlimited funds and unlimited qualified manpower [the university system] would do away with [teaching assistants] altogether and simply have fully trained professors teach students" (p. 223). This quote epitomizes the difficult balance that must be found in the university system between providing a financially accessible education to a large number of students while simultaneously funding instructors who possess high-quality teaching abilities. While Mackertich made this comment in 1970, this sentiment still holds true in more recent years, illustrated by the claim from Nicklow et al. (2007) that there is a massive disconnect between the responsibilities we continue to assign to GSIs and the investments we make in their preparation. My own experience with GSIs exposed a need to examine how universities can support these instructors in an effort to help them become more effective educators.

I began working closely with GSIs in August 2017 when I became the coordinator of a highly coordinated course in my department, a course distinction given due to the large number of GSIs assigned to teach it and the extensive guidance and supervision that was therefore necessary. In my role, I was tasked with supporting the teaching of between eight to 16 GSIs each semester. I had high expectations for the effort my GSIs would put into their

instruction, in part because I was trained in secondary mathematics teaching and have strong opinions about how to support students in a mathematics classroom. I found myself frustrated with the lack of interest in teaching exhibited by many of the GSIs I supported. Wheeler et al. (2015) claimed apathy toward teaching is not unique amongst GSIs in science, technology, engineering, and mathematics (STEM) fields. This disinterest may be due to the fact that many STEM graduate students are more likely to seek out assistantships in research, leaving those who did not make the cut for highly sought-after research assistantships accepting teaching assistantships for the sole purpose of funding their own graduate education. My personal experiences with GSIs drove me to pursue research regarding how to best support these novice instructors in their teaching efforts.

I felt if I could help GSIs become better educators, it would serve the dual purpose of supporting them in becoming part of the academic community while also promoting better experiences and greater success for the students who were enrolled in the courses GSIs taught. Student success and retention are vital goals in post-secondary education. If GSIs are used to meet the demand for teaching lower-level collegiate courses, university administrators and faculty tasked with student success must determine ways to support the learning and development of GSIs as educators. While there are a variety of ways to accomplish this task, examining how GSIs learn through their participation in Communities of Practice (CoPs), a specific type of situated learning, may be a viable way to track the learning and development of GSIs throughout their time as university instructors.

Theoretical Framework

Situated learning theory posits that learning is a fundamental characteristic of human nature and is inherently experiential and social (Wenger, 1998). Wenger (1998) asserts this social perspective on learning is "first and foremost the ability to negotiate new meanings" (p. 226), and this ability is developed through practice and within communities. In other words, learning occurs through doing and working with others in order to process one's own actions and associated outcomes. Examining GSI learning through a situated learning lens is appropriate because GSIs gain knowledge and skills to become teachers while they are simultaneously being tasked to teach. In other words, GSIs are assigned to be primary instructors of classes while at the same time using prior and present experiences to negotiate what it means to fulfill their teaching duties effectively. One way in which GSIs negotiate the meaning of moving from being a student themselves to being an instructor is through their participation in different CoPs.

There are three characteristics that must be present within a group in order for it to be considered a CoP: (1) domain, (2) community, and (3) practice (Wenger-Trayner & Wenger-Trayner, 2015). Domain constitutes the area of interest that makes the group come together. A commitment to the group's domain is necessary for membership within the CoP. There may be multiple domains that bring GSIs together to form a CoP. For one, they are all involved in the unique experience of teaching while pursuing their own graduate studies. This experience sets them apart from other graduate students who can focus solely on obtaining their degree. Smaller CoPs may also form based on the domain established by the specific courses GSIs are assigned to teach.

The community element of CoP refers to the group of people who are interested in the domain and interact with one another regarding it (Smith et al., 2017). GSIs in the present study are members of a professional learning CoP, led by a faculty member who serves as the department's GSI coordinator. This coordinator focuses on the overall development and support of GSIs as they balance their teaching and graduate student roles. GSIs in this study are also members of course-specific CoPs in which the community consists of GSIs (either novice or intermediate) assigned to teach the course, a course-specific coordinator, and, occasionally, faculty members who also teach the course in a given semester. These CoP members work together as a community to develop an understanding of favorable teaching practices and administrative responsibilities specific to each course.

Finally, practice describes the resources the group develops, whether these are tangible items to be shared among each other or norms that assist in the understanding of routines within the group. The act of coming together and sharing experiences with one another supports the process of GSIs making sense of established group norms. This sharing also supports GSIs as they negotiate their multifaceted position of graduate student and course instructor. Practice within course-specific CoPs may also include developing or understanding activities and tasks an instructor could include in a specific lesson but could also entail understanding student demographics within the course and negotiating how to handle certain student situations that arise.

Table 1 summarizes how these three necessary CoP characteristics are represented in both the professional learning and course-specific CoP settings in the present study. The combined presence of domain, community, and practice create the ideal setting for learning to

take place because when group newcomers and old timers work together and the three CoP characteristics are present, group members get to experience the process of legitimate peripheral participation, or LPP.

Table 1

Defining Characteristics of Communities of Practice within the Present Study

CoP characteristic	Manifestation of these characteristics within the present study CoPs	
	Professional learning CoP	Course-specific CoPs
Domain	Teaching as primary instructors while simultaneously pursuing their own graduate studies	Teaching the same course as one another
Community	All GSIs in the department GSI coordinator	GSIs assigned to the specific course Course coordinator (faculty) Faculty assigned to the specific course
Practice	Creating study groups Participating in professional development seminars Balancing the roles of student and instructor Discussing issues that arise	Developing course materials Sharing helpful teaching practices Discussing issues that arise within the course

Note. CoP = Community of Practice; GSI = Graduate Student Instructor

LPP is an essential component for learning to occur within a situated setting. Lave and Wenger (1991) describe LPP as the process of a learner moving toward full participation within

a community of practitioners with the purpose of gaining mastery knowledge and skills necessary within that community. The CoP communities described in Table 1 comprise the LPP community of practitioners in the present study. Working in a community of practitioners is common for many GSIs, as implied by Wheeler et al.'s (2015) description of the generally *highly coordinated* nature of GSI-taught courses. Highly coordinated courses in the present study are characterized by regular meetings of course instructors to discuss all aspects of teaching the assigned course. Course instructors include a possible mixture of new GSIs (novices), experienced GSIs (either novices or intermediates), and full-time faculty (either novices, intermediates, or experts). The natural support that comes from meeting weekly and interacting with instructors of varying expertise in these highly coordinated settings encourages novice GSIs to move toward full participation as instructors in higher education, indicating LPP is present.

Another aspect of these highly coordinated courses demonstrating the presence of LPP is that their respective coordinators develop the assessments to be used across all course sections. Having a course expert design course assessments allows students enrolled in these multi-section courses to have as many similar experiences as possible, regardless of the teaching experience of their instructor. This course component demonstrates the process of LPP in that the GSIs are not expected to take on the full-blown responsibilities of an instructor of record (making curricular decisions, developing assessments, etc.) when they first take on their new role. As GSIs gain experience in their position, coordinators may use GSI input and suggestions to adjust assessments from one semester to the next. In certain courses,

experienced GSIs may even be asked to create their own exams under the guidance of their coordinator.

The GSIs in the present study experience LPP through their participation in multiple CoPs. LPP within a CoP supports meaningful experiences that allow for learning to occur (Lave & Wenger, 1991). The challenge for a researcher interested in examining GSI CoPs is finding a tool that links participation in a CoP to GSI learning and development. Fortunately, Wenger et al. (2011) developed a framework that can be used to better understand the learning and value creation that take place within a given community of practice. They defined learning as "the power to renegotiate the meaning of the past and future in constructing the meaning of present circumstances" (Wenger et al., 2011, p. 34) and use the term *value creation* to describe the value of learning created by taking part in a CoP. Researchers can build a robust picture of the value that is created through CoPs by looking for specific indicators within personal narratives of study participants.

Research Regarding Graduate Student Instructors and Communities of Practice

Recent research regarding GSIs has examined the impact of specific GSI training and professional development programs (Harris et al., 2009; M. A. Parker et al., 2015; Ridgway et al., 2017; Rivera, 2018; Young & Bippus, 2008) as well as the impact teaching during a graduate program had on both GSIs and the undergraduates they taught (Bettinger et al., 2016; Ridgway et al., 2017). Findings from these studies highlighted the benefits of training, teaching, and professional development for GSIs both in terms of teaching and for completing their own degree plan. These studies also called for the need for more research in the areas of GSI learning and growth as educators. Further research regarding CoPs focused on the impact these

communities had on K-12 educators (Cuddapah & Clayton, 2011; Lambson, 2010; Sim, 2006), on university instructors, whether they be graduate students or full-time faculty (Beisiegel, 2011; Gourlay, 2011; Kensington-Miller et al., 2014; Smith et al., 2016; Wheeler et al., 2015), and in business (Fontaine & Millen, 2004; Kirkpatrick, 1996; McDermott, 2002). While much of the research involving CoPs has examined the impact they had on the development of their participants, certain studies also looked to determine whether groups in education or the business world did, in fact, constitute a CoP. The current study looks to extend research in these areas by analyzing the learning that occurs and the value GSIs find through their participation in CoPs.

Research Questions

Since the present study involves two CoPs with differing domains and practices, it is important to address the value created within each of these CoPs separately. Therefore, this study addresses the following questions:

1. What activities and experiences within the GSI professional learning and course coordination CoPs most influence GSI professional learning?
    a. What patterns, if any, exist in activities and experiences identified by GSIs when in their CoPs?
    b. How, if at all, do these activities and experiences influence the value of learning for GSIs?

Chapter 2: Literature Review

This chapter starts by introducing the reader to literature involving GSIs. Much of this research examined GSI beliefs about their own teaching abilities and how training, professional development, and evaluation protocols improved GSI teaching practices. The research has also sought to explain how university faculty, students, and even the GSIs themselves viewed the role and abilities of graduate students as instructors. The present study looks to extend the current research by examining the effects the given learning environment has on GSI learning. The second part of this chapter describes the theoretical framework guiding this study, followed by a discussion on how the framework has been used in current research. The chapter concludes by introducing the Wenger et al. (2011) value-creation conceptual framework that will be used to analyze the data collected in the study.

Research Regarding Graduate Student Instructors

According to a 1970 report for the U.S. Department of Health, Education, and Welfare, there are few records describing the historical use of GSIs in higher education throughout the United States (Chase, 1970). The earliest discovered cases of graduate students with teaching responsibilities occurred in 1876 when 20 fellowships involving teaching duties were awarded at Johns Hopkins University. Chase reported that as enrollment in undergraduate education grew rapidly, universities began looking for ways to fund graduate students hoping to continue their education as well. Employing graduate students to teach was a way for universities to increase the number of undergraduate instructors while financially supporting graduate students at the same time. Chase's report is useful for more current research because it shows graduate students and their roles, responsibilities, and abilities as educators have been of great

interest in higher education for over half a century. The use of graduate students in university classrooms continues to grow (Parker et al., 2015), and calls for increasing support of these novice instructors continue to be made (Burmila, 2010; Cervantes & Inlow, 2022; Dragisich et al., 2016; Musante, 2013; Parker et al., 2015; Pentecost et al., 2012; von Hoene, 2020; Weaver, 2020). Naysayers may claim graduate students should be able to step into a classroom and support undergraduate content knowledge since graduate students are likely to have been observing teachers in action for the previous 16 years. Lortie (1975) claimed this line of thinking possibly stemmed from the fact society in general views schooling as an *apprenticeship of observation* (p. 61) within the educational system. This philosophy, however, underplays the understanding and skills needed to be an effective educator. In order to be successful instructors, graduate students need more than just content knowledge and a history of being in classrooms themselves; effective GSIs need pedagogical knowledge as well. One approach universities can take to support this unique group of educators is by implementing preparation programs focused on the specific needs of graduate students who serve as primary instructors.

While the acronym GSI has been and will continue to be used throughout this paper, it is important to note that a more common term in the literature is *graduate teaching assistant*, or GTA (Dragisich et al., 2016; Dunn-Haley & Zanzucchi, 2012; Mackertich, 1970; Musante, 2013; Musgrave & Carlson, 2017; Parker et al., 2015; Pentecost et al., 2012; Reeves et al., 2016; Ridgway et al., 2017; Rivera, 2018). The term GTA is used to refer to a graduate student with teaching related duties. GTA duties historically involved, but have not been limited to: teaching, grading, exam preparation, professional service, clerical duties, and/or administration (Chase, 1970). While GTA and GSI have been used synonymously in more recent literature, the use of

GSI in the present study is deliberate to differentiate between graduate students assigned to be instructors of record for undergraduate classes and graduate student whose duties are limited to tasks with less responsibility such as grading, tutoring, or facilitating a supplemental lab experience. The graduate students of interest in this study are GSIs. Many studies examining graduate students have used the term GTA when describing their participants, making it unclear as to whether the study participants were primary instructors of students or if their duties were more administrative. While the present study strives to make the use of GSI clear, as I describe different studies regarding graduate students in the sections below, I will be using the same terminology used by those authors to discuss their research.

Training and Professional Development

The majority of research that can be found regarding GSIs focused on GSI training and professional development (PD). GSI training is an area of interest in higher education because well-trained GSIs can improve undergraduate retention rates due to the student demographics in the classes GSIs are normally assigned to teach (Harding, 1999). Training programs for graduate students, when they exist, have varied greatly at different institutions across the country, but Deshler et al. (2015) found the most successful GTA preparation programs involved an extensive orientation as well as continued learning opportunities throughout the academic year. Wheeler et al. (2015) examined the impact of one such preparation program and found novice GTAs, who varied in teaching experience, content knowledge, and English proficiency, benefited in their efforts to become more expert instructors from continued interaction with more experienced GTAs. In order to understand the variety of support provided to GTAs, Ellis et al. (2016) collected training and PD information from 192 graduate

degree granting institutions. There were 114 doctoral programs and 78 master's programs that provided data for the study. In these programs, 47% offered a semester-long course or seminar to support the development of GTAs, 28% offered a multi-day workshop, and 17% offered a 1- to 4-hour orientation. These data show the importance institutions are placing on graduate student development. Unfortunately, it is unknown what role these graduate students played at each of these institutions. While the study provided a big picture view of graduate student support, other studies have examined individual training and PD programs at specific universities.

The Teaching Assistant Institute at University of North Carolina Wilmington, for example, provided a university-wide, four-hour training to its GTAs. The goal of this voluntary experience was to share strategies and campus resources for increasing applied learning teaching practices (Parker et al., 2015). Although only 48 out of 275 GTAs chose to attend the training, pre- and post-Likert scale means showed increased understanding of and improved attitudes toward incorporating applied learning in their classrooms.

While the Parker et al. (2015) study examined the impact of a training program that lasted only four hours, Young and Bippus (2008) examined the impact of a three-day training and PD program on graduate teaching *associates'* (also GTA) beliefs in their ability to accomplish specific teaching tasks. Young and Bippus used quantitative data from the Teachers' Sense of Self-Efficacy Scale (TSES) and found GTAs reported a statistically significant increase regarding their beliefs in their ability to manage and involve students and use instructional strategies in the classroom. Ridgway et al. (2017) also found positive results when they examined the perceptions of 69 GTAs and 368 faculty at The Ohio State University. In this study,

GTAs expressed they had more confidence, felt more prepared, and were better able to teach as they gained more experience. These sentiments were similar for both novice and experienced GTAs and were supported by formal analysis of GTA Likert-scale responses, which showed no statistically significant difference between the scores of the two groups in these categories. The GTAs in the study felt some sort of training orientation was most useful for new GTAs, while weekly course-specific meetings were essential to all GTAs, regardless of their level of experience.

While the training and PD programs mentioned above lasted between a few hours and a few days, other programs lasted for weeks or over semesters. At the end of a five-week summer seminar, Rivera (2018) used data collected from reflection journals, interviews, and video-recorded observations to conclude there was an increased GTA awareness regarding student assessment and the importance of question response wait time after participation in the summer training. The data collected in this study also indicated GTAs possessed increased teaching confidence at the end of the seminar. Harris et al. (2009) examined the impact of a semester-long course and found results similar to Rivera in terms of how GTAs felt after their training and professional development experiences. Both Rivera and Harris et al. used qualitative data to conclude their respective GTA training programs supported the GTAs' beliefs that they were better able to teach.

With the number of variations occurring in training and PD program designs, it is necessary to note that a one-size-fits-all program for GSIs does not exist. In order to be effective, training and PD programs must be context specific with links between university, school, and department support (Knott et al., 2015). Pilgrim et al. (2020) went through

numerous iterations of a training and PD program at San Diego State University in order to develop a program that worked best at their institution. Pilgrim et al. went from having no GTA professional development, to incorporating training before each semester with a mid-semester PD session, to having pre-semester training with a year-long PD course. The PD course went through its own iterations as GTAs did not find it valuable and were frustrated with having to take a non-credit bearing course. After making adjustments to its focus and content, course enrollment became the standard within their department.

The frustrations shown by the GTAs in the Pilgrim et al. (2020) study are not unique, especially when the teaching requirements associated with many graduate assistantships are not valued by either full-time faculty or the graduate students themselves. Ridgway et al. (2017), for example, worked with graduate teaching faculty who expressed the opinion that GSIs should put more focus on their own coursework than on their teaching responsibilities. BrckaLorenz et al. (2020) found that GSIs often did not take advantage of PD opportunities to enhance their teaching, but most often were looking for support in developing student's critical thinking skills, creating a supportive learning environment, and assessing student learning. While some GSIs and faculty may not see the immediate benefit of teaching while pursuing a graduate degree, Ridgway et al. found graduate students who participated in more than 55 hours of teaching PD had a significantly higher likelihood of employment in a faculty position within five years of graduation. This finding implies that GSI PD can have extended benefits for a GSI's career in academia and provides reasoning to back von Hoene's (2020) call to move from voluntary to required teaching preparation and PD.

While there may be long-term benefits of initial GSI PD, the importance of continued guidance after specialized GSI PD needs to be addressed as well. Pilgrim et al. (2020) determined GSIs needed continued support while teaching in order to facilitate appropriate activities in the classroom and create an environment in which students participated in active learning. Pentecost et al. (2012) found that the 31 graduate students in their study valued their pre-semester training and longed for support throughout the remainder of the year. Faculty who supervised these GTAs after their training experience claimed to have fewer undergraduate student complaints. These supervisors also stated GTAs who participated in the training understood the importance of their teaching experience as it related to their growth in academia. Graduate faculty in this same study mentioned the training supported camaraderie among the GTAs, which is of special interest to the present study since camaraderie relates to community.

The positive impacts training and PD have had on GSIs demonstrates the importance of supporting GSIs as classroom instructors. GSIs face challenges both as instructors and students as they handle the duties of these roles, and it is important to increase the amount of resources available to them to successfully navigate these challenges (Cervantes & Inlow, 2022). Handelsman et al. (2007) argued for the need of PD focused on teaching and learning when they asserted that focusing all aspects of graduate student training on successfully completing graduate coursework without also focusing on improving teaching ability is like training "pianists to play with their right hands, hoping the left hands will figure it out all on their own" (p. xi). In other words, supporting graduate students both as students and as instructors is critical to their development and future success in the field. This sentiment is echoed by

Ridgway et al. (2017) who argued that GTA PD was vital to preparing graduate students for life beyond their schooling since both teaching and research were aspects of academic professional identities. The present study hopes to add to current literature by examining the value GSIs find through participation in training and PD within different communities of practice.

Teaching Observation Protocols

While research supports the idea that pre-instruction training and continued professional development are both fundamental in supporting GSIs' growth as teachers, researchers have also examined the effect of observation protocols on GSI teaching practices. Miller et al. (2020) examined 25 observation protocols provided by colleagues in higher education to find trends in how novice mathematics instructors were provided feedback on their teaching. They found most protocols were quantitative and evaluative in nature with items that were unevenly distributed between teacher-centered, student-centered, and content-centered components. Department protocols tended to be teacher-focused, university protocols tended to have an even split between teacher- and content-focused items, while researcher developed protocols had the closest to an even split of all three categories. These observations were made around the same time Rogers et al. (2019) developed an observation protocol specifically for GSIs: the Mathematics Graduate Student Instructor Observation Protocol (GSIOP).

Rogers et al. (2019) based the GSIOP on the already established Mathematical Classroom Observation Protocol for Practices ($MCOP^2$) developed by Gleason et al. (2017). The need for a new protocol arose in an effort to make feedback more accessible and understandable to GSIs who, for the most part, are unfamiliar with the national education

standards included in the MCOP[2]. In a subsequent study, Yee et al. (2021) used the GSIOP to determine how feedback from the protocol impacted the teaching practices of GSIs. Experienced GSIs served as mentors to novice GSIs and used the GSIOP to support the novice instructors in improving their teaching practices. The experienced GSIs gave feedback on both student-focused and teacher-focused items. Yee et al. concluded from their results that feedback in and of itself is not enough to support a change in teaching practices. The feedback given needed to be specific and contextualized in order to have a positive impact on a GSI's protocol score. They also claimed that to be effective, observations and protocols needed to be formative as opposed to summative. The Yee et al. study placed novice GSIs under the guidance of more experienced ones. The novice GSIs were able to learn from their more experienced peers and become better instructors based on these interactions. This study showed the positive impact learning from other practitioners could have on novices in a given community.

Perceptions and Impacts of Graduate Students as Instructors

Another way in which researchers have examined graduate students as instructors is through understanding how GSIs felt about their responsibilities as well as how the students and faculty viewed the role of GSIs. Yee et al. (2020) analyzed student complaints about GSIs from two universities over five years and found common themes within student remarks. When students had issues with GSIs, 40% involved classroom practices, 39% involved assessment practices, 13% involved outside-of-class issues, and 8% involved design practices. Classroom practice issues involved GSIs having unclear communication regarding due dates, course content, or the way in which they presented course materials. Considering the biggest issue among student complaints involved classroom practices, faculty involved in the training and

development of GSIs could focus their GSI support on these areas. Complaints regarding assessment practices addressed how assessments were graded, the grading structure within the course, and the amount of time allocated for course assessments. When GSIs teach highly coordinated courses, as described in Chapter 1, many of these assessment practices are out of their control. The results of the Yee et al. study, however, highlight the need for faculty working with GSIs to model and discuss teaching practices that align with student assessment in their courses. These faculty can also support GSIs by giving ideas on how to explicitly communicate the purpose of course assessments to their students. While student perceptions of GSIs in the classroom could be a catalyst for adjustments in the training and PD offered to GSIs, GSI and faculty perceptions of the GSI role could also give insight to the support GSIs have and the environment in which they fulfill their teaching duties.

Beisiegel and Simmt (2012) found that graduate students had negative outlooks on teaching when they were tasked solely with administrative duties, such as tutoring and grading. The value these graduate students placed on teaching as part of their future in academia also diminished as their programs progressed. This negative outlook could possibly be due to the lack of substantial teaching experiences for graduate students when they are being used for purely administrative purposes. The findings from the Beisiegel and Simmt study show how meaningful GSI participation can prepare graduate students for a future in academia by supporting the development of a teacher identity. Teaching experience is especially important for those graduate students hoping to pursue careers in education. Teaching throughout a graduate program can also have positive effects on graduate students with no interest in

teaching post degree, however, even if they personally value other graduate experiences over their teaching ones while in their program.

In the Ridgway et al. (2017) study described in a previous section, over 50% of GTAs had a desire to pursue a career in teaching, while 10% of GTAs had no desire to teach at all. The other 40% expressed an interest in teaching-related fields. The researchers also found tenure-track faculty teaching in the Center for Life Sciences Education, as well as the research advisors of GSIs participating in professional development at the university, believed GSIs should focus more on their graduate coursework than on their teaching. However, as previously mentioned, teaching has been found to be beneficial for graduate students in their own studies. Bettinger et al. (2016) found GTAs who taught more frequently tended to graduate earlier. They also claimed graduate students as instructors had a positive impact on undergraduate students due to the finding that students whose first course was taught by a GTA were twice as likely to major in that subject than their peers whose first course was taught by a faculty member.

The benefits of teaching while being a graduate student have been discussed, but these benefits are not always seen by GSIs themselves when they reflect on their experiences. Meanwell and Kleiner (2013) analyzed reflections from 86 first-semester GSIs to explore the feelings they had regarding teaching. The GSIs were required to take a semester-long pedagogy course that supported them during their first semester of teaching. Meanwell and Kleiner found a balanced mix of positive and negative emotions mentioned by GSIs in their reflections, but there were twice as many unique negative emotions as positive ones. GSIs in the study shared that regular meetings were helpful and that they turned to peers and faculty for support in order to deal with the stress, anxiety, or uncertainty that came with their teaching

responsibilities. This is a promising discovery for the proposed study as it suggests the importance of learning through LPP within a CoP. Another interesting discovery in the Meanwell and Kleiner study was that GSIs expressed more positive than negative emotions when it came to the act of reflecting on their experiences and using those to make changes in the future. This response may indicate the value GSIs placed on their experiences and the learning that came as a result of their value creation.

Graduate Student Instructor Learning and Growth

While the specific impacts training and professional development have on GSIs has been a major area of interest in the field, the topic of how GSIs learn and grow as educators has also been examined. Miller et al. (2018) completed a literature review to classify how research examined the growth of GSIs as teachers. The largest portion of research they found (10 out of 26 articles) focused on how beliefs, knowledge, or teaching practices changed over time. The studies they classified in this category were similar to the ones mentioned in the training and professional development section in this chapter. Another study that fits into this category is one by Lai et al. (2016) that examined changes in knowledge and teaching practices of GTAs who participated in two-hour weekly PD sessions. GTAs in these sessions discussed their teaching experiences and how they related to required PD readings. Many of these group discussions focused on student misconceptions, hypothesizing causes of the misconceptions, and thinking through resulting future actions an instructor could take. Lai et al. found these discussions lessened occurrences of concrete judgements from GTAs regarding student thinking and supported an increase in active learning practices in the classroom. The researchers also found that working together to reflect on these topics supported GTA learning more than when

GTAs reflected individually through writing. Yee and Rogers (2017) examined changes in beliefs of more experienced GSIs who mentored novice GSIs over the course of a semester. Mentors in this study observed their novice protégés and had follow-up conversations debriefing the observations. Before acting as mentors, the more experienced GSIs felt student effort was the primary indicator of student success. After becoming mentors, however, the experienced GSIs felt student effort held less weight and that quality of instruction played a larger role in student success than they had originally believed.

Another category in the Miller et al. (2018) literature review, *Taking a Stance on Desirable Growth,* focused on articles in which researchers suggested specific areas where GSIs could improve their abilities as teachers. The 11 articles in this category examined a specific type of GSI growth, like the Deshler et al. (2015) study, mentioned in the Training and Professional Development section, that measured pedagogical content knowledge growth. Beisiegel et al. (2019) also studied desired growth of GSIs when they explored how graduate students progressed through the four developmental stages of teacher growth theorized by Katz (1972): survival, consolidation, renewal, and maturity. Beisiegel et al. concluded graduate students did not progress linearly through these stages and found taking on solely administrative roles of a TA had a negative impact on graduate student teaching identity. This is a similar conclusion to the Beisiegel and Simmt (2012) study mentioned in the previous section. Beisiegel et al. (2019) claimed taking on the less-fulfilling role of a TA inhibited progress through Katz's (1972) stages. These results lead readers to hypothesize graduate students need to take on tasks associated with the role of a GSI in order to grow as educators.

The final three articles in the Miller et al. (2018) literature review discussed how a specific theory supported or limited GSI growth, including Vygotsky's sociocultural theory and Lave and Wenger's legitimate peripheral participation (LPP). The latter topic, examined by Beisiegel (2011), is of special interest to the present study as both studies use the same theoretical framework. In their research, Beisiegel investigated how attention to LPP in a math department prevented graduate students from adopting alternate modes of teaching. The graduate students in the study were not provided mentorship for teaching duties and lacked a forum to discuss their views. Beisiegel found graduate students in this setting felt there was only one way to teach mathematics based on what they saw from experienced professors in their department, leading Beisiegel to conclude a lack of LPP limited individual growth and prevented changes to teaching in higher education settings. The lack of support found in the Beisiegel study contrasts GSIs support in the present study. In fact, the present study looks to expand upon current research by exploring how participating in different communities of practice and learning through experiencing LPP within those CoPs may support value creation and learning for GSIs.

Graduate Student Instructor Research Summary

Research regarding GSIs has focused on the types of training and professional development offered to GSIs (P. Parker, 2014; Ridgway et al., 2017; Wheeler et al., 2015; Young & Bippus, 2008), the development and use of observation protocols designed specifically for the GSI population (Miller et al., 2020; Rogers et al., 2019; S. Yee et al., 2021), perceptions of graduate student teaching duties among graduate students and faculty (Beisiegel & Simmt, 2012; Meanwell & Kleiner, 2013; Ridgway et al., 2017; S. P. Yee et al., 2020), and different ways

to examine the growth and development of GSIs (Beisiegel, 2011; Beisiegel et al., 2019; Lai et al., 2016; S. P. Yee & Rogers, 2017). While the type and length of training provided for GSIs varies, a common finding was that training left GSIs feeling more confident and prepared to fulfill their classroom duties (Harris et al., 2009; Ridgway et al., 2017; Rivera, 2018). Since GSIs have a large impact on student learning, scholars continue to make calls for GSI PD, with some stating such PD should be required (von Hoene, 2020; Weaver, 2020). Miller et al. (2018) specifically called for more research linking theories of growth and learning to GSI teaching. The present study looks to add to this growing body of research by examining how participation in CoPs can support GSI learning, defining learning as "the power to renegotiate the meaning of the past and future in constructing the meaning of present circumstances" (Wenger et al., 2011). Wenger et al. used the term *value creation* to describe the value of learning created by taking part in a CoP. In order to fully understand the implications of the findings of the current study, we must first understand the Lave and Wenger (1991) theory on which it is positioned.

Conceptual Framework: Situated Learning

The present study uses a situated learning framework to understand how the GSI working environment impacts GSI learning. Situated learning theory posits that learning is a special type of social practice (Hanks, 1991, p. 18) and what people learn, see, and do is located in their role as a member of their community (Lave & Wenger, 1991). Lave and Wenger believed learning "is a process that takes place in a participation framework, not in an individual mind" (Hanks, 1991, p. 15). They also stated learning is not one activity that occurs in a given situation but is instead an embedded aspect of all activity. It is a mistake to describe situated learning as merely thought and action occurring in the same place and time. Lave and

Wegner (1991) argued this misconstrued definition of *situated* promoted some activities as situated and others as not. Instead, Lave and Wenger claimed all activities are situated and that learners, activities, and surroundings impact each other interdependently to create the necessary setting for learning to occur.

According to Lave and Wenger (1991), learning occurs through participating in activities and gaining access to types of behavior a person would not have had access to otherwise, which then allows them to develop certain skills. This belief contradicts the idea that learning is purely knowledge acquisition and promotes the possibility that learning can occur without the presence of intentional instruction. While learning and intentional instruction are able to occur concurrently, that does not mean a causal relationship exists between the two. In other words, one cannot assume intentional instruction causes learning to occur or that learning is caused solely by intentional instruction, even though intentional instruction has historically been linked to knowledge acquisition (Lave & Wenger, 1991). Lave and Wenger argued against the aforementioned causal relationship and instead asserted that learning is not the simple acquisition of abstract knowledge to be used in later contexts but is instead the acquisition of skills through engaging in legitimate peripheral participation (LPP), a process I describe in greater detail later in this section. In other words, true learning requires action and authentic experiences for the learner.

Learning under the Lave and Wenger (1991) definition results in a transformation of both the learner and the procedures for learning skills (Hanks, 1991). Learners are transformed as they construct identities within the community membership. What it means to be a member of the community is ever evolving as identities and skills within the community change. Due to

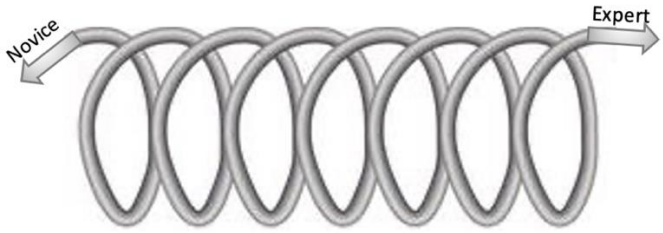
this contextual nature of learning, it is important to note while a certain level of structure is necessary for these transformations to occur, the structure must be adaptive in order to support learning in any given context (Hanks, 1991).

Figure 1 depicts the learning continuum from novice to expert within the situated learning setting. As you can see, the path from novice to expert is structured, but not in a straight line. The ever-changing direction along the path from left (novice) to right (expert) is due to the constant redefinition of what it means to be an expert in a situated setting. Newcomers and old-timers alike are changing as they experience LPP. The idea of what it means to be a relative novice or expert changes as the group itself changes. Movement along the continuum can be either horizontal (moving from novice toward expert) or vertical (resulting from a redefinition of the group itself). Members can move forward or backward as they gain more understanding of both their role within the group and the applicable knowledge they have as compared to the group. A newcomer may join and provide insight or ways of acquiring skills other members, including experts, had not considered before. This occurrence may then redefine what it means to be a novice within the group. Another common occurrence is the exit of members who were considered experts within the group. When this happens, other members fill the void the absence creates, but in their own unique way. This could then redefine what it means to be an expert within the group. All members have the potential to bring new experiences that can change both the knowledge within the group and how the group operates. Old artifacts created by group members may become obsolete, requiring new artifacts to take their place. It is working together through the aforementioned experiences

that both the group itself and its individual members grow and learn. The way in which these groups operate can be described as a Community of Practice (CoP).

Figure 1

Situated Learning Visual: The Learning Continuum from Novice to Expert



Note. This figure depicts the learning continuum from novice to expert within the situated learning setting. The ever-changing direction along the path from left (novice) to right (expert) is due to the constant redefinition of what it means to be an expert in a situated setting.

Communities of Practice

CoPs are a "learning partnership among people who find it useful to learn from and with each other about a particular domain" (Wenger et al., 2011, p. 9). In other words, members within a CoP use each other's experiences of practice to make sense of and address challenges they face in their community. Not all groups fit the requirements to be classified as CoPs. Wenger (1998) claimed three central factors were necessary in order for a given community to be categorized as a CoP: (1) Members must work with each other in shared conditions, (2) the group accomplishes its tasks through working together in these shared conditions, and (3) members of the group serve as resources to one another. By working together, members develop the group operational practices. These practices can be explicit, such as developed

policies, procedures, or group artifacts, or implicit, like developing common perceptions, underlying assumptions, or interpretations (Wenger, 1998). These practices are what support members moving from the periphery of a community to an active, full participant and eventually learning. The process of negotiating meaning is what allows this movement to occur.

Negotiating Meaning. Wenger (1998) claimed learning was a result of negotiating meaning, which he defined as "the process by which we experience the world and our engagement in it as meaningful" (p. 53). In other words, negotiating meaning is the process of receiving information from the world regarding an experience, using an internal filter to decipher which information will be useful to us, and then applying that useful information in a new way. New interactions, even with routine people and places, create new experiences, which supports negotiation of meaning. Negotiating meaning occurs when participation is combined with taking abstract ideas and utilizing them in concrete ways, otherwise known as reification.

Participation is a process that allows us to relate to what we see. Within CoPs, participation refers to both the process of taking part in something and the connections that come from that process (Wenger, 1998). Participation allows members to develop group and individual identities while also understanding how individuals within the group relate to one another. True participation in a group is not something that can be turned off or on; participation leaves a lasting impact on a member's life, even after they leave the group. Reification, on the other hand, is a process that allows us to project and develop new understandings. Within CoPs, reification shapes our experiences (Wenger, 1998). In fact, it is collective reification that supports the ever-changing direction of the coil from Figure 1.

Wenger claimed that participation without reification resulted in misunderstanding while reification without participation resulted in little understanding of purpose. It is only when the processes of participation and reification are interconnected that members are able to negotiate meaning.

Becoming a Full Participant Within a Community. Within a CoP, members work toward becoming full participants in the group through the use of mutual engagement, joint enterprise, and shared repertoire (Wenger, 1998). Mutual engagement means members at all levels are being included in determining what matters within the group. If important decisions were left solely to experts, novices would lack insights to group values, wants, assumptions, and perceptions. Lacking this information would keep these novices from being able to become full participants within the community. Mutual engagement then allows participants to negotiate a joint enterprise. This means members within the group take part in negotiating their common purpose and contributing to it. One of the main components of joint enterprise is mutual accountability. It is through mutual accountability that members learn what information is important versus disposable, what behaviors are appropriate versus inappropriate, and when to speak up versus when to listen. This implicit knowledge gained through mutual accountability allows group members to actively participate in the group's joint enterprise, thereby moving closer to full participation within a group. Newcomers respond differently than old-timers as they have not yet negotiated the meaning of responses to situations that are novel to them within the community. It is through this negotiation while moving toward full participation that learning occurs within a CoP. As mutual engagement continues over time, a CoP develops resources known as a shared repertoire. A shared repertoire constitutes the

routines, symbols, tools, and norms a CoP has established through the mutual engagement of its members.

Learning. Shared knowledge and experience come together in CoPs through legitimate peripheral participation (LPP) (Wenger & Lave, 1991). LPP provides an adaptive structure where learning can take place. In fact, Hanks (1991) asserted "learning would be likely to take place whenever people interact[ed] under conditions of LPP" (p. 19). Lave and Wenger (1991) argued for a stronger connection between learning and LPP by claiming learning is simply LPP within a CoP. Due to the important role LPP plays in situated learning, it is necessary to examine LPP in its own right.

***Legitimate Peripheral Participation*.** Lave and Wenger (1991) claimed LPP is a way to describe the integration of learning within social practice. LPP occurs when "learners inevitably participate in communities of practitioners" (Lave & Wenger, 1991, p. 29). This participation allows learners to immerse themselves in experiences of practice without taking on the full responsibilities of experts in the field. As newcomers experience what it means to be a member of a given CoP, they move toward full participation in sociocultural practices as a means of gaining mastery of community knowledge and skills. Lave and Wenger argued learning and social practice were inseparable and LPP was a critical condition both for learning itself and for defining the specific content to be learned. While traditional views of learning are normally associated with formal schooling, Lave and Wenger argued that learning could be examined on a larger scale when it is viewed as LPP and not as a construct associated with a given social institution. In fact, they derived many of the ideas of LPP from apprenticeships of tailors in Liberia who became masters of their trade despite lacking formalized intentional instruction of

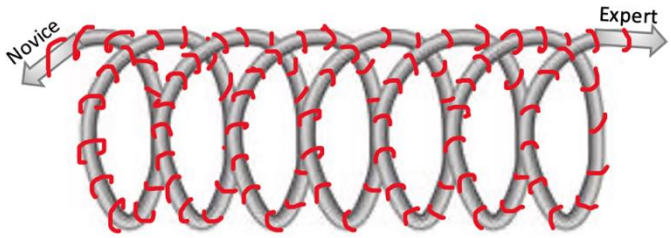
necessary skills in their field. With apprenticeship in mind, Lave and Wenger contended learning happened through the process of becoming a full participant of a group in a given practice. This process is the same way they described LPP to their readers, further clarifying that learning and LPP are synonymous from their point of view. It is important to note that the apprenticeships examined by Lave and Wenger greatly differed from the previously mentioned idea of Lortie's (1975) apprenticeship of observation. While Lave and Wenger argued the apprenticeships of tailors occurred in an LPP setting, allowing for learning to actually occur, an apprenticeship of observation is, by definition, passive and therefore not an example of LPP. This clarification validates the argument that a 16-year apprenticeship of observation is not solely sufficient for a GSI to effectively learn how to be an educator.

While defining learning as the process of becoming a full participant in a CoP, Lave and Wenger (1991) also claimed learning within a CoP meant its membership was always evolving due to how understanding and experience (i.e., the situatedness of learning) are intertwined. In other words, they felt it was participation within a given CoP that supported learning and vice versa. Figure 2 shows this intertwined relationship by adding the ever-evolving path of membership within a group around the situated learning continuum originally depicted in Figure 1. This path of membership within a situated setting spirals just like the path of situated learning itself and can move up, down, forward, or backward based on CoP experiences. Members may have a setback that causes them to see they are closer to the novice end of the spectrum than they had originally thought. Becoming an expert in a given field is an ever-moving target due to interactions between newcomers and old-timers redefining the CoP and the labels given to its members. Regardless of being closer to the novice or expert positions on

the spectrum, all members of the community learn by taking past experiences and renegotiating the meaning gained from them into present circumstances. It is the process of LPP that supports this cycle.

Figure 2

How Participation in a CoP Shapes an Individual's Experience on the Learning Continuum



Note. CoP = Community of practice. Individuals within a CoP move along an everchanging path as they grow and evolve within the everchanging identity of a CoP.

Figure 2 displays how intricate LPP can be as occurrences within the group impact both the knowledge within the group and the individual path a member takes in pursuit of that knowledge. As previously mentioned when Figure 1 was introduced, the shape of the learning continuum coil is formed by occurrences that redefine what it means to be a novice or expert within the CoP as group learning occurs. These occurrences rarely cause a break in the coil (i.e., the dissolution of a CoP), but instead, create a shift within it. There is no defined start or end of the coil as participants can be placed at any point along the coil's continuum when they join a given CoP. Members of the group move from novice to expert (i.e., left to right) along the learning continuum by winding around the coil. This movement occurs as the CoP is reshaped and its participant labels are redefined by the learning that occurs through LPP.

The everchanging landscape of a CoP makes it difficult to argue that newcomers move to experts by learning solely from one individual. In fact, Lave and Wenger (1991) argued that "mastery resides not in the master but in the organization of the community of practice of which the master is part" (p. 94). This means GSIs could not learn from listening or working with a solitary expert but could instead learn from partaking in the activities of a CoP. Examining how groups of people learn is a topic of interest to many researchers. CoPs provide a flexible framework that suits a variety of contexts including education, business, government, and organizational design (Smith et al., 2017). Recent research that explored learning through CoPs is described in detail in the following section.

Research Regarding Communities of Practice. CoPs can be found historically in many apprenticeship relationships. Lave and Wenger (1991) highlighted the use of CoPs among tailors as a prime example of where group learning was necessary. They claimed that while novice tailors must actively be sponsored by a master tailor in order to be considered legitimate in their field (an example of LPP), it is really through the novice tailor's relationship with other novices and with the master tailors sponsoring other novices that opportunities to learn occur. This example supports the argument that learning does not occur by simply replicating the actions of others, but instead is centered in LPP within a CoP.

Interactions like the ones between novice and master tailors also occur within a GSI experience. During their time as classroom instructors, novice GSIs may watch other novices, more experienced GSIs, or even full-time faculty members teach to better understand different teaching styles as they develop their own. These actions align with an important characteristic of CoPs in that novices are learning about their field by watching experienced instructors model

teaching practices and classroom management techniques as opposed to simply listening to experienced instructors tell the novices they need to be better at fulfilling their duties. In his research regarding CoPs among insurance claims processors, Wenger (1998) found training did little to support claims processors in on-the-job competence. Instead, it was through performing their daily job duties that the processors were able to discover which aspects of their job they did not understand, seek out the required knowledge, and negotiate meaning of this knowledge by putting it to practice. While novice members of a CoP may start by locating themselves on the periphery of the group, it is through action and mutual engagement that they negotiate meaning and move from the periphery to becoming a full participant.

Many studies regarding CoPs involved education, either K-12 or post-secondary, or business settings. Most of these studies appeared to be qualitative in nature, but a quantitative analysis by Nistor and Fischer (2012) claimed a causal relationship existed between an individual's domain knowledge and artifact creation within the CoP. This finding provided insight to CoP operations in that CoP members with the most content knowledge contributed most to the CoP's shared repertoire. Mittendorff et al. (2006) examined a group of educators, a group of governmental policy experts, and a group of nature conservationists to determine if each group met the criteria to be called a CoP and to identify their resulting learning outcomes. The researchers found that while the educators had a shared domain and practice, they lacked a shared community. This resulted in some collective learning outcomes but learning more often resulted from individual efforts. The government expert group had no shared domain, practice, or community. There were few collective outcomes from this group, with the knowledge coordinator of the group leading the outcomes that developed. The nature

conservation group possessed a shared domain, practice, and community and produced numerous collective outcomes. The results of this study provided managers with ideas for determining whether or not a group possessed the characteristics of a CoP and how to guide that group in developing collective learning outcomes for a given organization.

Research involving CoPs in an organization or business setting focused on how CoPs supported productivity and efficiency. Fontaine and Millen (2004) researched CoPs in a business-specific setting to determine how CoPs benefited and impacted organizations. They received 431 survey responses from employees in seven global organizations that asked employees if they saw benefits, whether those be individual, community, or organizational, resulting from participation in a CoP. Over 50% of respondents agreed that the CoP improved 11 out of the reported 15 areas. Respondents felt the organizational benefits, such as employee retention and speed of service, were least impacted by the CoP. When asked to provide a specific benefit of the CoP, 120 out of the 431 participants were able to articulate how their participation in the CoP helped them in their position, whether the benefit was for themselves or the organization as a whole. Iverson and McPhee (2008) explored the enactments of CoPs in two volunteer organizations and how communication between members supported mutual engagement, a shared repertoire, and negotiation of joint enterprise. They found that the two groups participated in these three processes differently, but the communication that occurred between members still supported knowledge development among the volunteers and established the group as a CoP. Iverson and McPhee concluded that while the enactment of CoPs differed between groups, sharing an engagement of members supported the development of a shared repertoire, which in turn established the CoP.

While businesses and organizations could benefit from the use of CoPs, many CoP studies have occurred in K-12 educational settings. Cuddapah and Clayton (2011) and Surrette (2020) both sought to understand the impact CoPs had on teachers who took alternate routes to their certification. Cuddapah and Clayton worked with 12 K-8 educators in an urban school district who met for 16 two-hour sessions over the course of the school year. The researchers took field notes during these meetings and coded the transcripts for the ideas of *meaning*, *practice*, *identity*, and *community*. The researchers found participants used these meetings to discuss (a) what it meant to teach, especially in an urban school setting; (b) their personal goals for teaching; (c) ideas for connecting with students; and (d) different classroom management strategies and techniques. These discussions allowed participants to make sense of their experiences. Participation in the CoP allowed these novice teachers to share resources with one another, affirm each other, and make sense of their experiences together, guiding, validating, and mentoring each other along the way. Surrette (2020) also found benefits for novice teachers enrolled in an alternate certification program. The local university paired these novice teachers with retired mentor teachers. Surrette conducted semi-structured interviews with 28 participants and found the majority of novice instructors identified the impact a variety of mentors, including informal mentors, had on their own teaching perspectives and knowledge. These mentors came from different teaching communities, showing the positive effect a variety of CoPs can have on novice instructors.

While the Surrette (2020) study examined teachers in an alternate certification program, CoPs have had the ability to influence novice teachers on traditional certification paths as well. K-8 teachers who met in a group with experienced teachers and an appointed

facilitator for biweekly 90-minute sessions were able to embrace the existing culture and adopt the practices of the group, in effect learning and growing as teachers (Lambson, 2010). While the facilitator of the group was not a teacher at the school, they guided group discussions, modeled teaching strategies, and led reflection activities for the CoP. This study showed the importance a facilitator could have on a CoP and led Lambson to claim facilitators who focused on the needs of newcomers in a CoP played a large role in moving those members from the periphery to full participation within the group. These results are important to the present study because group facilitators exist in each of the examined CoPs.

CoPs have also been used as a framework in higher education settings. Kensington-Miller et al. (2014) claimed participation in CoPs was especially important for new instructors trying to incorporate new teaching practices. The novices in their case studies felt the CoPs provided a place for suggestions from others, support for reflection, and outside encouragement. The researchers maintained these supports were vital to establishing effective and long-term change. Gourlay (2011), however, was unable to find positive outcomes when conducting their own study. Participants in Gourlay's study were professionals who transitioned to the role of university instructor. These instructors expressed feelings of confusion and isolation in their transition, leading Gourlay to claim CoPs lacked the necessary support required by novice university instructors. Gourlay admitted, however, that the aspects of mutual engagement and shared repertoire were not present in the study setting. Since two of the three attributes of CoPs were nonexistent, these novices were not actually participating in a CoP. Smith et al. (2016) found when the three CoP aspects were present, the knowledge of the practice of teaching in higher education emerged and increased among novice instructors. In

fact, the roles of expert and novice were very fluid among participants in this study as instructors with different responsibilities and backgrounds were able to contribute to the shared repertoire. The Smith et al. study provides insight as to why the Gourlay study may not have worked: shared practice and sustained mutual engagement are key indicators of a successful CoP.

GSIs may not initially attribute their success to CoPs, even when shared practice and mutual engagement are present. Wheeler et al. (2015) found novice GTAs were not able to see the direct connection between their participation in a CoP and their assigned duties. The GTAs who participated in follow up interviews attributed this disconnect to the perceived limited power they had over their teaching choices and the fact that teaching was not emphasized to them as graduate students with an assistantship. This finding suggests multiple CoPs may better meet the needs of graduate students in their unique role as instructor. The GSIs in the proposed study participated in both a teaching-specific and a general GSI development CoP. The additional focus on teaching-specific aspects of their role may allow GSIs to see the benefits of CoP participation.

With the many studies that have examined the use of CoPs, it is helpful to understand the effectiveness of CoPs on the growth and learning of its members. McKellar et al. (2014) found numerous evaluation frameworks in the literature to support this understanding. The researchers found 16 unique frameworks that had been published between 2002 and 2013 that either provided methods to better understand CoPs or methods to evaluate them, with the former making up the majority. Twelve of the 16 frameworks could be applied to management or industry settings, two to healthcare, one to interdisciplinary research, and only one,

developed by Wenger et al. (2011), to education. The Wenger et al. framework will be presented in greater detail in later sections of this paper as it is the theoretical framework applied to the present study.

Conceptual Framework Summary

Lave and Wenger (1991) described situated learning as the theory that learners, activities, and surroundings must work in tandem for learning to occur. They further clarified that when this learning occurs, it is due to legitimate peripheral participation, or LPP, a process where people immerse themselves within a community and participate in its practices. LPP often occurs within a Community of Practice, or CoP, a specific group learning environment in which members share a common purpose, work together to accomplish tasks, and serve as resources for one another. A CoP facilitates learning for its members through LPP as members gain new understandings that allow them to move closer to being a full participant in the community at hand.

Wenger (1998) found pre-job training was not in and of itself enough to support learning. Instead, it was reflecting with others while in a situated setting that allowed novices to make the meaning necessary to actually learn from their experience. This important connection between CoP participation and learning through LPP has been the catalyst for a variety of research regarding CoPs. This research has taken place in business (Fontaine & Millen, 2004; Iverson & McPhee, 2008), K-12 education (Cuddapah & Clayton, 2011; Lambson, 2010; Surrette, 2020), and higher education (Gourlay, 2011; Kensington-Miller et al., 2014; Smith et al., 2016; Wheeler et al., 2015) settings. The amount of research on CoPs has sparked an assortment of CoP evaluation frameworks to be developed as well. The Wenger et al. (2011) framework

provided a means for taking different sources of data to create an overall view of how CoPs contributed to the value creation of their members and is the framework that is used in the present study. To understand what this framework evaluates we must first have an understanding of value creation and its role in learning.

Theoretical Framework: Value Creation

Value-creating education promotes the idea that value creation is the ultimate purpose of human existence (Gebert & Joffee, 2007). Wenger et al. (2011) argued that learning takes place as members within a CoP create and negotiate value for themselves and for the collective group. Exploring value creation among CoP members could therefore provide insight into specific components of CoP experiences that support learning and growth. Value creation has often been looked at through a business or customer service lens because if individuals do not see value in a product, Chung and McLarney (2000) argued those individuals would not go away satisfied. Wenger et al. applied this theory to educational settings, implying if GSIs do not see value in their training and professional development, they will walk away having not learned anything.

Value cannot be forced on CoP participants simply by telling them what they should find valuable; members of the CoP must perceive information as valuable on their own (Chung & McLarney, 2000). Chung and McLarney mentioned stakeholder intimacy and operational excellence as two concepts found in organizational value creation that could be used to support value creation in an educational setting as well. Stakeholder intimacy occurs when you understand your customer enough to meet their wants and needs (Chung & McLarney, 2000). Stakeholder intimacy is critical in preparing GSIs for their duties; those working with GSIs should

first understand GSI wants and needs in order for these novice instructors to find value in their training and professional development experiences and, in effect, learn. Operational excellence is being as efficient as possible when delivering services (Chung & McLarney, 2000). This means for GSIs to find value in their training and professional development it should focus on essential information and not be seen as a waste of one's time. If perceived value is necessary to support learning and growth, it would be important for those supervising GSIs to understand how GSIs create value in their training and professional development experiences. The Wenger et al. (2011) value-creation framework provides the basis for understanding how GSIs create value through their participation in CoPs, which, in turn, supports those who focus on the learning and growth of GSIs to ensure they are doing their best at establishing environments that facilitate value creation.

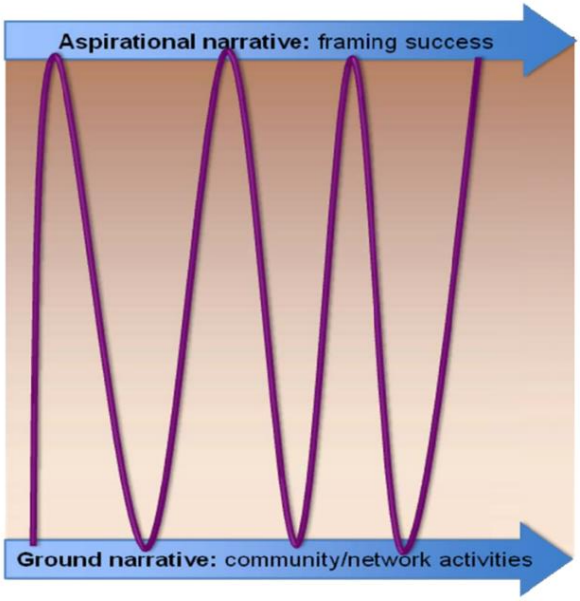
Wenger et al. Value-Creation Framework

Wenger et al. (2011) defined value creation as "the value of the learning enabled by community involvement" (p. 7) and suggested gaining understanding of value creation through personal and collective narratives. CoP member narratives can provide researchers with insight into CoP activities and operations. Wenger et al. coined these *ground narratives.* Narratives can also detail what individuals and CoPs as a whole hope to accomplish through participation in the CoP, coined *aspirational narratives*. Figure 3 shows how Wenger et al. connected ground narratives to aspirational narratives through productive tension, creating the space where learning takes place. They claimed the oscillating path between the ground and aspirational narratives "creates a space for learning and for deciding what is worth learning" (p. 17). This means the space between the current operations of a CoP and what members hope to get out

of the CoP is where members discover the knowledge that will support their aspirational growth. This sentiment supports the claim by Chung and McLarney (2000) that members of a CoP must understand how the actions of the CoP benefit them or could have benefitted them in order to actually learn. It is within this space that Wenger et al. situated their five-cycle value-creation framework.

Figure 3

The Productive Tension Between Aspirations and Everyday Narratives



Note. Wenger et al. (2011)

The Wenger et al. (2011) framework for assessing value creation is based on the training evaluation Kirkpatrick (1996) introduced in 1959. The first four cycles of Wenger et al.'s conceptual model (immediate value, potential value, applied value, and realized value) closely resemble the four levels of Kirkpatrick's model (reaction, learning, behavior, and results),

respectively. Wenger et al., however, included a fifth cycle (reframing value) that introduced a transformative aspect of learning that is overlooked by the Kirkpatrick model. It is important to note that while one cycle may lead into another, there is not a causal linear progression between the cycles. Reaching cycle five in this framework is not the defining characteristic of a successful CoP. The five cycles of value creation, as defined by Wenger et al., are described in detail in the following sections.

Cycle 1 – Immediate Value. The immediate value cycle looks at the activities and interactions that occur within a CoP (Wenger et al., 2011). An example of value that may be found in a GSI CoP at this level would be if a GSI were asking for help during their coordination meeting with how to reply to a student email. Other GSIs in the meeting may have had experiences in replying to similar emails and could share their expertise with their peer. Immediate value gives members of CoPs knowledge or perspectives they find beneficial for an in-the-moment situation.

Cycle 2 – Potential Value. While some interactions provide an in-the-moment benefit to CoP participants, other interactions may provide just-in-case knowledge possessing latent value. Wenger et al. (2011) coined this experience as potential value. GSIs may be given advice on how to handle hypothetical future situations such as dealing with late work or handling student disruptions in the classroom. These GSIs may not put that advice to use in the moment but may instead face a situation in the future when the shared advice would be valuable. Potential value comes in many forms including a skill, a feeling, a better understanding of who to turn to for support when it is needed, and tangible materials GSIs

could use in the classroom. Potential value may never be used, but if it is eventually put to use, it can lead to the next cycle of this framework.

Cycle 3 – Applied Value. Wenger et al. (2011) described applied value as taking potential value and adapting and applying it in novel situations. When GSIs participate in their CoPs, they hear what other GSIs have experienced and potentially receive advice on what changes could be made in the future. When GSIs experience a change in practice due to this knowledge, they are experiencing applied value. For example, a GSI may share stories during a classroom management professional development session regarding how they have dealt with disruptive behavior in the classroom. Another GSI would find applied value with this knowledge if they had not immediately used the shared strategy but later in the semester implemented it in their own classroom.

Cycle 4 – Realized Value. Realized value results from a CoP participant using their applied value to improve their performance (Wenger et al., 2011). An example of realized value occurs when a GSI acknowledges how participating in the group was helpful to them. This could be as simple as stating, "I was able to be a more efficient grader after [peer's name] suggested…" I argue realized value also comes from GSIs incorporating a change in practice and concluding it produces negative results for their students. This negative experience supports GSIs in understanding both what works and does not work for them in the classroom, allowing them to develop their own idea of what effective teaching looks like. Identifying knowledge as important to improving teaching skills and reaching group goals is another example of realized value (Bertram et al., 2014).

Cycle 5 – Reframing Value. The last way in which Wenger et al. (2011) defined creating value is called reframing value. Reframing value occurs when learning within the CoP causes its members to redefine success at the individual, group, or organizational level. This redefinition could be the catalyst for an overhaul in existing organizational structures. Reframing value could show up in the form of GSIs redefining what they feel it means to be a successful educator or reevaluating the value of coordination meetings for their teaching practices.

The Wenger et al. Value-Creation Framework in Recent Research

The Wenger et al. (2011) framework has been used to examine the effectiveness of CoPs in health, business, and education professions (Abigail, 2016). While other frameworks exist for these same purposes, the Wenger et al. framework is one of the few that addresses intangible aspects of a CoP as well, bringing added benefit to its use. Studies by Bertram et al. (2014) and Dingyloudi et al. (2019) examined value creation for graduate students in CoPs. Both studies found an uneven distribution of value creation among the Wenger et al. cycles. Abigail (2016) had the same finding in her literature review of studies using the Wenger et al. framework. While the cycles may have held different levels of importance for CoP participants, Bertram et al. claimed the type of value members expressed was not of importance, but that they were finding value in the first place. The graduate students in both the Bertram et al. and Dingyloudi et al. studies found value in the interactions with their peers, whether that came in the form of immediate value or realized value, when they attributed their improvement to a previous interaction. Dingyloudi et al. expanded on the Wenger et al. framework by creating subcategories in each cycle: (a) personal, (b) social, (c) skill-related, (d) study-related, and (e) context-related. The researchers discovered most graduate students found value in activities

that were skill-related or context-related (e.g., the atmosphere of the CoP or the facilitator's impact on the CoP). While these studies seem promising for the present study, they focus on graduate students in academic CoPs and how these CoPs improved the academic abilities of their participants. The present study adds to the existing literature in that it examines how value creation in CoPs supports graduate students in learning how to be instructors.

Rogers and Yee (2018) did, in fact, examine what pedagogical topics mathematics GSIs found valuable while working with peer mentors, but their study focused on the wants of GSIs without discussing how those topics supported GSI growth and learning. The present study extends research in the field by examining how needs and wants of GSIs determine what they value in their preparation and how they enact their learning from these experiences.

Theoretical Framework Summary

Wenger et al. (2011) expanded upon Lave and Wenger's (1991) definition of learning described in the conceptual framework sections of this paper by arguing that negotiating new understandings through experiences is actually negotiating value. They clarified negotiating value on an individual and group level is what causes learning to take place within a CoP. Wenger et al. developed a value-creation framework based on Kirkpatrick's (1996) previously developed framework. Wenger et al.'s five cycles of value creation are immediate value, potential value, applied value, realized value, and reframing value. While I use this evaluation framework in the present study, I will introduce another level, called missed opportunities, as a result of study findings. This level is described in detail in the following chapter of this paper.

Examining value while learning is not new to studies in higher education. Rogers and Yee (2018) examined the value novice GSIs found in different pedagogical topics in mathematics.

While Betram et al. (2014) and Dingyloudi et al. (2019) focused on value creation of graduates as students and not instructors, both of their studies utilized the Wenger et al. (2011) value-creation framework. In fact, Dingyloudi et al. expanded upon the framework by adding the subcategories personal, social, skill-related, study-related, and context-related. These subcategories will be adapted and used in the present study as well. Since the CoP in the Dingyloudi et al. study focused on graduate academics, I have adjusted the study-related subcategory to student-related to reflect both the instructor and student aspects of the GSI role. As with the missed opportunity value-creation category, this subcategory is described in greater detail in the following chapter.

Chapter Summary

GSIs are an integral part of the higher education system, and their presence causes a substantial impact on undergraduate student learning. Numerous studies in recent decades have focused on a variety of GSI subject matter in an effort to better understand this unique demographic of educators. The present study looks to add to this growing body of research by examining how those working with GSIs can better support their learning.

This study used a situated learning lens to define learning and therefore posits learning is a special type of social practice that occurs through participation in activities and gaining access to novel behaviors, allowing those participants to develop certain skills (Hanks, 1991; Lave & Wenger, 1991). CoPs are an opportune place to evaluate learning since members within a CoP use each other's experiences of practice to make sense of and address challenges they face in their community. Wenger et al. (2011) extended this definition of learning by asserting learning takes place as members within a CoP create and negotiate value for themselves and

for the collective group. They then developed a framework to assess the value created in the learning process. The present study adapts Wenger et al.'s (2011) five cycles of value creation and Dingyloudi et al.'s (2019) value-creation subcategories to examine the value established by GSI participation in CoPs.

Since the two CoPs examined in this study each have a different focus and research has shown different reactions from GSIs to different types of support provided to them (BrckaLorenz et al., 2020; Pilgrim et al., 2020; Ridgway et al., 2017), the research questions for the present study examine overall value creation for GSIs as well as the value created within each individual CoP. The details of this study are provided in the following chapter.

Chapter 3: Methodology

Context

This study took place at a mid-sized university in the southwest United States. GSIs in the study were primary instructors of entry-level mathematics and statistics courses. First-year GSIs were paid to attend three days of training prior to the start date of their contract. Second-year GSIs joined the first-year GSIs for professional learning training during the first contracted week when all faculty returned to campus. Both first- and second-year GSIs continued receiving support throughout the year by participating in weekly coordination meetings specific to the course they were assigned to teach in addition to monthly professional learning meetings focused on the administrative aspects of their job as well as overall teaching and graduate student support.

Participants

The study included the GSIs and their faculty supervisors. Appendix A includes the approval letter for the project from the university's Institutional Review Board for the Human Rights Protection Program. A summary of study participants within each CoP is included in Table 2, with detailed demographics information from each GSI participant included in Table 3.

Table 2

Study Participants and CoP Distribution

	GSIs		Faculty Coordinator
	First-year	Second-year	
Professional learning CoP			1
Mathematics GSIs	10	6	
Statistics GSIs	6	3	
Mathematics education GSIs	1	1	
Course-specific CoPs[a]			
MATH 105	1	2	1
MATH 110	9	1	1
MATH 115	5	0	1
MATH 120	2	0	1
MATH 130	N/A[b]	4	1
STAT 250	N/A[b]	3	1

Note. GSI = Graduate Student Instructor.

[a] All GSIs from the professional learning CoP are also included in one course-specific CoP.

[b] First-semester GSIs were not eligible to teach MATH 130 or STAT 250.

Table 3

GSI Demographics

Name	GSI year	Master's program	Teaching assignment	Age	Undergraduate major(s)	Undergraduate minor(s)	Formal training in education	Prior experience
Adam	Second	Statistics	STAT 250	20-24	Mathematics	N/A	No	None
Annie	First	Mathematics	MATH 120	20-24	Mathematics	Anthropology	No	Teaching, tutoring
Ben	First	Mathematics	MATH 110	40+	Applied mathematics	Electrical engineering	No	Tutoring
Beth	Second	Mathematics	MATH 105	20-24	Mathematics education	none	Yes	Tutoring, student teaching
Brandon	First	Mathematics	MATH 110	20-24	Mathematics	German	No	Tutoring
Brittany	First	Mathematics education	MATH 105	20-24	Mathematics education	N/A	Yes	Tutoring, student teaching
Bruno	First	Mathematics	MATH 110	20-24	Mathematics & physics	N/A	No	Tutoring
Camille	First	Mathematics	MATH 115	20-24	Mathematics	N/A	No	Tutoring
Fiona	Second	Mathematics education	MATH 105	25-29	Mathematics	Mathematics education	Yes	Teaching
Harry	First	Statistics	MATH 110	20-24	Computer science and mathematics	N/A	No	Tutoring

Name	GSI year	Master's program	Teaching assignment	Age	Undergraduate major(s)	Undergraduate minor(s)	Formal training in education	Prior experience
Hazel	First	Mathematics	MATH 115	20-24	English and mathematics	N/A	No	Tutoring
Henry	Second	Mathematics	MATH 130	20-24	Mathematics	N/A	No	Tutoring
Kai	Second	Mathematics	MATH 130	20-24	Mathematics	N/A	No	None
Kenneth	First	Mathematics	MATH 115	20-24	Mathematics and physics	Computer science	No	Tutoring
Leonard	Second	Mathematics	MATH 110	25-29	Mathematics	N/A	No	Tutoring
Leroy	First	Statistics	MATH 120	20-24	Mathematics	N/A	No	None
Louise	First	Statistics	MATH 110	20-24	Mathematics	Applied business data analytics certificate	No	Tutoring
Mark	First	Statistics	MATH 110	25-29	Statistics	N/A	No	Industry
Oliver	First	Mathematics	MATH 110	30-34	Mathematics and physics	N/A	No	Tutoring
Sabrina	Second	Statistics	STAT 250	25-29	Economics	N/A	No	Tutoring
Samantha	First	Mathematics	MATH 110	20-24	Mathematics	Writing	No	None
Sean	First	Statistics	MATH 115	20-24	Mathematics	Statistics and actuarial sciences	No	Tutoring
Uriah	Second	Mathematics	MATH 130	25-29	Mathematics: Probability and statistics	Electrical engineering	No	Tutoring
Victor	First	Mathematics	MATH 110	40+	Mathematics	N/A	No	Teaching
Wendy	First	Statistics	MATH 115	25-29	Mathematics	N/A	No	None

Name	GSI year	Master's program	Teaching assignment	Age	Undergraduate major(s)	Undergraduate minor(s)	Formal training in education	Prior experience
Whitney	Second	Statistics	STAT 250	20-24	Mathematics	Statistics, psychology, and communication	No	Tutoring
Wyatt	Second	Mathematics	MATH 130	35-39	Mathematics	N/A	No	Tutoring, industry

Note. GSI = Graduate Student Instructor.

There were 27 GSI participants who were master's-level graduate students in Mathematics (10 first-year GSIs and 6 second-year GSIs), Statistics (6 first-year GSIs and 3 second-year GSIs), or Mathematics Education (1 first-year GSI and 1 second-year GSI). All three second-year M.S. Statistics GSIs were assigned to teach STAT 250 and four of the six second-year M.S. Mathematics GSIs were assigned to teach MATH 130. The fifth second-year MS Mathematics GSI was assigned to teach MATH 110. The sixth second-year M.S. Mathematics GSI and the sole second-year M.S. Mathematics Education GSI were assigned to MATH 105. The first-year GSIs were split between MATH 105, MATH 110, MATH 115, and MATH 120. All GSI participants provided consent regarding the use of their data. Appendix B includes the GSI consent forms.

The study also included seven faculty participants to corroborate findings from the analysis of GSI data. One faculty member served as the GSI Coordinator, and six other faculty members served as coordinators for the various courses GSIs were assigned to teach. All seven faculty participants signed the consent form included in Appendix C. The GSI Coordinator's role was to support GSI induction to the department and address faculty and course supervisor concerns with GSIs regarding their academic or teaching performance. The GSI Coordinator also served as an advocate for GSIs, addressing GSI concerns with graduate faculty or course coordinators. Each course coordinator's role was to support the GSIs on their coordination team in understanding their specific course content, appropriate pedagogical strategies to use in the classroom, and the administrative duties required as university instructors. Course coordinators provided feedback to GSIs on their instruction through teaching observations that were required each semester.

Communities of Practice Within the Proposed Study

This study examined how GSIs created value through their participation in CoPs. As previously mentioned, CoPs are characterized by (a) having a common purpose (domain), (b) engaging in actions and negotiating meaning together (community), and (c) utilizing group resources (practice) (Bertram et al., 2014). Lave and Wenger (1991) stressed the importance of clearly defining these aspects of a CoP to ensure a given group truly represents a CoP and is not simply a group of people with common interests. As first shown in Table 2, multiple CoPs existed within the study, including one CoP comprised of all GSIs, called a professional learning CoP, and a course coordination CoP comprised of six course-specific CoPs that divided the GSIs into subset groups.

Each of the CoPs had a different meeting pattern and included different members. The professional learning CoP required GSIs to meet in an all-group setting at the beginning of the semester followed by monthly meetings with the GSI Coordinator. The course coordination CoPs met on a more frequent basis as instructors of highly-coordinated courses, whether they were GSIs or full-time faculty members, met weekly with the course coordinator to discuss course topics and pedagogical strategies. Table 4 provides a summary of each CoP's membership.

Table 4

CoP Membership

Member type	Professional learning CoPs		Course-specific CoPs					
	Pre-semester training	Monthly GSI meetings	MATH 105	MATH 110	MATH 115	MATH 120	MATH 130	STAT 250
First-year GSI	18	18	1	9	5	3	0	0
Second-year GSI	11	11	2	1	0	0	4	4
Faculty[a]	2	2	2	2	5	2	2	6
Total	31	31	5	12	10	5	6	10

Note. CoP = Community of Practice; GSI = Graduate Student Instructor.

[a] This number includes the faculty coordinator.

As seen in Table 4, there were two faculty members in the professional learning CoP. These faculty were the GSI Coordinator and the Director of the math center. As members of this CoP they co-facilitated pre-semester training and shared their knowledge and experiences with the GSIs during meetings. The faculty members in each course-specific CoP included one course coordinator and additional faculty members teaching the course. For example, the two faculty members included in the MATH 105 CoP were the MATH 105 Coordinator and the Director of the math center. The faculty member in MATH 110 was unable to attend CoP meetings due to scheduling conflict, but all other faculty were able to attend these weekly meetings. As more experienced CoP members, faculty who were able to attend weekly meetings were expected to participate in group discussions and share strategies they have used to teach the course-specific content. While all faculty included in Table 4 were CoP members, the GSI Coordinator

and the course coordinators were the seven faculty participants in the study. The details of each CoP are described in the sections that follow.

Professional Learning Community of Practice. When all GSIs came together, they had a common purpose, interacted with one another as they worked together, and utilized common resources, the combination of which established this group as a CoP. Table 5 identifies the characteristics of the professional learning group that justify its CoP classification. GSIs in the study were all graduate students in the Department of Mathematics and Statistics who were pursuing a master's degree in either Mathematics, Statistics, or Mathematics Education while also serving as primary instructors of first-year mathematics or statistics courses. This common pursuit was the domain that united the GSIs within the professional learning CoP. The GSIs in the CoP came together for a week of training and professional development at the beginning of the fall semester and continued to meet monthly to discuss their dual roles of student and instructor. This community was made up of first- and second-year GSIs who had varying experiences as graduate students and as primary instructors in a classroom. The professional learning CoP was led by a department faculty member serving the role of GSI Coordinator who provided general training and support for both the student and instructor roles GSIs were required to fulfill. The GSI Coordinator viewed their role as one of a trainer for GSIs, a sounding board for course coordinators, and a GSI team-builder. The GSIs and the GSI Coordinator established the community of this CoP.

Table 5

Defining Characteristics of the Professional Learning CoP within the Study

CoP characteristic	Manifestation of characteristic within the professional learning CoP
Domain	Teaching as primary instructors while simultaneously pursuing their own graduate studies
Community	All GSIs in the department, facilitated by the GSI Coordinator
Practice	Creating study groups Participating in professional development seminars Balancing the roles of student and instructor Discussing issues that arise

Note. CoP = Community of Practice; GSI = Graduate Student Instructor.

The GSIs in the department interacted with one another to establish the practice, or resources, of the professional learning CoP. The GSI Coordinator supported the development of this practice by encouraging GSIs to develop study groups and by having second-year GSIs share their own experiences and strategies they had used to not only be successful students and instructors themselves, but also to successfully balance these two roles. The GSI interactions supported establishing a shared repertoire for defining being a GSI within the department.

As previously mentioned, the department's professional learning CoP met for pre-semester training and professional development. After this initial training, the CoP continued to meet monthly throughout the semester. The pre-semester and monthly meetings each had different purposes as described below.

***Pre-Semester Training*.** All of the pre-semester trainings were facilitated by the GSI Coordinator and the Director of the math center where all first-year GSIs were assigned to

teach. Training and professional development sessions varied from year-to-year, but were designed to comprise a balance of sessions aimed to support GSIs in becoming successful students and teachers. For pre-semester training in this study, first-year GSIs were initially introduced to the department through an online training course housed in the university's Learning Management System. Over the summer, these GSIs gave brief introductions and read about the faculty and staff with whom they would be working. They were also given information about the space in which they would be teaching and tutoring as well as insight to the structure of all courses they could be assigned to teach.

First-year GSIs continued their preparation by attending three paid days of training before their GSI contracts officially began. The purpose of meeting solely with the first-year GSIs during this time was to introduce them to each other and the department and to help them acclimate to their new teaching and learning environment. The GSI Coordinator felt their duties during these training days were to ensure first-year GSIs were familiar with their roles and responsibilities and to prepare them as much as possible for when they would enter the classroom for the first time.

The first-year GSIs started their in-person training with introductions to department administrators and staff, followed by the department's graduate teaching faculty. The GSIs were then able to meet with their advisors to discuss course options for enrolling in their first-semester classes. After focusing on their student role, the GSIs met with the course coordinators of the courses they would be assigned to teach and received a general overview of each course. Following that, the first-year GSIs participated as students in teaching demonstrations from three second-year GSIs. Each of the three teaching demonstrations

concluded with a short debrief to discuss what the second-year instructor did well and how the lesson or facilitation could have been improved. The second-year GSIs had deliberately used different strategies (e.g., teaching with PowerPoints, using document cameras, writing notes on the board, having students work individually, incorporating group work, utilizing non-permanent vertical surfaces, etc.) and covered different content in each of the demonstrations to support the first-year GSIs in learning how to best use the teaching space and technology for when they would give their own teaching demonstrations over the next few days.

Day two of first-year GSI training consisted of teaching demonstrations by the first-year GSIs. They were split into two groups of nine, with each GSI giving a 15-minute teaching presentation to their group. The eight observing GSIs and either the GSI Coordinator or the center's Director, depending on the group, provided written feedback to each GSI after their presentation. Appendix D includes the form used to provide this feedback. The first-year GSIs were then able to take this feedback and use it to prepare a five-minute teaching demonstration on a different assigned topic for the third day of training.

The first-year GSIs were split into different groups on this third day of training, with one group participating in the five-minute teaching demonstrations with the GSI Coordinator and the other group discussing academic integrity procedures and exam proctoring strategies and protocols with the Director. While the 15-minute teaching demonstrations from the previous day took place in large classrooms that held 72 students, the 5-minute teaching demonstrations took place in smaller classrooms that held only 36 students, allowing GSIs to experience teaching in different environments. The first-year GSIs then had a break over the weekend to

prepare for the university's faculty work week (the five days before the semester officially began), where they would be joined by the second-year GSIs.

General training and professional development sessions began once all GSIs returned to campus to start the semester. During this time GSIs were informed of their expectations as classroom instructors, were taught how to fulfill their administrative duties, and focused on general classroom instruction and management techniques. The GSI Coordinator viewed their role during these particular sessions as creating a team where second-year GSIs could take the lead in sharing their experiences to help the first-year GSIs understand the journey upon which they were about to embark.

GSI training during this week focused on mathematics education pedagogy, protocols for working with students with disabilities, and supporting first-year students in general. The GSIs also participated in training sessions that helped them better understand their role as a graduate instructor and student. This week was also the first time GSIs met in their course coordination groups and were able to focus on the specific content they would be teaching.

***Monthly Graduate Student Instructor Meetings*.** After the pre-semester training, GSIs were required to attend monthly meetings held by the GSI Coordinator. These meetings served as an opportunity for the GSI Coordinator to address general issues brought forward by course coordinators or graduate teaching faculty and for GSIs to come together and discuss experiences as well as share issues or concerns regarding their teaching or student duties. The monthly meetings were also an additional opportunity for GSIs to socialize with each other and offer or receive support.

The GSI Coordinator viewed monthly meetings as a time where GSIs were reminded they were a part of a team, regardless of the fact they were teaching different classes, attending different meetings, and were in different graduate programs. The coordinator's main goal of the monthly meetings was to support a sense of belonging and a sense of togetherness among the GSIs. GSIs described these meetings as a time where they were reminded about general administrative duties, reflected on how both the classes they were taking and teaching were going, asked questions or raised concerns, shared experiences they were having, and socialized with their peers.

While GSIs met altogether to discuss general teaching and graduate student issues with the GSI Coordinator, they also met weekly in smaller groups with a course coordinator to learn the content and pedagogical approach to the specific course they were assigned to teach. These smaller groups were called coordination groups and are what comprise the course coordination CoP.

Course Coordination Communities of Practice. Course coordination groups are an example of learning through a CoP, as defined by Lave and Wenger (1991) because the groups were made of novices who learned about teaching by participating in the actual practice of teaching experts, but to a limited degree and with limited responsibility. Each coordination group was defined by the common role of its members, who interacted with one another to better understand their role and the norms established within the group. Group members also shared resources with each other. Table 6 outlines the justification for classifying coordination groups as CoPs.

Table 6

Defining Characteristics of the Course-Specific CoPs within the Study

CoP characteristic	Manifestation of characteristic within the course coordination CoP
Domain	Teaching the same course
Community	GSIs assigned to teach the course Any faculty assigned to teach the course Facilitated by a course coordinator
Practice	Reviewing course content Developing supplemental materials Discussing pedagogical approaches Aligning administrative practices Establishing grading norms Discussing issues that arise

Note. CoP = Community of Practice; GSI = Graduate Student Instructor.

While GSIs made up the vast majority of participants in most of these communities, each CoP had a coordinator and, in some cases, additional full-time faculty who were also assigned to teach the course. Instructors in these coordination groups were relieved from designing their curriculum and even determining which content to teach from week to week as this was laid out for them by their course coordinator. All instructors had some freedom regarding how to present content in the classroom, but course policies were established by the course coordinator prior to the start of the semester. Issues that arose during the semester were often discussed in a group setting to determine how to approach handling the situation. The course coordinator also created common online homework assessments. Many coordination groups also had pre-established exams for course instructors to give their students. GSIs who had previously taught in the department became eligible to be part of

coordination groups where they experienced increased freedom in their instruction, developed additional written homework sets, and created their own exams, which needed to be vetted by the course coordinator before they could be given to students.

The coordination CoPs met weekly to discuss course-specific (a) content, (b) pedagogical strategies, and (c) administrative duties. Since each of these topics was course-specific, they defined the common interest, or domain, the members of each group shared. In years prior, first-year GSIs had an opportunity to gain insight in their coordination group from second-year GSIs who had previously taught the course. This unfortunately was not the case in the present study, however. Luckily many faculty members on the coordination team could share teaching strategies they had used to be effective instructors in their courses. The practice of these individual CoPs was defined by (a) the agreed upon group meeting norms, (b) teaching materials group members developed and shared, (c) grading and course policies group members were expected to uphold, and (d) the teaching practices the members discussed and implemented. Since each coordination group had a unique structure and established its own practice, it is important to examine each course and its CoP independently. Table 7 provides a summary of both the class information and CoP structure for each course.

Table 7

Summary of Courses Taught by GSIs

Variable	MATH 105	MATH 110	MATH 115	MATH 120	MATH 130	STAT 250
Credits	2	3	3	4	4	3
Class capacity	45	72	36	40	72	35
Pre-semester coordination support	Three 60-minute meetings	Three 90-minute meetings	Three 90-minute meetings	Three 90-minute meetings	Two 90-minute meetings	Two 90-minute meetings
Weekly coordination support	One 60-minute meeting[d]	One 90-minute meeting	One 90-minute meeting	One 75-minute meeting	One 60-minute meeting	One 60-minute meeting
Written homework[a]	N	N	N	N	Y[e]	Y[e]
Written quizzes[b]	N	N	N	N	Y	Y
Written exams[c]	N	N	N[f]	N	Y	Y

Note. GSI = Graduate Student Instructor; N = no; Y = yes.

[a] All courses had an online component to the homework that is designed by the course coordinator.

[b] MATH 110 and 120 had quizzes designed by the course coordinator.

[c] MATH 105, 110, 115, and 120 had online exams written by the course coordinator.

[d] Meetings started out weekly and then switched to an as-needed basis

[e] GSIs could develop their own written assignments.

[f] There was a written component to the MATH 115 exam, but it was created by the course coordinator.

The following sections describe each course coordination CoP and the information included in Table 7 in greater detail.

MATH 105 and its Community of Practice. GSIs teaching MATH 105 met with their students once a week for 75 minutes. Each GSI was assigned to teach two sections of the course, working with up to 45 students in each section. Instructors worked in class to support student understanding of mathematical concepts and to support students in meeting course requirements while progressing in their content mastery. The MATH 105 Coordinator determined the specific content students would cover in the course and created all assignment deadlines in the online software used in the class.

The MATH 105 instructors met before the semester began for three hour-long meetings in order to gain an understanding of course policies and software and to set up their specific course shell in the university's Learning Management System. Course coordination meetings continued weekly for 60 minutes once the semester began but switched to biweekly or every three weeks as the semester progressed. The sporadic nature of these meetings was due to MATH 105 instructors focusing on student support more than course content. MATH 105 instructors did not teach content as the course structure was designed to meet the specific content needs of each student on an individual basis. Instructors needed less support as the semester progressed because they better understood their role and how to support students appropriately in the course.

The MATH 105 Coordinator used coordination meetings as a time to ensure all instructors were on the same page and consistent with upholding course policies. The coordinator also wanted instructors to feel supported, be able to navigate the course

technology, and have the opportunity to get their questions answered. The coordinator's main goal was ensuring instructors felt comfortable enough to clearly explain course policies to students and that they could guide their students through successfully completing course requirements.

MATH 110 and its Community of Practice. GSIs teaching MATH 110 met with their students once a week for 75 minutes. Each GSI was assigned to teach two sections of the course, managing up to 72 students in each of these sections. Class time consisted of GSIs working with their students to complete problems that had been established by the course coordinator. GSIs had instructional freedom in presenting these problems to the class. Students in this course completed homework assignments, quizzes, and exams through the course's online software. The coordinator created all the course assessments before the semester began and ensured they were set up in each individual course section for the GSIs. The assignments were graded within the course software, but GSIs reviewed each of the exams to give partial credit based on the work submitted by students, as outlined by the course coordinator.

The MATH 110 Coordinator viewed their role as the first point of contact GSIs could go to with course questions and for advice on how to handle student situations. The coordinator met with all course instructors for three 90-minute sessions before the semester began. During these meetings instructors discussed the course structure and policies as outlined in the coordinator-created syllabus. The coordinator also provided instruction on how to navigate course software and how to address common technology issues that could arise throughout the semester. It was also during this time that the coordinator reviewed expectations on communicating with students and, if necessary, their advisors throughout the semester. Once

the semester began, this group continued to meet weekly for 90-minute sessions. The coordinator used coordination meetings as a time to provide administrative reminders about the course and the learning center, to ensure all instructors were on the same page with course content, and to provide tips on how to effectively present the content in class. The instructors also contributed ideas during meetings regarding presenting course material and shared how they had previously handled similar student situations that came up.

MATH 115 and its Community of Practice. GSIs teaching MATH 115 met with their students twice a week for 75 minutes. As with MATH 105 and MATH 110, GSIs were assigned to teach two sections of this course, but sections of MATH 115 were capped at 36 students. GSIs worked with their students in class to complete problems and activities that had been established by the course coordinator prior to the start of the semester. Like the structure of MATH 110, while the content was predetermined, GSIs this course still had instructional freedom with presenting material to the class. Students completed homework assignments and exams through the online course software. The coordinator created all assessments before the semester began and ensured the assessments were properly assigned in each individual course section for the instructors. The assignments in this course were graded by the online software. In addition to those assignments, students had open response examinations to complete in this course. These examinations were developed by the MATH 115 Coordinator each semester and used by all course instructors, who were then required to grade their own student responses using guidelines provided by the coordinator.

The MATH 115 Coordinator viewed their role as a facilitator and a guide to support instructors becoming facilitators in their own classrooms. The coordinator viewed the group as

a decision-making entity where all instructors were able to provide feedback and offer suggestions that impacted course policies and procedures. During meetings, the coordinator asked instructors to switch between student and instructor roles in order to both fully understand the content and think about how to present the content in their own classes.

There were similar aspects in the coordination meetings for MATH 115 and MATH 110: (1) the group met for three 90-minute sessions prior to the start of the semester to discuss course structure, policies, and technology; and (2) the group met weekly for 90-minute sessions once the semester began to discuss issues GSIs were facing and prepare for upcoming lessons and administrative duties. Unlike with MATH 110, however, the MATH 115 Coordinator also needed to support GSIs in normalizing grading practices and provide mini lessons on Microsoft Excel skills weekly so that GSIs were able to support their students while their class met in the computer lab. The course content of MATH 115 was novel to many GSIs so ample time was spent discussing student misconceptions and how to best approach these misconceptions in class.

MATH 120 and its Community of Practice. MATH 120 had a similar course structure to MATH 110: (1) There were 72 students in each section, (2) assignments were all created by the coordinator and completed online, and (3) GSIs provided partial credit for student work on exams using instructions from the course coordinator. This course, however, met for 50 minutes three times a week, and there were no pre-assigned notes for GSIs to use with their students in the classroom. Instead, the course coordinator provided resources GSIs could either use verbatim or adapt for their own classrooms. The MATH 120 CoP also met for three 90-

minute sessions before the semester to work on similar tasks as the previous three coordination groups and continued meeting weekly for 75-minutes once the semester began.

MATH 120 coordination meetings often started with administrative announcements and reminders before moving onto content for the week. The MATH 120 Coordinator expected GSIs to incorporate active learning when teaching and used their coordinator role to properly train GSIs on facilitating this specific educational approach themselves. The coordinator spent time during weekly meetings explaining what their own class instruction would look like so instructors could present material in the same manner, although instructors had the freedom to deviate from the coordinator's lessons. CoP members also discussed different pedagogical strategies and reviewed difficult course content in meetings through group discussions and problem solving.

MATH 130 and its Community of Practice. MATH 130 was only taught by full-time faculty, with limited GSI exceptions, until the academic year prior to the current study. During that year, a handful of second-year GSIs were assigned to teach the course with the expectation that second-year GSIs would continue teaching the course in the future. The semester of the present study marked the third semester in which GSIs taught this course.

MATH 130 classes met four times a week for 50-minute sessions. Due to the number of weekly class meetings and the amount of preparation required for instructors, GSIs teaching MATH 130 were each assigned to teach one section of the course capped at 45 students. Similar to the course CoPs described previously, there was an online homework software associated with this course that was predetermined by the course coordinator. Unlike those CoPs, however, GSIs teaching MATH 130 had the ability to assign written homework from the

book and wrote and graded their own quizzes and exams. The MATH 130 Coordinator viewed their role as a supporter of instructors teaching the course. They also felt the main purpose of their role was to ensure consistency in rigor, policies, and pace of content across course sections. To support these efforts, the course coordinator provided instructors with sample sets of notes GSIs could use or edit for their own lessons. While GSIs were given more autonomy when teaching this course than in the previously described courses, the coordinator still provided a syllabus outlining policies to be followed across all sections of the course.

GSIs teaching MATH 130 met with the course coordinator twice before the semester began. The smaller number of pre-semester meetings was due to the limited instruction required to support GSIs in preparing the technology component of the course. These two meetings covered the structure of MATH 130 and how the course structure and the expectations for GSIs differed from classes the GSIs had previous taught. Once the semester began the CoP continued to meet weekly for 60 minutes. During these weekly meetings the coordinator worked with GSIs to discuss upcoming content and appropriate pedagogical strategies. The coordinator also focused on common student struggles and how to address them. The meetings were a time to address any issues instructors were facing, either with content or with student situations, and to discuss administrative tasks associated with the course. MATH 130 coordination meetings appear similar to other CoP meetings discussed so far, but GSIs teaching MATH 130 had additional responsibilities compared to their peers in other courses, and these responsibilities were addressed during coordination meetings as well.

Since MATH 130 GSIs wrote their own exams, the coordination meetings were a time where the instructors discussed the types of questions to include on their exams and where the

coordinator could review exams for final approval. MATH 130 GSIs also supervised undergraduate teaching assistants (UTAs) in their classroom who graded assignments and led review sessions for the class. The coordinator worked with the GSIs during their weekly meetings to address how to use UTAs effectively in the classroom. These additional responsibilities were also required of the GSIs teaching STAT 250.

STAT 250 and its Community of Practice. STAT 250 was taught by second-year M.S. Statistics GSIs and full-time Statistics faculty. The course met either for three 50-minute sessions or two 75-minute sessions weekly, requiring daily course materials to differ from instructor to instructor depending on their individual section assignments. STAT 250 GSIs taught two sections of 35 students each. The assessment structure for STAT 250 was similar to that of MATH 130 in that there was an online homework software, but STAT 250 instructors created the online assignments, assigned written homework, and wrote their own quizzes and exams. GSI-written exams also needed to be approved by the STAT 250 Coordinator. The online textbook associated with STAT 250 provided lesson PowerPoint slides instructors were able to use, but instructors created any additional materials for their students. The pre-semester and semester weekly meetings for STAT 250 followed the same meeting pattern and general structure as MATH 130.

Weekly meetings for STAT 250 began by having a logistical or administrative question written on the board for all instructors to answer. These responses either guided the start of the meeting or were left to discuss at the end. Instructors spent time discussing content during their weekly meetings with GSIs pairing up with more experienced faculty to discuss how to approach a topic by alternating student and teacher roles. The STAT 250 Coordinator viewed

their main responsibilities as making sure instructors understood course logistics, facilitating discussions regarding course-wide decisions, and supporting GSIs by having veteran instructors share their experiences. The coordinator also felt it was important for GSIs to become independent instructors, using their own experiences to guide their growth as educators. Coordination meetings were used as a time for all instructors to share their experiences and discuss how to approach content in the classroom. The coordinator also provided hands-on activities instructors could use in the classroom. Towards the end of the semester instructors used their weekly meeting to additionally reflect on semester successes and areas they could improve upon in the upcoming semester.

Learning in the Coordination Community of Practice. As novice GSIs gained experience in their role, they were provided more opportunities to move away from the periphery of their field to become more active participants. In any CoP, as novices take on more responsibilities, they are more likely to experience novel situations that allow them to learn what it means to be a true part of their particular community of practitioners. The present study looks to better understand this learning process through the value-creation conceptual framework developed by Wenger et al. (2011). This framework was described in detail in Chapter 2. The application of this framework in the current study is described in later sections of this chapter.

Subjectivity of Researcher

It is important to note that while I conducted this research, I had a unique relationship with most of the study participants. I served as the Director of the math center where four of the six courses previously described were taught. Since most of the training and coordination meetings described occurred in the space where I was an administrator, I had a personal

investment in those happenings and the success of the instructors who taught those courses. As the Director, I supervised four of the six course coordinators I interviewed. I also worked with the GSI Coordinator in designing and facilitating the orientation and training sessions for GSIs before the start of the semester. While I had a direct connection to the coordinator roles, the questions I asked them in their interviews focused on their view of their role, their coordinator philosophy, and aspects of their position in which they have design autonomy. Even in my supervisory role, I did not have direct evaluative power over the coordinators as that was a responsibility of the Department Chair. Though I am not a direct supervisor of the GSIs in this study, it is likely they viewed me as an authority figure.

I gathered multiple sources of data in order to address the issue of my subjectivity as the researcher. I (a) collected numerous written narratives from GSIs, (b) conducted focus group interviews, and (c) gained insight into coordination CoPs from course coordinators. The multiple data sources allowed me to triangulate the data so that findings came from a variety of perspectives and not solely from my own observations and interpretations. Though various sources have supported limited bias in presenting my findings, my subjectivity had the biggest impact when analyzing questions involving the orientation and training aspects of the GSI experience. Many of the GSIs referenced specific sessions that I designed or facilitated. I have noted in the findings when an experience in which I was directly involved is mentioned.

Research Design

The present study required an in-depth investigation of the practices established by the different GSI CoPs and specifically what GSIs found valuable for their learning within these CoPs. The product of this investigation is a collective case study. While each coordination group

was unique, all course coordination groups were combined to create a case focused solely on learning how to be an instructor in a given course. The second case in this study was defined by the professional learning CoP, which focused on learning how to simultaneously be a graduate student and an instructor. Combining all course coordination CoPs into one case maintained equal sample sizes in the two cases, supporting a comparison between the value described by the GSIs when in their coordination groups versus in the professional learning CoP. Yin (2014) maintained it is appropriate to use case studies when examining phenomena in real-life contexts and to answer how and why questions. Since the present study examined the learning and value of novice instructors in a real-life context and research question 1b specifically asks how the different activities and experiences within these CoPs influence GSI learning, using case studies in the research design is appropriate. Multiple sources of data were collected to provide an in-depth understanding of each case and the value GSIs created through their participation in each one.

Case Study Construction

According to Stake (1995), a case is a bounded system that has a given purpose. Since each of the CoPs I have already described has a specific purpose, certain requirements for membership, and specific ways of operating, it makes sense that each of the CoPs be looked at as its own case. Since I examined multiple CoPs (the professional learning group and the combination of coordination groups), this is a collective case study. The approach I took in the collective case study reflects an instrumental case study approach because my purpose was to understand the value created within the group, not necessarily the group itself. The use of case study allowed me insight into the value-creation of study participants. It was important for me

to gain understanding of how these CoPs operated and how membership within the group supported learning. The purpose of using cases in the current study was to better understand these groups and the effects they had on the growth and learning of their members.

While two cases are described in the present study, it is important to note that these cases were not used to better understand each other. Instead, the cases were analyzed independent of one another in an effort to better understand how value creation and learning occurred among GSIs in each group. Once data from each case was collected and analyzed, I was able to address any generalizations across these cases that could be made regarding the value GSIs found in their CoP experiences that led to their growth and learning as instructors.

The data collected in a case study must lead to understanding of how the people being studied (i.e., the GSIs) see things (Stake, 1995). Multiple data sources can help establish the multiple realities that occur within each case. Direct insights from the GSIs were the main source of data in the present study, but observations from the researcher and observations and insight from the coordinators involved in the CoPs either validated the GSI experience or added different views that supported multiple realities within the case. The data that was collected in this study are described in detail in the following section.

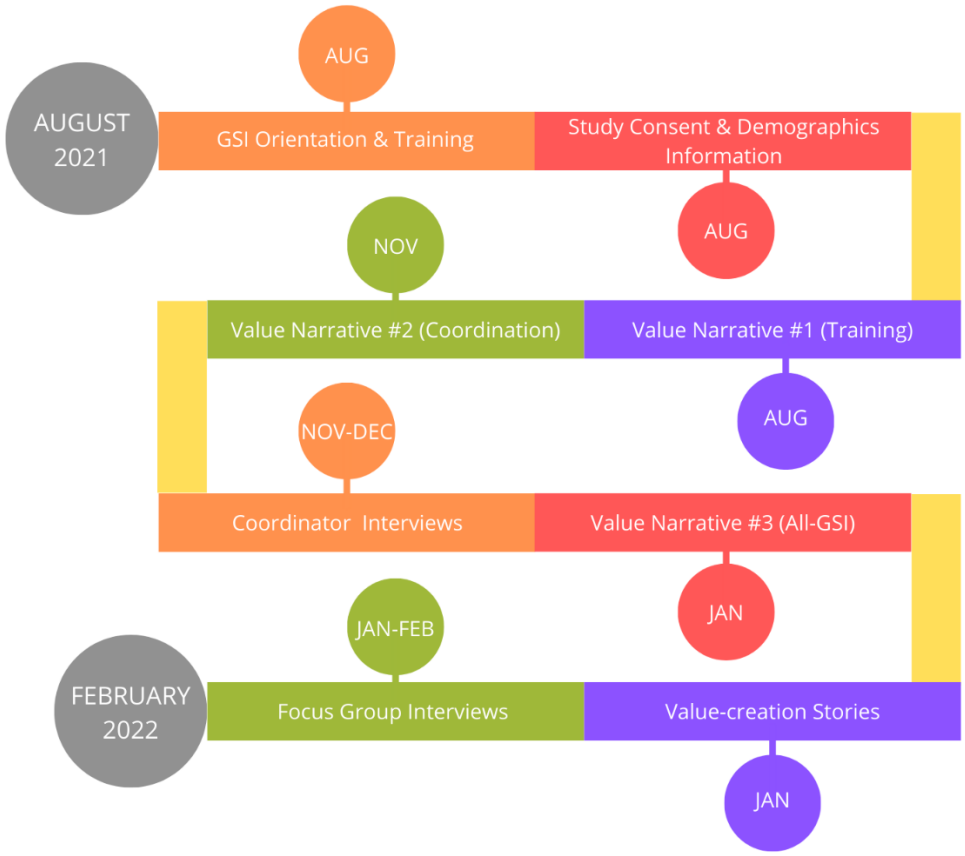
Data Collection

The current study used data collected from individual GSIs and coordinators, direct observations from the researcher, and focus group interviews based on GSI course coordination assignments. Data was collected from August 2021 through February 2022. Primary data sources came from the GSIs themselves. Coordinator interviews served as a secondary data source in order to triangulate the findings from the primary sources of data. The rationale for

why different data sources were collected at their designated time is included in the following descriptions of each data source. An overview of the data collection process is shown in the timeline in Figure 4.

Figure 4

Data Collection Timeline



Note. GSI = Graduate Student Instructor

Table 8 shows how each data source was used in this study to answer the research questions. Again, the research questions are as follows:

1. What activities and experiences within the GSI professional learning and course coordination CoPs most influence GSI professional learning?
    a. What patterns, if any, exist in activities and experiences identified by GSIs when in their CoPs?
    b. How, if at all, do these activities and experiences influence the value of learning for GSIs?

Table 8

Research Questions and Their Respective Data Sources

Data Source	RQ1	
	a	*b*
Primary Data Sources		
Value Narrative #1 (Orientation and Training)	X	X
Value Narrative #2 (Coordination Meetings)	X	X
Value Narrative #3 (Monthly Meetings)	X	X
Value-Creation Stories	X	X
Focus Group Interviews	X	X
Demographic Information	X	
Secondary Data Source		
Coordinator Interviews	X	

Note. RQ = Research Question.

While the data collected from the GSIs themselves were the primary sources used to answer these questions, coordinator interviews were used as secondary sources to triangulate the data collected through the primary sources.

Primary Data Sources

The data described in this section came directly from the GSIs and was the main source for study findings post data analysis.

Demographic Information. GSI demographic information was collected at the beginning of the Fall 2021 semester at the same time GSIs were asked to consent to the study. This data occurred through a Google Form in an all-group setting during one of the training orientation sessions. GSIs were asked to answer the questions found in Appendix E of this document. The demographic information was used to gain a better understanding of the population of the different GSI CoPs in the study and to contribute to any significant findings in the study.

Personal Value Narratives. The personal value narrative designed by Wenger et al. (2011) provided study participants with the opportunity to describe their overall experiences within a CoP. These narratives allowed GSIs to share how their CoPs impacted their skills, attitudes, social connections, and teaching practices. The narratives also allowed GSIs to reflect on how they viewed themselves as teachers and graduate students based on their personal goals, performance, and what they found valuable.

Instead of using the narrative in its original form, I asked the GSIs to complete a Google Form questionnaire that addressed the concepts of the Wenger et al. (2011) document. I made the decision to alter the presentation of the questionnaire for multiple reasons. For one, the first row of the original narrative addressed the reason for participation in the CoP. The GSIs in

the proposed study did not have a choice in attending the trainings, weekly coordination meetings, or monthly meetings that occurred within the CoPs, making the first row of the original Wenger et al. narrative irrelevant. The second reason for asking the questions through a Google Form and not in its original form was to provide more clarity. I found it difficult to understand what each cell in the Wenger et al. matrix was asking and felt GSIs would better understand the questions if they were asked individually as opposed to being presented with all the questions at once in its matrix form. A first draft of questions was piloted during the Spring 2021 semester. Based on GSI responses and clarifying questions, the draft questions were edited to their final form, presented in Appendix F, Appendix G, and Appendix H. While the piloted questions were sent to GSIs to complete individually, when collecting data for the actual study the narratives were given in a group setting at different points throughout the year.

The first personal narrative took place in August 2021, shortly after the semester began when the GSIs met for their first monthly meeting. The meeting ended with all GSIs going to a computer lab to respond to Value Narrative #1. These questions focused on the value GSIs created from their pre-semester training activities and experiences. Value Narrative #2 took place during the November monthly GSI meeting. This particular narrative focused on the value GSIs created from their weekly coordination meetings. At the time they were asked to complete the narrative, GSIs had attended 13 of their 15 coordination meetings for the semester, giving them enough experience to reflect on what had influenced their learning. Again, GSIs completed their Google Form in the computer lab of the building where these monthly meetings occurred. Value Narrative #3 was completed when GSIs returned for the spring semester in January 2022. The timing of this data collection allowed GSIs to reflect on all

four of the monthly meetings from the previous semester. As with the previous two iterations, GSIs completed the Google Form reflecting on the monthly professional learning meetings in a whole-group setting in the computer lab where the meetings took place.

Value-Creation Stories. While the personal value narratives previously described allowed for an overall picture of individual participation in a CoP, the collection of value-creation stories provided participants an opportunity to share specific examples of how that participation supported individual growth and learning (Wenger et al., 2011). The template for value-creation stories, as created by Wenger et al., is included in Appendix I. I used these questions exactly as written but had the GSIs answer them through a Google Form.

While the personal value narratives provided GSIs the opportunity to reflect on three separate occasions regarding the Fall 2021 semester, the value-creation stories were only collected once at the beginning of the Spring 2022 semester. GSIs were asked to answer the value-creation story questions while in an all-group setting as part of their spring training the week before the semester began. There were two reasons for using this timing for the value-creation stories:

1. I did not want to overwhelm GSIs with data collection at the end of the fall semester and wanted to give them time to truly reflect on the experiences they found valuable to their growth and learning.
2. Collecting this data at the start of the next semester would allow GSIs to include any experiences they had while grading final exams and submitting grades that they found meaningful, and these stories would add to the richness of the data I collected.

Focus Group Interviews. After collecting four individually written forms of data, I chose to collect follow-up data through focus group interviews over one-on-one interviews. Stake (1995) asserted sampling is inappropriate in case study research, so holding focus group interviews where the group that comprises a given case is providing insight was appropriate. He also claimed interviews are the most common method for gathering information that reflects the multiple realities that exist within a case and for providing insight into what the researcher may not have been able to observe. While individual interviews could have been one way to get more information about specific CoP experiences, holding interviews in a focus group setting allowed me to increase my sample size from six individual participants to 15 participants. Trotter II (2021) asserted focus groups provide a focused exploration of a bounded topic. Since case studies focus on a bounded system with a given purpose, they are an appropriate method of data collection for the present study. One limitation of the focus groups is that the responses reflected a public attitude, not a private one. I believe, however, this limitation was offset by the individual reflections from the previously collected personal value narratives and the value-creation stories.

Focus group interviews occurred between January and February of the Spring 2022 semester. This timing allowed me to look at responses from the personal value narratives and value-creation stories to make any necessary adjustments to the questions I asked in the focus group semi-structured interviews. The interviews took place over Zoom to accommodate the scheduling needs of the participants and were recorded to help with future data analysis. According to Trotter II (2021), one of the key characteristics of focus groups is that they are selected on the basis of a common characteristic. It was for this reason I created my focus

groups based on GSI Fall 2021 course coordination assignments. While all coordination group responses were combined in the final analysis of data, each coordination group operated under its own unique norms, making it appropriate to ask value-creation questions to the groups separately.

A common size for focus groups is anywhere from six to 12 participants (Trotter II, 2021). While the present study had potential for focus groups to range between three and ten participants, they actually ranged from two to four GSIs. The group size was limited by the willingness and availability of GSIs to participate. The homogeneously organized focus group interviews were an ideal form of data collection for exploring how CoP participation influenced GSI learning because they allowed me to look for common themes in responses regarding the professional learning CoP while also looking at how value was created across course coordination CoPs.

One important aspect of focus group interviews is the sequencing of questions (Trotter II, 2021). Questions should start off broad and become narrower as they progress. As mentioned previously in this section, the focus group interviews were semi-structured. A semi-structured interview allowed for natural themes to emerge in the conversation with probing questions when needed. The structured focus group questions were adapted from the Wenger et al. (2011) framework and are included in Appendix J of this document. Holding focus group interviews after collecting personal value narratives and value-creation stories allowed me to see if there were common experiences focus group members referenced individually that they could expand upon in the group setting.

Secondary Data Source

Coordinator Interviews were used for descriptive and triangulation purposes in conjunction with the primary sources described in the previous section. Coordinator semi-structured interviews took place between November and December 2021, after almost all of fall semester CoP meetings had occurred. The coordinators served as informants, people who know a lot about the given case and are able to provide an alternate view of the case that may not be observable by the researcher (Stake, 1995). Individual interviews were best for the coordinators because there were only eight total and each coordination group and environment had potential to be drastically different from the next. The interviews took place on Zoom to accommodate the scheduling needs of the coordinators and were recorded to help with future data analysis.

The coordinator interviews were a secondary source of data because findings from the interviews were used as comparative data to that collected directly from the GSIs. The data from the coordinator interviews was used to validate data from GSI narratives, value-creation stories, and focus group interviews. The questions in the course coordinator interviews were different from the focus group interviews because their purpose was to not see what value the coordinators created through these experiences but to get a more well-rounded picture of the setting in which the different course coordination CoPs took place. Since the course coordinators had a different role than the GSI Coordinator, the six course coordinators were asked the interview questions included in Appendix K while the GSI Coordinator was asked the slightly different questions included in Appendix L.

Data Analysis

Data analysis is the process of finding patterns within data that lead to an understanding of why the patterns exist in the first place (Bernard, 2011). The case studies in the current study are presented through coded data. My focus when analyzing the data was on *correspondence*, or determining whether there was consistency within each case that allowed me to present the case in a way that supported understanding of it.

Primary Data Source Analysis

The primary data sources came directly from the GSIs in the present study. The data reflected the thoughts, opinions, and values of GSIs in their own words. Since data from the personal value narratives and value-creation stories were collected in a similar way, there was also a similar analysis of this data. The focus group interviews required slightly different steps for their analysis.

Demographic Information. The demographic information collected was used for descriptive purposes to support the reader's understanding of the makeup of each CoP, or case, and each participant's background they brought and experiences they had within the group. When determining significant findings from the study I was also able to use the demographic information to look for common characteristics among GSIs with common responses.

Personal Value Narratives and Value-Creation Stories. Since the personal value narratives and value-creation stories were collected through a Google Form, the first step to their analysis was to download their responses into an Excel format. The data in the Excel spreadsheet allowed me to look across responses for a given individual as well as across responses for a given question. I then analyzed both of these sources through multiple

iterations of coding. The specific approach to coding was the same for these two data sources as it was for the focus groups interviews, so I will describe the coding approach in detail after a brief introduction to the focus group interview analysis.

Focus Group Interviews. Since the focus group interviews were recorded via Zoom, my first task in analyzing the data was to download the interview transcripts and check the transcripts against the recordings for accuracy. The transcriptions were then coded as detailed in the next section.

Approach to Primary Data Coding. When determining an appropriate approach to coding a researcher must keep in mind what needs to be known and possible relationships that may be discovered (Stake, 1995). With these ideas in mind, I completed multiple iterations of data coding. After preparing my primary sources in the ways I described in the previous sections, I manually coded the data using MAXQDA, a qualitative data analysis software package. My first two rounds of data coding incorporated a combination of multiple first cycle coding methods recommended by Saldaña (2016). I then participated in some of Saldaña's transitional processes before completing a preliminary analysis to revaluate my codes. This process and the rationale for codes and subcodes within the study is described in the following sections.

First Iteration of First-Cycle Coding. I used Saldaña's (2016) *Descriptive Coding* in my first iteration of coding to note the experiences and activities mentioned by GSIs in their narratives, stories, or interviews. While Saldaña discouraged the use of Descriptive Coding in case studies due to the limited insight provided by noun-based coding, I felt the method was appropriate to use in the present study in order to identify the specific experiences and

activities mentioned by participants. I also incorporated *Initial Coding* for this first round as I was unaware of what GSIs might mention in their responses, leaving me with a lack of preassigned codes. Initial Coding is appropriate for studies with a variety of data forms and creates a starting point for further analysis. This first iteration of coding was used to identify data that would answer research question one and provide me areas of focus for answering research questions 1a and 1b since I took the activities and experiences found in this first round of coding and used the second round of coding to gain further insight to the value they provided GSIs.

Second Iteration of First-Cycle Coding. While my first iteration of coding used Initial Coding, my second iteration used *Provisional Coding* because I had anticipated codes (modified from my conceptual framework) established (Saldaña, 2016). I also applied *Values Coding* in this round of coding. Values Coding is appropriate when exploring beliefs, experiences, and actions within a case study and can be used to code a variety of data sources that come directly from study participants. Pairing Descriptive and Values Coding together provided me the necessary insight for a case study approach. The last coding method I incorporated in this second iteration of first cycle coding was Subcoding. Subcoding is useful when incorporating a variety of data sources and when using broad codes during an initial iteration.

To start this second coding iteration, I assigned each activity and experience as either positive or negative based on the associated explanation provided in participant responses. It was important for me to acknowledge that value creation, or learning, could occur through both positive and negative experiences, especially given my subjectivity as Director where the

study took place, and there could also be potential to highlight differences between the CoPs and participant outlooks on their experiences when answering my research questions.

Since research question 1b explores the value GSIs established through their participation in CoPs, I then used my value-creation cycles, adapted from Wenger et al. (2011), as the primary codes for each activity and experience in this second iteration of coding. As described in Chapter 2, Wenger et al.'s value-creation cycles are: (a) immediate value, (b) potential value, (c) applied value, (d) realized value, and (e) reframing value. During the coding process I added the primary code *missed opportunity*. The addition of this code is justified in the next section of this chapter. Table 9 provides descriptions for each of these primary codes.

Table 9

Value-Creation Primary Codes, Their Descriptions, and Examples

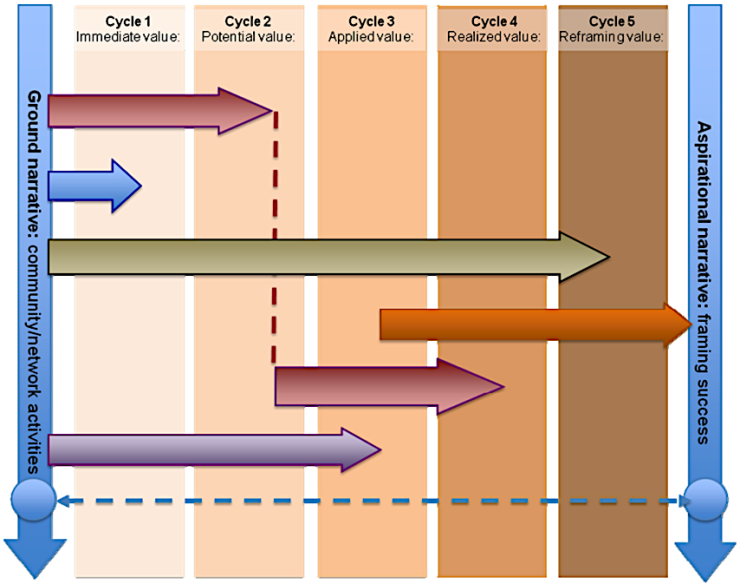
Primary code	Description	Example from data
Immediate value	Activities and experiences possessing in-the-moment value	"Hearing stories from the other [GSIs] helped me see that I was not the only one struggling with certain situations and we all seemed to have similar experiences." (Oliver, Value Narrative #3)
Potential value	Activities and experiences possessing latent value	"Our discussion of weekly lessons gives me ideas of ways to explain/introduce certain concepts when I am teaching." (Brandon, Value Narrative #2)
Applied value	Adapting and applying activities and experiences in novel situations	"I used the power point presentations that were made by [Coordinator] that we went over in our meetings for teaching my classes." (Louise, Value Narrative #2)
Realized value	Identifying how an activity or experience actively impacted one's abilities	"The first semester first day of training was very beneficial for me and then after that I felt like I was not getting much out of the trainings after that." (Sabrina, Focus Group Interview)
Reframing Value	Redefining success at the individual, group, or organization level	"That is probably a lesson that'll stick with me throughout my entire teaching career on students. Students need compassion and sometimes that's what they need first in before the honesty." (Henry, Focus Group Interview)
Missed opportunity	Suggestions for improvement or experiences that did not occur	"We do not discuss different ways to present the notes in our meetings." (Adam, Value Narrative #2)

Note. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes.

Each activity and experience mentioned by GSIs had the potential to be coded with zero, one, or multiple value-creation cycle codes, depending on the explanation that followed it. Wenger et al. (2011) suggested using the experiences described in participant narratives, stories, and interviews to present the path of the value-creation cycles. By following the value creation presented through these stories across the cycles, researchers add to the reliability of claims that a CoP creates value for its members, even though not all stories go through all five cycles (as shown in Figure 5).

Figure 5

Progression through Value-creation Cycles



Note. Wenger et al. (2011)

As I assigned each activity and experience a primary value-creation code, I also assigned it a subcode inspired by the ones used by Dingyloudi et al. (2019). Since the Dingyloudi et al.

study focused on graduate student academic CoPs, they used sub-values codes of (a) personal, (b) social, (c) skill-related, (d) study-related, and (e) context-related. The study-related sub-value code did not apply to the current study so I replaced it with student-related, which allowed me to capture value from interactions GSIs had with their students as well as value they created from being students themselves. My adapted subcodes were still values-based and determined whether the value described by participants was (a) personal, (b) social, (c) skill-related, (d) student-related, or (e) context-related. Table 10 includes descriptions of each of these subcodes.

Table 10

Value-Creation Subcodes, Their Descriptions, and Examples

Subcode	Description	Example from data
Personal value	Describes any value that directly relates to the development of a participant as a person or how participants view themselves	"I realized that I enjoyed teaching so much, and that is one of the reasons why I am still… doing all my work and being able to get through grad school because the teaching is like the highlight of the day, and it makes me happy." (Sabrina, Focus Group Interview)
Social value	Describes any value related to the group as a whole, relationships within the group, or development of members as a group	"We were open and honest about our experiences in our weekly course coordination meetings which I feel allowed me to grow closer with my colleagues." (Brittany, Value Narrative #2)
Skill-related value	Describes any value related to teaching skills and practices	"The practice teaching sessions helped me to better understand how to cater content to first year undergraduates who do not have much experiences in mathematics." (Kenneth, Value Narrative #1)
Student-related value	Describes any value related to managing and interacting with students or being students themselves	"The video about "being nice" was cool. I had a lot of patience with my students and I feel they really appreciated it." (Uriah, Value Narrative #3)
Context-related value	Describes any value related to CoP environment and setting	"It never felt a ton like a meeting was definitely a space that I could share my thoughts and how my class was going and hear about everyone else's." (Camille, Value Narrative #2)

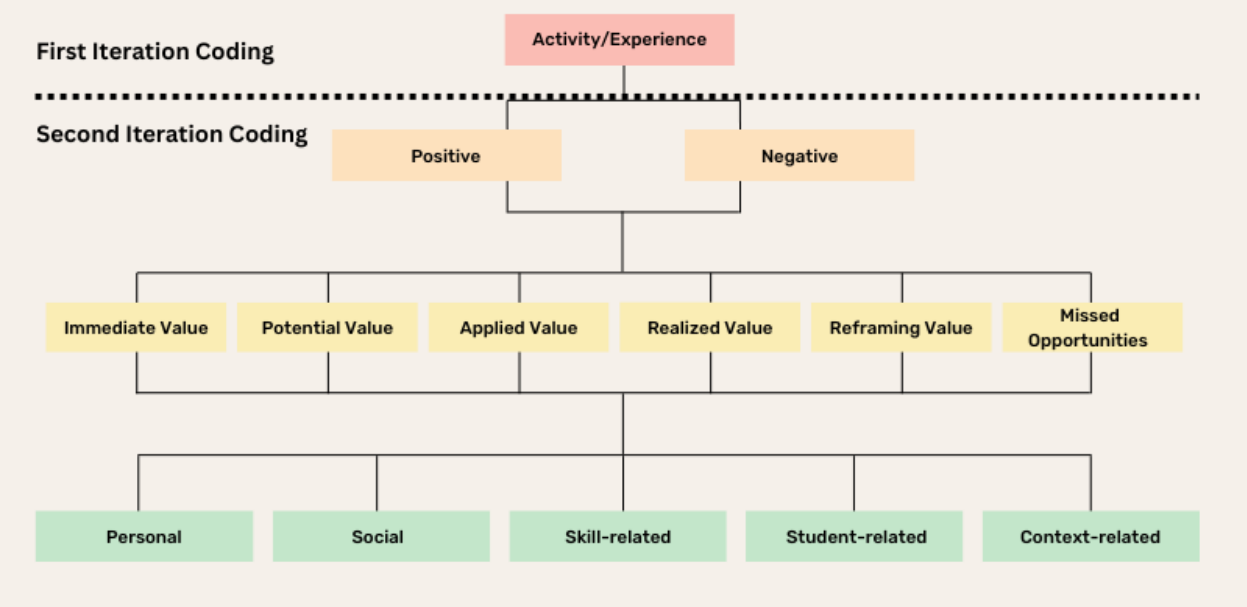
Note. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

Intercoder Consensus. I worked with two colleagues to finalize my code book and support the interrater reliability of my data coding. We took samples from the first value narrative collection and, at first, applied the Wenger et al. (2011) primary codes and my adapted subcodes to participant responses. We independently agreed upon 85% of the codes. After discussion we arrived at a consensus on 91% of the codes. While we were at 100% consensus with our subcode assignments, we continued to struggle with sentiments similar to one expressed by Samantha, "I wish more thought was taken into our schedule and the fact that we started classes-our own and ones that we were teaching for the first time-the following week**"** (Value Narrative #1). Two members coded this as realized while one coded it as immediate value. The suggestion to approach meetings differently or the hope of something that had not actually occurred kept us from reaching 100% consensus.

It was at this point I talked through my preliminary findings and coding struggles with members of my committee. Saldaña (2016) called this technique *shop talk*. This was a valuable stage in the coding process as after hearing where coding issues occurred, one committee member suggested the introduction of my new code: *Missed Opportunities*. After sharing this new code with my colleagues and incorporating it when recoding the data, we independently agreed upon 95% of the codes. After discussion and clarification, we reached 100% consensus on our coding. Again, the description of this code was included in Table 9. The final coding structure used to code in the present study is shown in Figure 6.

Figure 6

Codes and Subcodes for the Present Study



Note. Codes from the second level of second iteration coding were adapted from Wenger et al. (2011). Codes from the third level of second iteration coding were adapted from Dingyloudi et al. (2019).

Initial Analysis. After coding the data, I performed a code relations analysis in MAXQDA to get an overall picture of the data. Through this analysis I was able to see the total number of times an activity or experience was mentioned. After examining the activity and experience codes, I was able to combine codes with similar purposes or meanings. For example, *collaborating with others* and *working with peers* were combined to make the code *collaboration*. A final list of activity and experience codes is included in Appendix M.

Post-Coding Analysis. Once I finalized my activity and experience codes, I executed my post-coding analysis. My first step in this process was to, again, run different code relations

analyses in MAXQDA that allowed me to record the frequency of activity and experience codes for all GSI responses. I used these numbers to create a Pareto chart displaying all the activities and experiences mentioned by GSIs in the data I collected. A Pareto chart is often used by organizations when analyzing processes to focus on specific items having the greatest impact (Koch, 1997). I used the activities and experiences that comprised 80% of GSI responses to answer research question one. I then took those specific responses and created pie charts and stacked bar graphs to examine the distribution of value-creation codes from all of the data. The pie charts were used to display the distribution of the primary value-creation codes among the responses, while the stacked bar graphs displayed how the value-creation subcodes were distributed within each primary code.

I followed the same strategy when examining patterns between the CoPs. I created Pareto charts, pie charts, and stacked bar graphs for each CoP separately. I then took the activities and experiences that comprised the top 80% of GSI responses in each group and established the activities and experiences that were impactful to both CoPs, impactful to only the professional learning CoP, and impactful to only the course coordination CoPs. I then created mosaic plots to further examine the activities and experiences that were influential to both CoPs. Mosaic plots allowed me to discover patterns in responses between the CoPs as asked in RQ1a. An explanation of how to read and interpret a mosaic plot is included when the plots are presented in Chapter 4. I further explored RQ1b by taking the activities and experiences that were either shared between the CoPs or unique to one of them and made three tables showing the primary value-creation code distribution of each activity and

experience in the three groups and three tables displaying the value-creation subcode distribution.

Creating multiple charts and tables was my approach to Saldaña's (2016) code charting. The different visuals allowed me to look across responses as a whole regarding the professional learning and course coordination CoPs. Once the primary data source analysis was complete, I used the secondary data sources to corroborate my findings.

Secondary Data Source Analysis

The coordinator interviews were used to validate the findings from the primary data source analysis. Another main purpose of this data source was to provide insight to the multiple realities that existed within each case. As with the focus group interviews, I was able to record the coordinator interviews via Zoom and downloaded the interview transcript, checking the transcript against the recording for accuracy. Since the coordinator interviews were used to provide further insight to the experiences GSIs described, I did not code this data the same way I coded the primary data sources. Instead, I used this data as descriptive data to provide additional details regarding each CoP. The entire analysis process allowed me to identify patterns and themes within the data that supported the presentation of each case as presented previously in this chapter as well as in Chapter 4.

Presenting the Cases

The cases in this study are presented through the activities and experiences that emerged as influential to learning within the CoPs. Each activity and experience, as well as its impact, is described by including the words of the GSIs themselves. The activities and experiences that were influential to learning in both CoPs are described in each context, while

the activities and experiences that were influential to learning in only one CoP are examined through that unique CoP's lens.

Validity of Data

With the personal understanding necessary for analyzing data, Stake (1995) reported it is likely for misunderstandings to occur when interpreting data. Triangulation can limit these misunderstandings and support the trustworthiness of study findings. I have increased the trustworthiness of my findings by using data source triangulation. This involved collecting multiple sources of data (personal value narratives, value-creation stories, and interviews) from multiple stakeholders (GSIs and coordinators). I did not, however, use investigator triangulation, which involves additional researchers. I chose not to use this method of triangulation due to the time and effort required on an additional researcher's part to fully understand the theoretical framework, the context of the proposed study, and how to properly code the data. My use of data source triangulation, particularly spread out over a seven-month period, as well as Saldaña's shop talk process with my committee members, offset the lack of additional triangulation methods.

Member checks also support validity in the collected data and conclusions made through data analysis (Stake, 1995). I shared rough drafts of each case description with members of that case to check the accuracy of the reported information. After receiving feedback from coordinators and GSIs I was able to clarify and correct misinformation, allowing me to present a more accurate interpretation of the CoP experience.

Another aspect of this research that supports the trustworthiness of my data is transparency to the reader regarding the subjectivity of the researcher. This is why I placed that

specific section of this paper before the data collection and data analysis sections. Due to my role in the research, it is important for the reader to understand my perspective prior to learning about my study. Sharing this information preemptively will hopefully keep readers from examining the study through one lens, only to question what they read after discovering how closely I interacted with study participants.

Chapter 4: Findings

In this chapter I answer the research questions using the data I coded as described in Chapter 3. The chapter is organized by research question (RQ) and sub-question. As a reminder, the research questions are as follows:

1. What activities and experiences within the GSI professional learning and course coordination CoPs most influence GSI professional learning?
    a. What patterns, if any, exist in activities and experiences identified by GSIs when in their CoPs?
    b. How, if at all, do these activities and experiences influence the value of learning for GSIs?

Each section in this chapter incorporates data visuals to support answering the research questions of the present study. I used Pareto charts to identify the activities and experiences that most influenced GSI learning and mosaic plots to address patterns between the CoPs (RQ1 and RQ1a). I used pie charts, stacked bar graphs, and tables to examine the distribution of value-creation codes within each CoP and across the influential activities and experiences (RQ1b).

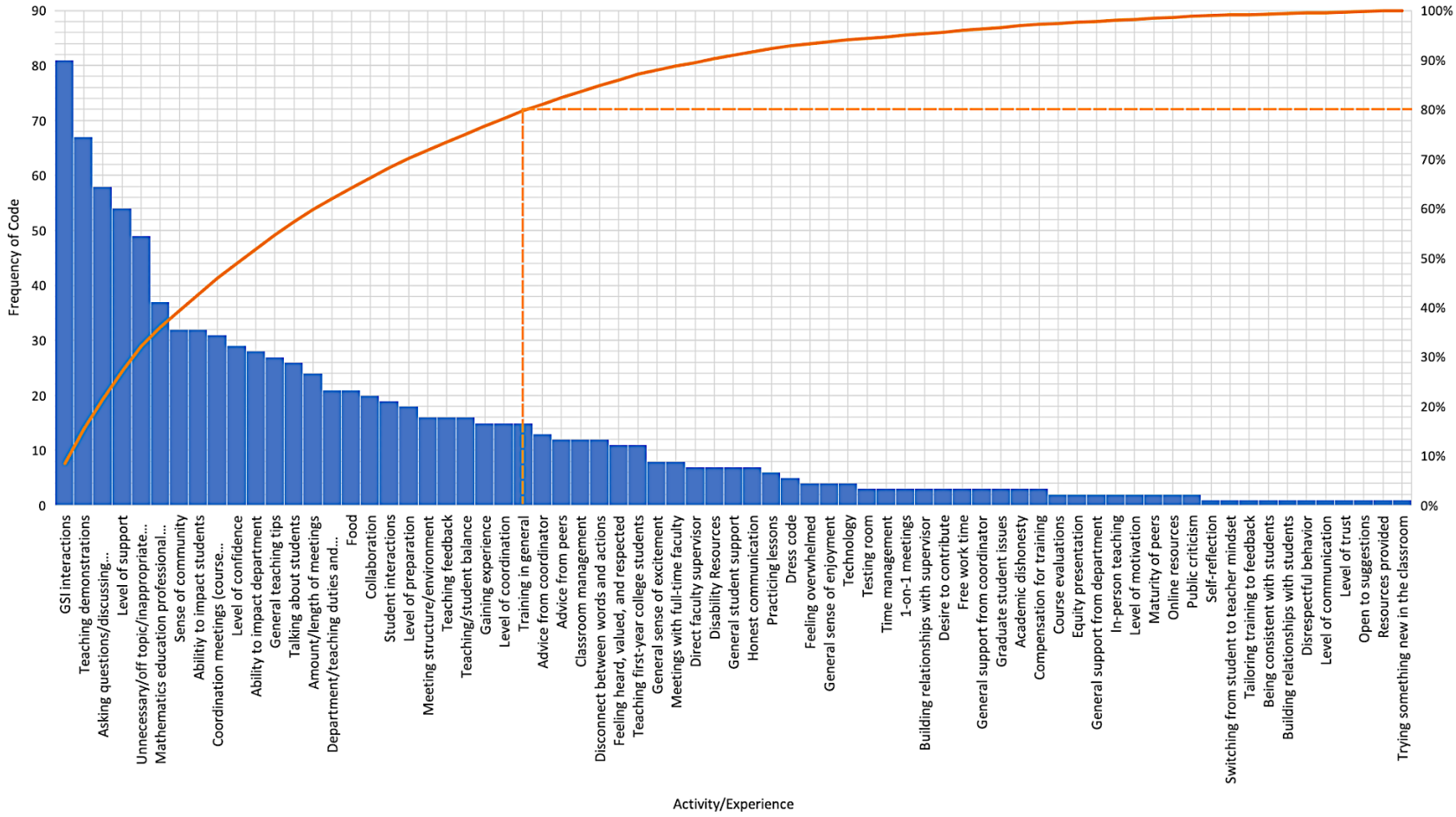
Activities and Experiences Influencing GSI Learning (RQ1)

This section answers RQ1 and contains subsections that address answers to RQ1a and RQ1b throughout. I start by presenting a Pareto Chart comprised of all coded activities and experiences. I then present a pie chart showing how the primary value-creation codes were distributed among these activities and experiences, along with a stacked bar graph that shows how the value-creation subcodes were distributed within each primary code.

Coding the entirety of data to address RQ1 resulted in over 900 mentions of activities and experiences with the 71 unique codes listed in Appendix M. I needed to narrow the number of activities and experiences I examined in order to identify those that were most influential to the learning of GSIs. By creating a Pareto chart from the data contained in Appendix M and adapting the 80/20 Principle (Koch, 1997) (discussed in Chapter 3), I was able to identify the activities and experiences that established the top 80% of responses, indicating the large influence they had on GSI learning. Figure 7 shows the resulting Pareto chart.

Figure 7

Pareto Chart to Determine Activities and Experiences that Influenced GSI Learning Overall



Note. GSI = Graduate Student Instructor. The dotted lines in the Pareto chart identify the activities and experiences that comprise 80% of GSI responses.

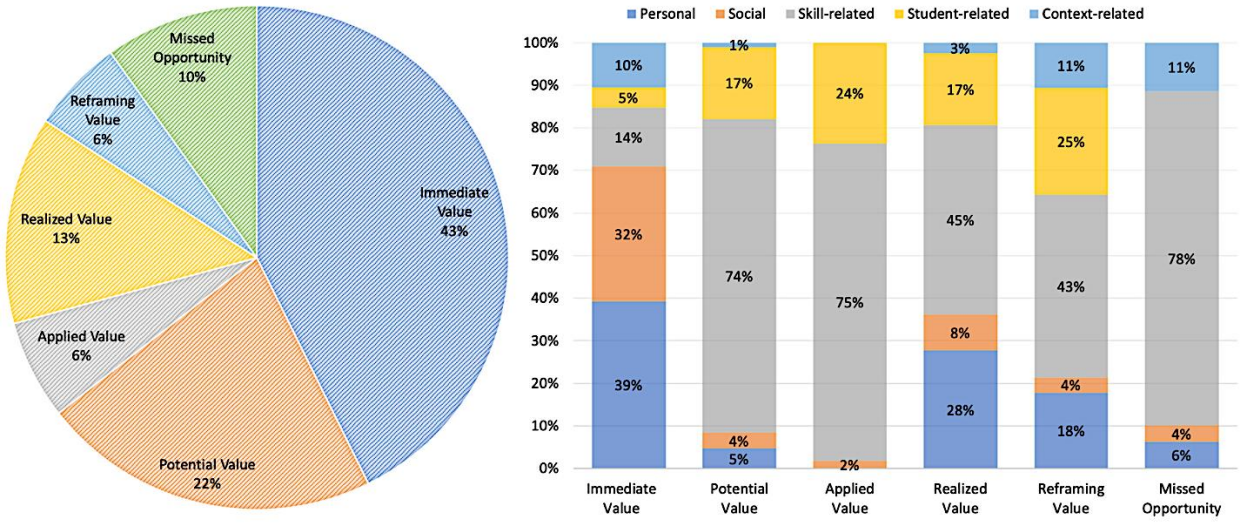
Twenty-five of the 71 mentioned activities and experiences comprised 80% of all GSI responses, regardless of CoP group. These activities and experiences, in order of frequency, were: (a) GSI interactions; (b) teaching demonstrations; (c) asking questions/discussing issues/sharing experiences; (d) level of support; (e) unnecessary/off-topic/inappropriate information; (f) mathematics education professional development; (g) sense of community; (h) ability to impact students; (i) coordination meetings (course information, structure, and content); (j) level of confidence; (k) ability to impact department; (l) general teaching tips; (m) talking about students; (n) amount/length of meetings; (o) department/teaching duties and expectations; (p) food; (q) collaboration; (r) student interactions; (s) level of preparation; (t) meeting structure/environment; (u) teaching feedback; (v) teaching/student balance; (w) gaining experience; (x) level of coordination; and (y) training in general. The remaining 46 mentioned activities and experiences also influenced GSI learning, but to a lesser extent.

Value-Creation Through the Impactful Activities and Experiences (RQ1b)

This section contributes to answering RQ1b in the context of all GSI responses. Figure 8 shows the value-creation code distributions for the entirety of collected data.

Figure 8

Distribution of Value-Creation Primary Codes and Subcodes Across GSI Responses



Note. GSI = Graduate Student Instructor. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

The largest portion of GSI comments focused on activities and experiences where GSIs saw immediate value (43%), followed by potential value (22%), realized value (13%), missed opportunity (10%), and reframing value and applied value (both 6%), respectively. When examining the value-creation subcodes, skill-related activities and experiences made up the largest portion of all but the immediate value category with 74% in potential value, 75% in applied value, 45% in realized value, 43% in reframing value, and 78% in missed opportunity. Most of the comments coded to immediate value focused on personal (39%) and social (32%) impacts. After examining the responses from both CoPs together, it was important to identify

activities and experiences that were influential on learning within each CoP separately and explore any existing patterns between the group members' responses.

Identifying Patterns Between the Professional Learning and Course Coordination CoPs (RQ1a)

I incorporated the same strategy I used answering RQ1 to answer RQ1a, this time separating my responses between the professional learning and course coordination CoPs. Appendix N contains a table with the distribution of codes from the professional learning CoP, separated by first- and second-year responses. Appendix O contains a table with the distribution of codes from the course coordination CoP, separated by specific course coordination group responses. Figure 9 shows the Pareto chart from the professional learning CoP responses.

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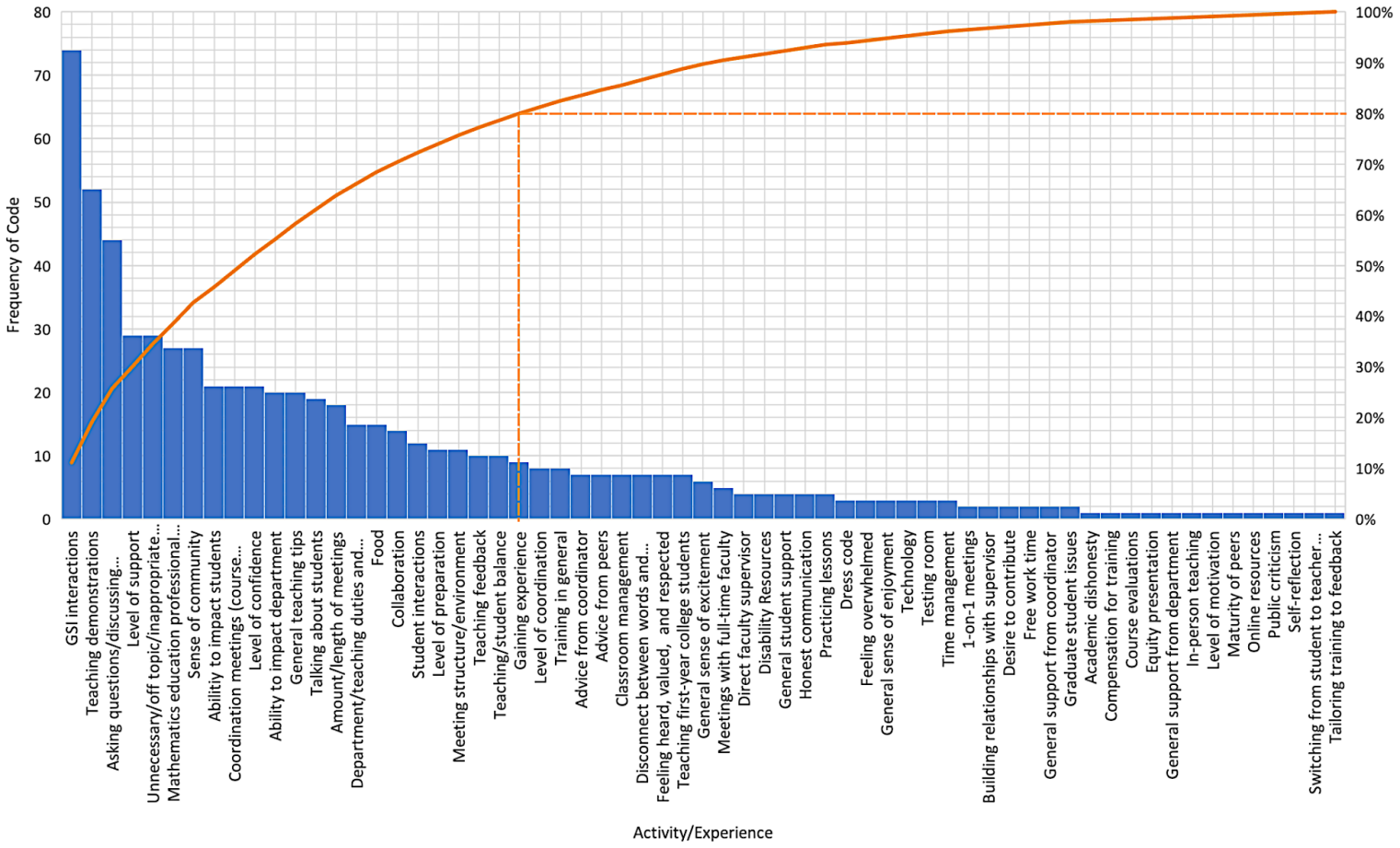
Figure 9

Pareto Chart to Determine Activities and Experiences that Influenced GSI Learning in the Professional Learning CoP

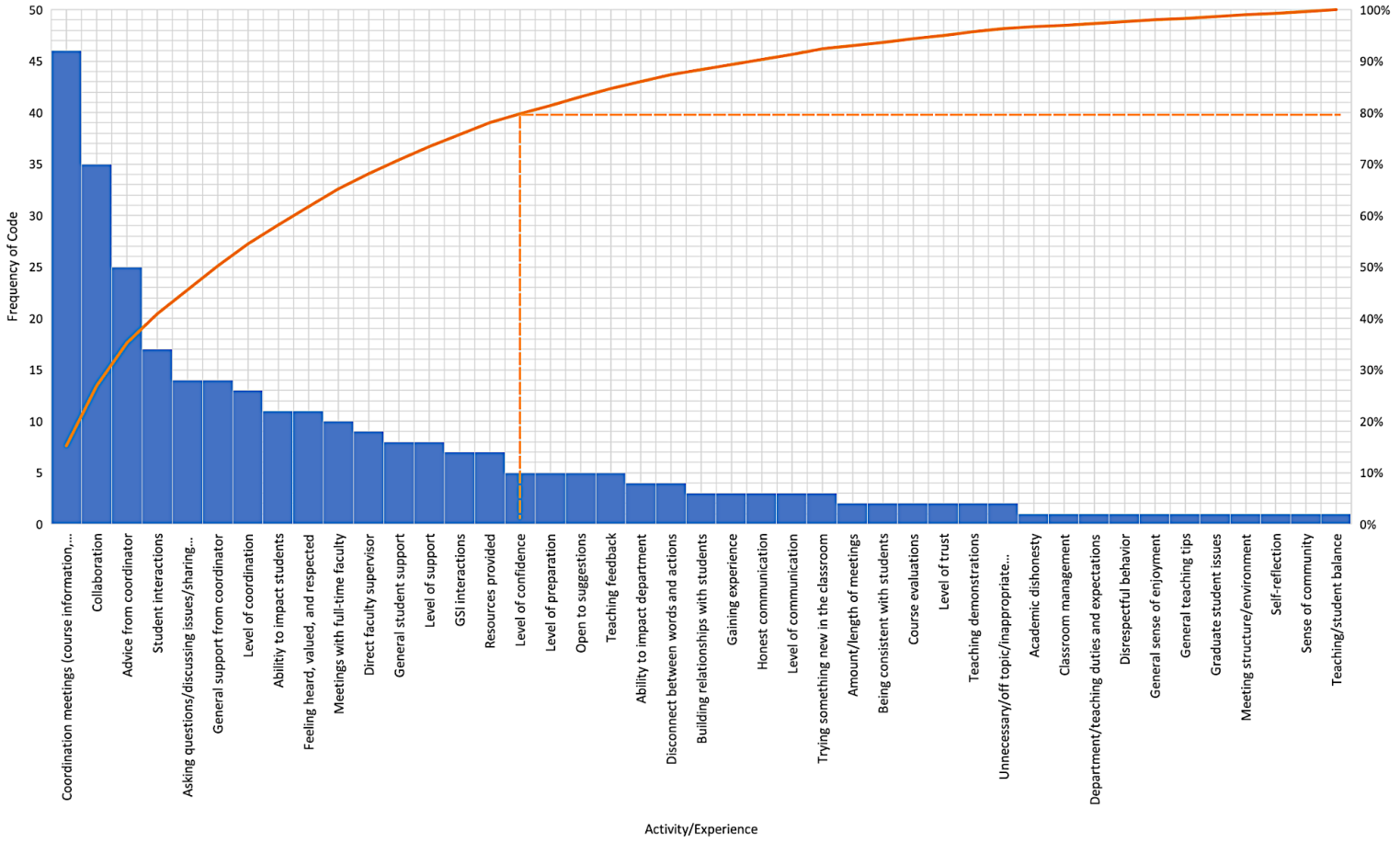


Note. GSI = Graduate Student Instructor; CoP = Community of Practice. The dotted lines in the Pareto chart identify the activities and experiences that comprise 80% of GSI responses.

GSIs mentioned 63 activities and experiences in surveys and interviews regarding the professional learning CoP. Twenty-three of the 63 mentioned activities and experiences comprised 80% of these responses. These activities and experiences, in order of frequency, were: (a) GSI interactions; (b) teaching demonstrations; (c) asking questions/discussing issues/sharing experiences; (d) level of support; (e) unnecessary/off-topic/inappropriate information; (f) mathematics education professional development; (g) sense of community; (h) ability to impact students; (i) coordination meetings (course information, structure, and content); (j) level of confidence; (k) ability to impact department; (l) general teaching tips; (m) talking about students; (n) amount/length of meetings; (o) department/teaching duties and expectations; (p) food; (q) collaboration; (r) student interactions; (s) level of preparation; (t) meeting structure/environment; (u) teaching feedback; (v) teaching/student balance; and (w) gaining experience. Figure 10 shows the Pareto chart from the course coordination CoP responses listed in Appendix O.

Figure 10

Pareto Chart to Determine Activities and Experiences that Influenced GSI Learning in the Course Coordination CoP



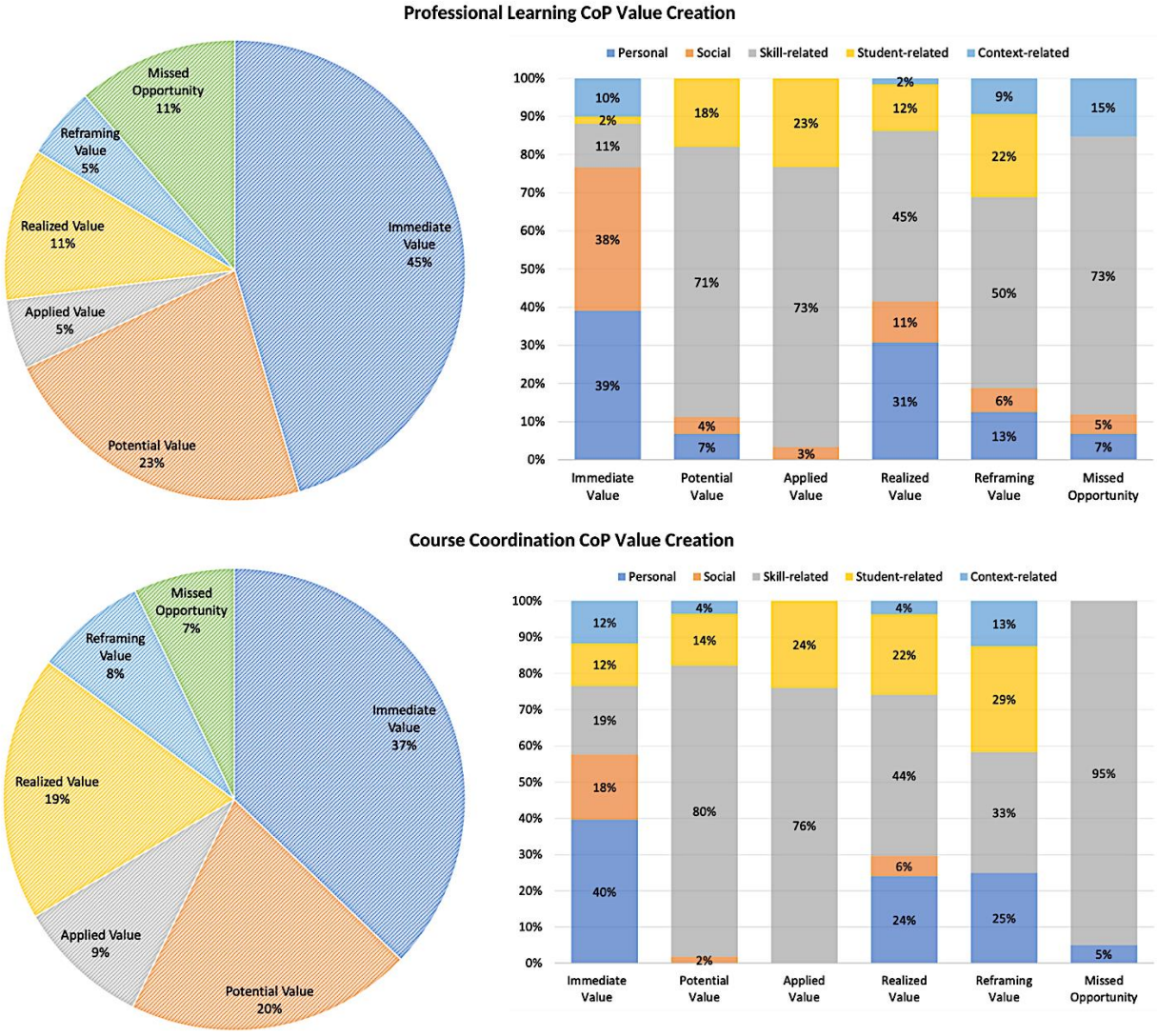
Note. GSI = Graduate Student Instructor; CoP = Community of Practice. The dotted lines in the Pareto chart identify the activities and experiences that comprise 80% of GSI responses.

GSIs in the course coordination CoP mentioned 43 activities and experiences in surveys and interviews regarding their coordination group. Sixteen of the 43 mentioned activities and experiences comprised 80% of these responses. I chose to include the top 15 responses because the 16^{th} – 19^{th} responses had the same frequency and when added to the other activities and experiences would make the list encompass almost 90% of total coordination CoP responses. The top 15 activities and experiences, in order of frequency, were: (a) coordination meetings (course information, structure, and content); (b) collaboration; (c) advice from coordinator; (d) student interactions; (e) asking questions/discussing issues/sharing experiences; (f) general support from coordinator; (g) level of coordination; (h) ability to impact students; (i) feeling heard, valued, and respected; (j) meetings with full-time faculty; (k) direct faculty supervisor; (l) general student support; (m) level of support; (n) GSI interactions; and (o) resources provided.

Value-Creation Within Each CoP (RQ1b). Since I determined which activities and experiences impacted each CoP separately, it also became necessary to examine how GSIs created value within each CoP separately as well. As when I examined all responses cumulatively, I created a pie chart for each CoP displaying the distribution of primary value-creation codes as well as a stacked bar graph for each CoP displaying the distribution of each value-creation subcode within the primary codes. Figure 11 shows the pie charts and stacked bar graphs from each of the CoPs.

Figure 11

Distribution of Value-Creation Primary Codes and Subcodes Separated by CoP



Note. CoP = Community of Practice. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

There is a similar distribution of value-creation primary codes between the professional learning and course coordination CoPs, with immediate value and potential value being the top two categories. Realized value occurred more often in the course coordination CoP than in the professional learning one (19% compared to 11%), with the opposite being true for missed opportunities (11% in the professional learning CoP and 7% in the course coordination CoP).

Examining the value-creation subcodes also provides interesting information. Skill-related responses comprised the majority of activities and experiences that created potential value, applied value, and missed opportunities for GSIs in both the professional learning and course coordination CoPs. The largest differences between the CoPs came from activities and experiences causing immediate or reframing value. In the professional learning CoP, GSIs found immediate value in mostly personal (38%) and social (39%) items, followed by skill-related (11%) and context-related (10%) items, with minimal mention of student-related items (2%). Immediate value in the course coordination CoP was heavily impacted by personal (40%) items. The distribution of the remaining subcategories (social (18%), skill-related (19%), student-related (12%), and context-related (12%)) was more evenly distributed than in the professional learning CoP. When activities and experiences in the professional learning and course coordination CoPs supported reframing value, GSIs referenced skill-related value most often, followed by student-related value, personal value, and context-related value, respectively. Social value played the smallest role in reframing value for the professional learning CoP, while it was not referenced at all regarding reframing value by GSIs in the course coordination CoP context.

Identifying Shared and Unique Activities and Experiences Within the CoPs (RQ1a). I decided to present the cases in the present study through the influential activities and experiences that emerged in the data. With this in mind, it became necessary to explore patterns between the GSI responses from both CoPs. There were seven repeated activities and experiences between the two CoPs. The professional learning CoP had an additional 16 activities and experiences that were unique to its group, and the course coordination CoP had an additional eight activities and experiences that added to the top 80% of codes within its data. Figure 12 shows the responses that were most influential to GSIs in the professional learning CoP, in the course coordination CoP, and those that were influential to both CoPs.

Figure 12

Similarities and Differences Between CoP Responses

Note. CoP = Community of Practice. GSI = Graduate Student Instructor. Ed. = education. Info. = information

Activities and experiences that were impactful to GSIs in both the professional learning and course coordination CoPs were: (a) ability to impact students; (b) asking questions/discussing issues/sharing experiences; (c) collaboration; (d) coordination meetings (course information, structure, and content); (e) GSI interactions; (f) level of support; and (g) student interactions.

In addition to the seven activities and experiences just listed, the following 16 activities and experiences influenced learning in the professional learning CoP: (a) ability to impact department, (b) amount/length of meetings, (c) department/teaching duties and expectations, (d) food, (e) gaining experience, (f) general teaching tips, (g) level of confidence, (h) level of preparation, (i) mathematics education professional development, (j) meeting structure/environment, (k) sense of community, (l) talking about students, (m) teaching demonstrations, (n) teaching feedback, (o) teaching/student balance, and (p) unnecessary/off-topic/inappropriate information.

There were fewer activities and experiences that uniquely influenced GSI learning in the course coordination CoP. In addition to the activities and experiences that were mentioned by both groups, learning for GSIs in the course coordination was influenced by (a) advice from coordinator; (b) direct faculty supervisor; (c) feeling heard, valued, and respected; (d) general student support; (e) general support from coordinator; (f) level of coordination; (g) meetings with full-time faculty; and (h) resources provided.

Examining the Cases (RQ1a and RQ1b)

Now that I have identified the activities and experiences that influenced GSI learning in the professional learning and course coordination CoPs, it is important to gain insight as to how

these activities and experiences influenced GSI learning. I will include the voices of the GSIs themselves throughout the rest of this chapter to share how they negotiated meaning and created value from their CoP experiences.

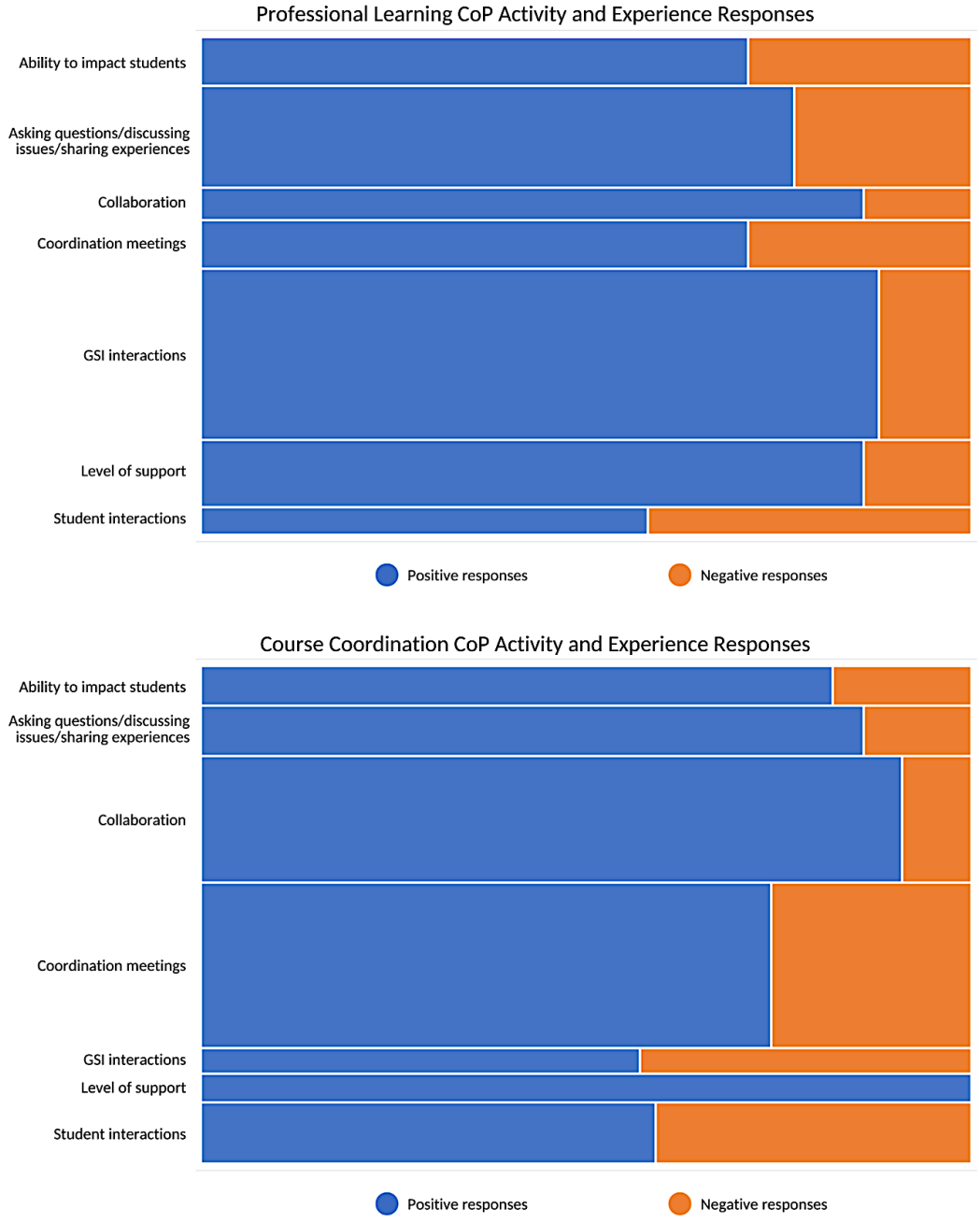
Value-Creation Through Activities and Experiences Shared by the CoPs (RQ1b)

This section provides the data from the activities and experiences that were influential to both the professional learning and course coordination CoPs. As previously listed, these activities and experiences were: (a) ability to impact students; (b) asking questions/discussing issues/sharing experiences; (c) collaboration; (d) coordination meetings (course information, structure, and content); (e) GSI interactions; (f) level of support; and (g) student interactions.

I first took these activities and experiences and created mosaic plots, seen in Figure 13, that simultaneously show the distribution of frequency and the positive or negative nature of GSI remarks within each CoP. A mosaic plot allows us to examine relationships between two categorical values. In this case, we are looking at positive and negative responses for each of the activities and experiences that influenced GSI learning in both the professional learning and course coordination CoPs. Each activity or experience is divided into two parts, representing the proportion of positive and negative GSI responses for that item, while the thickness of each bar represents the proportion of times that item was mentioned by GSIs when reflecting on the given CoP. Table 11, which follows Figure 13, provides the numerical values represented in the mosaic plots.

Figure 13

Comparison of CoP Common Influential Activities and Experiences



Note. CoP = Community of Practice; GSI = Graduate Student Instructor. The thickness of each bar represents the proportion of times that item was mentioned by GSIs. The two colors represent the proportion of positive and negative responses regarding that item.

Table 11

Percent Distribution of Professional Learning and Course Coordination CoP Top Activity and Experience Responses

Activity/Experience	Percentage of Responses					
	Professional Learning CoP			Course Coordination CoP		
	Overall	Positive	Negative	Overall	Positive	Negative
Ability to impact students	9.8	71	29	8.0	82	18
Asking questions/discussing issues/sharing experiences	20.5	77	23	10.1	86	14
Collaboration	6.5	86	14	25.4	91	9
Coordination meetings (course information, structure, and content)	9.8	71	29	33.3	74	26
GSI interactions	34.4	88	12	5.1	57	43
Level of support	13.5	86	14	5.8	100	0
Student interactions	5.6	58	42	12.3	59	41

Note. CoP = Community of Practice; GSI = Graduate Student Instructor. The percentages in the Overall columns correspond to the width of the bars in Figure 13. The percentages in the Positive columns correspond to the blue sections of the bar in Figure 13. The percentages in the Negative columns correspond to the orange sections of the bar in Figure 13.

While the two CoPs were both impacted by these seven activities and experiences, there are some interesting observations that can be made by examining the mosaic plots in Figure 13. The proportion of positive and negative responses was similar between the two groups for five of the seven activities or experiences. There was a larger percentage of negative responses regarding GSI interactions from the course coordination CoP than the professional learning CoP (43% versus 12%), and there were no negative responses regarding explicit mentions of level of support from the course coordination CoP, while 14% of the responses from the professional learning CoP were negative when referencing level of support. The mosaic plots in Figure 13 also highlight GSI learning in the professional learning CoP was most influenced by GSI interactions and asking questions/discussing issues/sharing experiences (encompassing 34.4 % and 20.5% of the shared activities and experiences, respectively), while learning in the course coordination CoP was most influenced by coordination meetings and collaboration (encompassing 33.3% and 25.4% of the shared activities and experiences, respectively).

After examining the similarities and differences between frequency and tone of comments between the two CoPs, I analyzed how the participants created value through these activities and experiences. Table 12 shows the percent distribution of value-creation primary codes and subcodes from the comments regarding each of the top activities and experiences shared by the CoPs.

Table 12

Percent Distribution of Value-Creation Primary Codes and Subcodes for Shared Activities and Experiences

Activity/Experience	Primary codes						Subcodes				
	IV	PV	AV	RealV	RefV	MO	P	S	Sk	St	C
Ability to impact students	27	50	0	20	0	3	24	0	27	45	3
Asking questions/discussing issues/sharing experiences	53	22	13	9	0	4	27	12	39	10	12
Collaboration	45	25	16	11	2	2	17	20	53	3	7
Coordination meetings (course information, structure, and content)	30	32	5	14	5	14	15	6	61	11	7
GSI interactions	72	10	3	10	4	1	13	71	13	3	0
Level of support	64	21	0	12	0	3	58	8	28	3	3
Student interactions[a]	27	50	0	20	0	3	24	0	27	45	3

Note. GSI = Graduate Student Instructor; IV = Immediate value; PV = Potential value; AV = Applied value; RealV = Realized value; RefV = Reframing value; MO = Missed opportunity; P = Personal; S = Social, Sk = Skill=related; St = Student-related; C = Context related. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

[a] I was personally involved in facilitating sessions regarding this topic.

All of the influential activities and experiences that ranked highly for both the professional learning and the course coordination CoPs appeared to enable GSIs to create mainly immediate or potential value. The value-creation subcodes were not as well-defined, with only four of the six activities and experiences showing a majority over three different subcodes: (a) collaboration (53% in skill-related value); (b) coordination meetings (61% in skill-related value); GSI interactions, (71% in social value); and level of support (58% in personal value).

The following sections describe how these seven activities and experiences were enacted in both the professional learning and course coordination CoPs.

Ability to Impact Students. The largest percentage of comments GSIs made regarding impacting students showed potential (50%) and student-related (45%) value. The professional learning CoP supported GSIs seeing themselves as being able to impact students, with many of the GSIs using the term "authority figure" to justify this outlook. Sean, a GSI who had worked in the math center as an undergraduate tutor, even referenced the difference he felt switching from a tutor to a GSI:

> To be honest, as a [tutor] I really didn't feel like a part of the [center]. I wasn't mad or upset about it but I just saw myself as an undergrad tutor [sic]. Now as a [GSI], I feel like I can actually make a much larger help [sic] to students because they see me as an 'authority' figure or an expert on everything. (Value Narrative #1)

Much of the impact GSIs expressed having was regarding how their own students felt about their course content. Wendy, a second-year graduate student but first-year GSI, made this clear

by commenting, “I think I have a responsibility to help students and foster a positive relationship with math for them” (Value Narrative #1).

Pre-semester training also left GSIs feeling a sense of responsibility to their future students and the experiences those students would have in their classrooms. For Sabrina, a second-year GSI, this responsibility was so overwhelming she felt she “personally and mentally struggle[d] with living up to [her] title at times” (Value Narrative #1). While most of the comments regarding ability to impact students were positive, not all GSIs felt they were making an impact on students. Mark, a first-year GSI new to the university, commented after his initial training he did not feel like he had an impact on what happened in his classroom (Value Narrative #1). This sentiment continued for him when reflecting on the monthly GSI meetings, and he remarked at how discouraging it felt to not feel he had any influence on what happened in his classroom (Value Narrative #3).

When GSIs reflected on their ability to impact students in course-specific settings, the most common contributor to believing they had an impact was the amount of freedom or control they had over their classroom. Often times, this was established through course policies or procedures. While many course coordinators provided materials to use for class instruction, GSIs had some flexibility to incorporate different teaching approaches in their classrooms. Beth, a second-year GSI made numerous comments about feeling empowered by her course coordinator and her own ability to impact students:

> I always felt supported and that I had the power to make decisions regarding my students. I felt like I had a lot of freedom in how I communicated and dealt with

situations in my classroom. I feel like my role as a GSI is important and I do make a difference in my students' lives and education. (Value Narrative #2)

Similar to the feelings expressed in the professional learning CoP setting, GSIs in the course coordination setting felt they could most impact how students viewed mathematics. Whitney, a second-year GSI, commented:

> I believe I am a role model for my students and I believe I can affect the way they think about math, as well as how they think about their own success. I believe I am someone who can help students have more confidence in themselves and help them succeed in their future endeavors. (Value Narrative #2)

Not all GSIs felt they were making an impact, however, especially in such highly coordinated courses. Harry was a first-year GSI who, like Sean, had worked in the math center as an undergraduate and had a lot of ideas for how to support students in the classroom. While he incorporated interactive activities for students in his class, he shared frustrations with limitations he faced, especially when it came to wanting to support his students more:

> I feel pretty powerless as a [GSI]. There are a lot of things in the classroom that I'm simply not allowed to do. I also didn't like how I couldn't do a review session for my class alone. I understand why I couldn't, but it still felt really political when I was just trying to be compassionate and helpful. (Value Narrative #2)

Overall, both CoPs instilled GSIs with a sense of responsibility towards their students and the experience those students had in their classrooms.

Asking Questions/Discussing Issues/Sharing Experiences. The largest percentage of comments mentioning asking questions, discussing issues, or sharing experiences displayed

immediate (53%) and skill-related (39%) value. Professional learning monthly CoP meetings were seen as a low-stress way to meet with peers. Many GSIs saw these as “check ins” with no real agenda in mind. GSIs responded differently to open agenda items. The most common positive response from GSIs regarding the ability to have open conversations with one another reflected feelings of camaraderie in their classroom experiences. This theme emerged from both first-year and second-year GSIs in their responses. Brandon, a first-year GSI commented:

> One thing I really liked about the monthly meetings was getting to meet with all the other [GSIs] and hear how everything was going for everyone else. It made me feel like the teaching experiences I was having were normal and helped boost my self-confidence. It was also great to hear about other [GSIs’] "success stories" with their students and made me feel like we were making a difference. (Value Narrative #3)

Oliver, another first-year GSI, shared a similar sentiment when he wrote, “Hearing stories from the other [GSIs] helped me see that I was not the only one struggling with certain situations and we all seemed to have similar experiences” (Value Narrative #3). Henry, a second-year GSI, created deeper value in his share by using these meetings as an opportunity for personal growth:

> Before I've always been pretty reserved, I think, especially in conflict. I don't like conflict, but I actually spoke up during our meetings… it felt really good and helped me to reach my goal of being able to speak up for what I believe in in a setting that is, I believe, hard to do. That it's hard to stand up in a meeting…to share something that, you know, might be different from what a lot of people believe, and I've done that… and so I would say that these meetings have definitely helped me grow in that sense and reach that goal of

being able to speak up whenever I feel like it's a good thing to do so. (Value Narrative #3)

While there were many positive comments regarding the ability to share, there were also numerous frustrations with the monthly meeting open agenda format. Some of the strongest complaints regarding the monthly meetings came from second-year GSIs. Adam, a second-year GSI, shared:

> I just don't like sitting down and hear people complain like that. I think it's just – it might just be me, like I just don't like hearing a bunch of complaints and then no solution is really ever offered. [GSI coordinator] usually listens to them, and [they] might offer, "talk to your coordinator, email this person", but no solution is ever actually offered to deal with the situation, so I just never – I don't really enjoy those meetings. (Focus Group Interview)

Fiona, a second-year GSI, shared insight as to why GSIs might not offer their own solutions:

> In some of those monthly meetings, it seemed as though people were so focused on certain things, and they truly believe, like, if I can get this question answered like my teaching and everything will be better. And I guess I just was kind of getting at like, "there's more to a classroom than the thing you're worried about," but I don't think like my voice at that point would be heard because they're really focused on, "hey I need to get this thing fixed because that's what's wrong in my classroom at the moment, and once I do that, then everything will be fine." And so I don't know if my experiences of like working with fourth graders and having to deal with 40 of them in a classroom would help at all. Because I just think it's like new [GSIs], as they come across all of these

> situations as a [GSI] and they're you know, in the moment that time they want to get those fixed. (Focus Group Interview)

Some GSIs took the complaints from their peers and used them as an opportunity to learn what not to do in the classroom. Beth, for instance, stated, "I could learn from some of the experiences that were mentioned. I could also make sure I was not approaching my students the same way that some others we[r]e [*sic*] to hopefully avoid certain situations" (Value Narrative #3). Wyatt, also a second-year GSI, similarly mentioned, "Hearing others' experiences helps me stay professional when teaching because I hear examples of what not to do" (Value Narrative #3). Sometimes these negative stories became too much for certain GSIs, though, especially if the stories came across as solely complaints and not being solution-oriented. Whitney, a second-year GSI, mentioned:

> Another thing that I just don't really like about having them share only negative stories is at the end of every meeting, anyway, in my perspective, I just hear people talking about how bad that person is at teaching because they shared that poor experience that happened to them. Like, "oh, they must suck because that happened in their classroom," like, "they have no control over these students," or whatever, and I think that way, too, because I'm hearing all these things that are happening with these people. But if we were to hear more of the good things that happened in their classrooms, I think we would have more - I don't know if I call it respect. I don't know if my respect has been lost for them, or of them, but yeah… It just kind of leaves everybody in kind of a like gossipy tone after these meetings. (Focus Group Interview)

Sharing negative experiences also impacted how certain GSIs felt in their role. Annie, a first-year GSI, shared, “I think hearing that a lot of people don't like teaching diminished my overall happiness, and excitement to teach” (Value Narrative #3).

The monthly meetings were not always a free-for-all discussion. Sometimes these open discussions led into some pretty important topics. In fact, there were two experiences the GSI Coordinator brought up based on in-the-moment situations GSIs faced: (a) a Title IX situation and (b) cheating allegations. Multiple GSIs brought these situations up in their responses. After bringing up the open discussion concept, Leroy, a first-year GSI, mentioned how these focused conversations on specific experiences were helpful:

> Then we occasionally run into something that like “oh hey, everyone should really know about this.” Like there was an issue with contacting the Title IX office with one of the other instructors, and I think it was useful for me to hear about that because I didn't really know. I thankfully haven't needed to use that advice, but you know it kind of started out as more of just like swapping like talking about what happened and then [GSI Coordinator] kind of brought up “oh hey, like everyone should hear about this,” and then it was helpful to know that “hey I need to go there if this incident happens in the future.” (Focus Group Interview)

Annie, a first-year GSI, was someone who had a novel experience regarding a cheating allegation and felt it was beneficial to share with others. She mentioned:

> When it was kind of like starting with like the cheating allegations… my student had, at the time, was the only one who had contested, so I kind of knew the process. So someone was like, “yeah my student contested, and I have no idea what I'm doing,” and

> I was like, "oh, you just meet with your coordinator and like do this whole thing," and I was like – I found it really helpful because it was like, "okay, thank God I'm not the only person in this sitch [*sic*]." (Focus Group Interview)

It is important to note that mentions of asking questions/discussing issues/sharing experiences only occurred when referencing the monthly GSI meetings and were not reflected in any of the pre-semester training data.

The opportunity to ask questions, discuss issues, and share experiences was also impactful in the course coordination CoP setting. Numerous GSIs mentioned the positive impact such activities had on their teaching and feelings as a teacher. Hazel, a first-year GSI, mentioned:

> Getting to ask [Course Coordinator] questions on how to handle certain situations with students helps me to feel more confident in handling different situations. It gives me insight as to what I can and cannot allow as a graduate student instructor." (Value Narrative #2)

Henry, again, took this experience to a deeper level by separately stating:

> My course coordinator gives us the opportunity to share our thoughts on teaching strategies. Having the opportunity to share my thoughts and experiences helps me feel like I am trusted as a teacher, which boosts my confidence in my teaching. It also helps me trust my course coordinator more, as I know they are willing to listen to everyone in the meeting. (Value Narrative #2)

Fiona and Brittany felt the coordination meetings for MATH 105, in particular, brought positive experiences for them as educators and allowed them to create positive experiences for their students.

Fiona started:

> And so, just like listening to each other, talk about how we're emailing students like how we're wording things in an email so that we're all being pretty similar, or like how to deal with [unsatisfactory grades] and, like different situations… I always felt like we were talking about how to make this experience the best for the students and for us (Focus Group Interview).

Brittany then added:

> One thing that [Fiona] said that stood out to me was a lot of the [MATH 105] experience is the same for all of the classes. And so it was really helpful for me to hear other instructors' experiences during those meetings because if I had not yet experienced that situation I knew that I was likely to in the future, and so that gave me tools that I could use when encountering those types of situations with students or as I'm grading or doing attendance or any of that stuff. (Focus Group Interview)

The lack of shared experiences actively had a negative impact on GSIs teaching STAT 250. Whitney and Adam expressed this frustration together:

> I think one thing [course coordinator] doesn't do is [they don't share with us [their] past experiences from teaching like if [they] did one thing that worked, one thing that didn't work, we never know. We pretty much just have to do it on our own to figure it out. (Adam, Focus Group Interview)

Whitney added:

> I like being able to know “okay, the students are going to struggle right here” before I even start the lesson so that I can like maybe ease into it, rather than jumping through and then being like “oh crap. they all … look lost … and I have to rewind. And in [course coordinator’s] class you just kind of figure that out like “oh crap, nobody understood that. Now I'm going to backtrack.” (Focus Group Interview)

These outlooks might explain a lack of participation in the STAT 250 meetings specifically, where Sabrina separately mentioned:

> The other graduate students in our meeting often don't ask any questions [sic] and I ask a lot of questions to clarify what needs to be taught, how we should make our exams etc. [sic] which makes me feels like I need more guidance than is needed to teach. (Value Narrative #2)

Collaboration. Collaboration appeared to produce immediate (45%) and skill-related (53%) value among GSIs. The pre-semester training week left GSIs with an understanding that community and collaboration would enhance their experience in their graduate program, both as a student and as an instructor. The unscheduled interactions between the GSIs during this time really cemented this idea for Samantha, who commented:

> The grad lounge is also somewhere i [*sic*] look forward hanging out in and seeing my classmates and talking to them. At the meetings, i [*sic*] didn't really have any time to interact or get to know them. I also have come to know that a lot of them also feel as stressed out and tired as i [*sic*] do and that we can work through difficult situations and problems together. (Value Narrative #1)

Leroy felt this same sense of community was established through the continued monthly professional learning CoP meetings that occurred. He stated, “I enjoyed talking with everyone together as a group, and talking about issues that we may face or other things. I felt like having a good community to support our teaching was important and these meetings added to that” (Value Narrative #3). Brittany felt collaboration supported her success as both a graduate student and an instructor. She mentioned:

> When I work with the other GSIs… that helps me reach those goals [I set], and… I know… these are people that I can come to and ask questions and ask advice and receive support from in my schoolwork as a student and in the classes that I'm teaching. (Focus Group Interview)

In particular, numerous GSIs mentioned getting feedback from others based on relationships they established in the professional learning CoP, especially when it came to how to respond to students or handle certain student situations. Fiona brought up how getting early feedback on emails led to improved email writing skills:

> It might seem miniscule, but I feel like over the last two years, my emailing skills have gotten amazing, so I would say… I mean like, even if I don't feel comfortable like I'll write an email, and if I’m like, “mmmm, not sure,” I could still send it to like [Beth] or multiple like multitude of people, and they would give me feedback on – and “change this,” or “change this,” or “this looks great,” so I started to just like ease off of that and realize like I'm writing pretty good emails and I can send it to them. (Focus Group Interview)

This type of feedback also supported GSIs in their course coordination CoPs. Multiple GSIs commented on how working collaboratively within their CoP was beneficial to them.

Victor, a first-year GSI, highlighted, “We were able to collaborate on difficult student issues. I feel student issues were more difficult than material issues” (Value Narrative #2). Whitney felt similarly, but added that hearing feedback from others was valuable for her confidence:

> In particular, I think that being able to share how I deal with student issues was a very positive experience for me. We all went around and talked about how we handle certain circumstances and that made me feel like i [*sic*] was doing it correctly when the other faculty members agreed to what I was saying and said that they liked certain things. It was a very good experience. (Value Narrative #2)

Fiona appreciated the collaboration that came from the freedom instructors in her CoP had to experiment in the classroom and report back to the group with the results:

> I'm always like big into like, “tell me how you did it and tell me how, you know, the outcome was. And I feel like in this space, when we were like trying things in that class, you know, we all feel comfortable to be like, “it went like this,” or “it went like this, maybe don't do that because you have class on Wednesday. Do it this way,” or “you do a way, and then you tell me how it went.” There was like a lot of collaboration between everyone, instead of just maybe like a few here and there, which is cool. And like I said, hearing those outcomes… makes me a better educator, and, you know, makes me enjoy this program because I get to kind of hear the ins and outs of what went right, what went wrong, what to do better, what to do not again, to everything. (Focus Group Interview)

While collaborating on how to facilitate classroom operations made Fiona feel like she was growing as an educator, these shares could also impact how GSIs viewed their peers.

Henry, in particular, felt hearing different classroom approaches impacted how he related to his fellow GSIs:

> I am passionate about teaching, particularly on the subject of respecting students. When my colleagues share ideas and strategies that show they respect their students, I respect them more as a teacher. When my colleagues share ideas and strategies that show they don't respect their students, I respect them less as a teacher. (Value Narrative #2)

Sabrina also used what her peers shared while collaborating in her course coordination CoP to reflect on her own abilities as an instructor:

> In these meetings I often realize that I am a lot more organized, accommodating to my students, and meticulous as an instructor compared to other graduate students from things like how we have our [learning management system] set up and how I am the only one who offers zoom [*sic*] option [*sic*] to attend class to students that are sick. Additionally, when we share where we are in terms of material coved [*sic*] and I realize that I am on the same section as others or ahead of everyone then I feel good about myself. I view myself as a better and more caring teacher because I feel I try harder than others since I ask questions and am more organized and accommodating as a teacher. (Value Narrative #2)

While the aforementioned experiences involved GSIs collaborating with their peers, a few coordination CoPs provided opportunities for GSIs to also collaborate with full-time faculty in the department. This experience allowed GSIs to gain knowledge about teaching the course from multiple experienced perspectives. Kenneth, a first-year GSI, mentioned:

> [Coordinator and 3 faculty who teach 115 and show up for coordination meetings] always provide insight into how to deliver content to students in a way that is accessible and supportive to students. [Coordinator and faculty] often present portions of the [MATH 115] lecture for a given week, during which they provide comments about specific materials that students historically struggle with and how to overcome these difficulties. Since my background in teaching is minimal, the weekly reminders about approaching topics from different perspectives, and tips on how to do so, significantly helped me bring these practices into the classroom. Additionally, seeing more experienced teachers present parts of a given lecture gave me a launching point for my own lectures and helped me to develop these skills. (Value Narrative #2)

Positive interactions between GSIs and faculty teaching the courses did not always occur, however. Whitney and Adam, in particular, felt judgement from certain faculty participating in their coordination CoP. Adam shared:

> One of the times that we were doing these conversations I sat next to [a faculty member] who teaches [STAT 250] and [they're] like very stubborn in [their] point of view about teaching. [They're] trying to tell me that if you don't make your test impossible, the students aren't gonna [*sic*] learn, and [they were] like telling me how [their] average was like 73 and [they were] like so proud of it and then [they] asked me… my average, and it was like a lot higher, and I'm like, "yeah, don't worry about it," and like, that's just not something that's helpful at all to do in a conversation… Like [they're] trying to tell me that if you don't put super tricky questions on every exam the students are not going to learn, and you can't like argue with [them]. Like, what am I going to tell

> them, like, “okay… we do things differently, period, and it's not something that we can like pick apart and then share different point of views. That conversation was just all about, “here's how I do it, here's how you do it Okay, we disagree.” Period. (Focus Group Interview)

Whitney then added:

> Yeah, it was like [they were] like implying that [Adams’] students were not as smart as [their] students, because [their] students had harder tests and [Adam] was making it easier for them, and so on, so forth, but [they need] to remember that we all put our test through [Course Coordinator], and [they approve] all of them … And so yeah [they’re] downplaying our ability to teach them and, and that was happening under [Course Coordinator] like [they’re] there, [they’re] supposed to be coordinating us, supposed to be a coordinated course, but yet, the people that are teaching the same subject are like saying, “oh, your students are worse than mine because of this,” or “I'm a better teacher than you because of this,” so on, so forth. (Focus Group Interview)

Coordination Meetings (Course Information, Structure, and Content). The largest portion of value-creation from coordination meetings was split between immediate (30%) and potential (32%) value. Sixty-one percent of all comments, however, reflected skill-related value. At the professional learning CoP level, coordination meeting information was presented during the pre-semester training. Many GSIs expressed the course-specific sessions were the most beneficial part of their training week experience and wanted to spend more time preparing for the classes they would be teaching. Kenneth even stated, “I think the overall amount of course specific preparation was not enough” (Value Narrative #1). While these meetings occurred prior

to the start of class, Mark expressed, “I felt that the coordination meetings should have happened well before class started. They were the most insightful. I think having those well before and practicing them with peers would be the most beneficial” (Value Narrative #1).

GSIs also expressed it would have been beneficial to incorporate a broader understanding of all courses throughout the training week. Annie shared a desire to better understand the courses she was not teaching before the semester began:

> Not learning what the other courses are being taught does not help in the lab. When I'm dealing with non-[MATH 120] students, I don't feel as comfortable answering questions in the lab only because I don't know what material they are supposed to be learning. (Value Narrative #1)

The course coordination meetings throughout the semester had a larger impact on the weekly happenings for each course. While each course had a unique structure and coordinator, some common themes emerged from the courses. For the most part, these meetings helped GSIs prepare for what they would be doing with their students in the upcoming week. According to Louise:

> Going through the material during the meetings help [*sic*] me feel more confident going into class on the days I teach. We get to have a discussion about what to expect and what to mention to our classes. There [*sic*] have impacted me positively and helped me feel like I am setting my students up for success as best as I can, [*sic*] and help me feel less stressed when it came [*sic*] to prepping for my lectures. (Value Narrative #2)

These meetings also supported relationship building, with Kenneth sharing, “The discussions in coordination meetings help me to build relationships with everyone in the meetings, as well as [Course Coordinator] specifically” (Value Narrative #2).

Not all experiences regarding course coordination meetings were positive, however. Some GSIs felt focusing only on the upcoming week in their meetings was detrimental to their ability to support students. Annie commented, “it's that we are not told a lot of what happens until the very last second, which doesn't help when students have questions” (Value Narrative #2).

While this was one viewpoint GSIs shared, others felt they could not get anything out of coordination meetings because they felt they did not have time to review upcoming content prior to the meeting. According to Whitney:

> I think that asking to talk about how to teach something that was coming up, such as talking about ways to teach a subject in the next week was weird to answer if I had not looked at what we were teaching before hand [*sic*]. It puts people who have not taught on the spot and makes them look as if they don't know anything, but they haven't even looked at the topics in that chapter yet. (Value Narrative #2)

Adam independently echoed this sentiment about the group’s course coordination CoP when he shared, “Truthfully, I feel that most of the coordination meeting is not meaningful and could be summarized in a short email” (Value Narrative #2). These feelings were also brought up in the group’s focus group interview, where Sabrina added her frustrations about not getting course-specific questions answered:

> Honestly, I feel like the meeting is just another responsibility, and I don't get much out of it… I used to ask so many questions in like the coordination meeting… and [Course Coordinator] was just like not able to answer it. As much as I would have wanted an answer to so then I just do whatever I feel like works for me. (Focus Group Interview)

While Whitney, Adam, and Sabrina were frustrated with a lack of guidance, Beth, Brittany, and Fiona had unique frustrations with teaching the administrative-focused MATH 105 that led to positive changes in their teaching outlooks. Beth started:

> I do feel like I didn't lesson plan or really get to plan any activities or practice doing any of that. Or – and I really didn't practice classroom management either because my students just were working independently. They were doing their own thing, so I didn't get to build those skills, but I do think I had to push myself out of the comfort zone and like approach students who weren't asking me for help… to have to like push myself to interrupt them almost and like check in with them, that was a skill that I'm glad that I learned because it helps me now. Like when my students are working in groups [in MATH 110] I have really no problem like interrupting them and asking them what they're doing and how they're doing it… I was just too nervous to do it before [MATH 105], and I actually feel like I – it's a lot better for me now. (Focus Group Interview)

Brittany then added:

> I think I was challenged by [MATH 105] in a way that I wasn't expecting. I didn't know that [GSIs] were teaching [MATH 105] like for last semester, and so I think I had an expectation of what being a GSI last semester would look like in like a [110], [120], or [115] course. And as [Beth] said, I mean in [MATH 105] there was no lecture. I didn't do

any lesson planning or prepping. I certainly grew in my administrative skills and tracking and building intentional one-on-one relationships with students and supporting them individually, and like going deeply into where they're at, what progress they've made, and setting goals for them to continue progressing in the future, but it was definitely – it was a challenge to have so – I felt very excited to teach and plan and prepare, and it was almost like, “put me in coach – I got this! I want to do it! I'm ready!” And then it was like taking a step back and not engaging in those like typical teaching experiences, and so I feel so grateful that I did teach [MATH 105] for all of those skills I did build. (Focus Group Interview)

Fiona even added that the experience teaching MATH 105 was a catalyst for a career change:

> Because I've taught like with a different curriculum each semester, I think [MATH 105] gave me the like the little push that I was needing to say, “hey, [Fiona], maybe you would be good at something else, too. Especially in ways, and people will always be like, “well, you're good at teaching” like, “your students love you,” “you do this,” “you do that,” and I think coming to the realization of like seeing [MATH 105 software] and seeing the potential that a curriculum can have on a student's ability changed my, I guess. end goal now. Because before – into my program, like my end goal is to like get a PhD and hopefully teach at the college level, but now my goal is to like look into curriculum development and see what I can go from there. So I do think those experiences in [MATH 105] and in those GSI meetings kind of gave me the little push that I needed to kind of check out a further, or like, a different destination that would still help students success. (Focus Group Interview)

GSI Interactions. GSI interactions overwhelming supported the creation of immediate (72%) and social (71%) value. GSIs were encouraged early on in the professional learning CoP to interact with one another both in and out of the GSI setting. Those recommendations stuck with GSIs, as when Annie and Leroy had the following conversation during their focus group interview:

> I think [GSI Coordinator] mentioned at one time on day one… that students who tend to stick together always tend to do the, be, do better…I think it is because you get to lean on each other, number one. You get to bounce a lot of ideas off each other in class and outside of class, and overall, I just think that it's been good to have a lot of the interactions with other [GSIs]. (Leroy, Focus Group Interview)

Annie then added:

> And I also feel like when – the first day when [the GSI Coordinator and Director] released us for lunch and… said, "no one eat alone"… I don't know if that was partly because, like, after Covid, you know, it was Zoom, so it was just, you know, like everyone was home, or if it was actually like [GSI Coordinator] said, like, "I want you all to like meet each other and like learn each other's names"… but I was like, "this is super nice" because now I'm, you know, really good friends with a bunch of these people, so I feel super comfortable going to them and being like, "Hey, can you read this email real quickly?" you know? Or, like, "what would you say to this person because I'm thinking this. Do you agree with this?" And you know, started on day one when it was like "nobody eat alone." (Focus Group Interview)

Leroy ended the discussion with, “I think [GSI Coordinator] was definitely right to make that announcement all together, and I would recommend it to any [GSI] coming next year” (Focus Group Interview).

GSIs acknowledged that relationships with one another supported their success as both instructors and students. Brittany mentioned it “helped me feel supported and even more excited to be a GSI” (Value Narrative #1), while Wendy shared, “Having friendships with the other GSIs makes me feel more confident and comfortable in my own teaching responsibilities. I can vent to them about teaching frustrations and they understand what I'm going through” (Value Narrative #1). Ben, a first-year GSI, but second-year graduate student mentioned:

> [GSI Coordinator] encouraged the GSIs to socialize. I am making an effort to be sociable, which is something outside my comfort zone as a loner…. I am enjoying my engagement with fellow GSIs. I am not as shy to ask for help with homework as I used to be, for instance. (Value Narrative #1)

The welcoming nature of second-year GSIs stood out to their first-year peers, again on both a personal and professional level. Brandon commented, “I appreciated that the second-year students were so welcoming and actively trying to make events happen so that we could all socialize… I was worried about getting to know everyone but I already feel much better about that” (Value Narrative #1), and according to Bruno, “Personal conversations with the 2nd year GSIs…boosted my confidence up [*sic*] and let me know that I could rely on them if issues with teaching occur” (Value Narrative #1).

It is important to note when GSIs felt a lack of interactions with their peers, they felt negative effects. Henry noticed this difference between his first and second year:

> It just seems there was a massive shift from first year, to second year. First year it was like the academics were the big stressor. But I think [former GSI], she was a second-year at the time, she put it best. She's like, "we're all on the Titanic sinking together," and that's what it felt like. Like I was, like… we were all drowning, but we're drowning together. I felt like last semester it was like, we're all drowning, but we're drowning independently now, and that was really, really hard. (Focus Group Interview)

There were specific peer interactions that also left GSIs with negative feelings. Brandon shared, "I felt a couple of GSIs were painfully unaware of how their actions may have been perceived by others around them" (Value Narrative #1). Fiona echoed this statement and shared how that impacted her ability to view these peers as someone she could turn to for advice:

> Most of the time when I was in the lounge it was a bashing session about students (calling them idiots, etc.). [GSIs] would feel comfortable talking badly about their students, that students [sic] grades are horrible, and how their classroom has been horrible as well. There was not an activity for this specific issue I found but it made me not want to take their advice seriously when we were in all staff meetings… The main reason for this story is I want to be able to listen to each one of my colleagues [*sic*] advice about being a better [GSI] but [*sic*] when I hear things like this in the lounge, I am hesitant to listen. (Value Creation Stories)

A conversation involving vaccines during one of the professional learning monthly CoP meetings was particularly frustrating to many GSIs, regardless of their vaccination views. One such outlook came from Sabrina:

> Last semester when we had a vaccination deadline there was a meeting in which I sat next to [Ben], and the whole time he was complaining about how people are not vaccinated and stuff and spreading Covid this and that. And I am not vaccinated, and the reason I'm not vaccinated is because of some health issues, and so, like, I actually got an exception from the university to be not vaccinated. And I just felt like attacked the whole time, and I didn't say anything. And he just assumed that I'm vaccinated, and he kept like complaining the whole hour about, like, the whole hour that we were there. (Focus Group Interview)

Leonard felt incredibly stressed during this discussion as well, but an interaction with a peer settled his nerves. He shared:

> During the whole vaccine talk… it did, near the end, it got kind of tense. And for whatever reason, I don't know if it just brought back really painful memories, but I wasn't even involved in the conversation, and I started like freaking out. I don't know why… like I was hyperventilating…. and, I don't mind saying [Brandon] actually noticed and he actually came up to me he's like, "dude, are you okay?" and just – it just showed like even in those situations, you know, we still just – showed like how cool and supportive of a community we still have, even when we go to those areas. (Focus Group Interview)

Some GSI interactions mentioned in the data regarding course coordination CoPs were also negative, especially when peers did not show enthusiasm for their teaching duties, as expressed earlier by Fiona in the professional learning CoP setting. One particular interaction during a MATH 110 CoP meeting left Harry feeling deflated:

> At one of the meetings, I spoke up for the first time to [Course Coordinator] about something I think all the [GSIs] should consider including in their lecture… Before I could complete my thought, [Victor] interrupted me to tell me in front of everyone else that "this is confusing" and "students will use this whenever they can (including in the wrong cases)". I never feel like I got to make my point clear to everyone because [Victor] kept talking over me; especially when I spoke too softly to be heard over him. I felt like this was very unfair of him to do; especially because I was only offering a piece of knowledge that all the [GSIs] should only consider teaching in their classes, but thanks to [Victor], nobody will consider doing it. (Value Narrative #2)

Other GSIs in the same course CoP expressed similar frustrations with certain peers talking over others, including the course coordinator.

While there were negative GSI interactions at the course coordination level, most of the interactions mentioned left GSIs feeling a sense of camaraderie. Annie shared, "I feel that we have grown a little closer together since we are constantly checking in with each other, reassuring each other, and just generally being there for each other" (Value Narrative #2). The effect of these interactions even extended to their own graduate classes, as demonstrated when Camille stated, "We got along really well in the coordination meetings which helped us get a lot closer, and half of my [GSI] colleagues sit in close range to me which helped us get along and talk about the classes easier" (Value Narrative #2).

Level of Support. GSIs expressed immediate (64%) and personal (58%) value when discussing the level of support they received. The training week for the professional learning CoP left many GSIs feeling supported going into the semester. Leonard mentioned, "The thing

that really helped the most were the content [*sic*] reminders that our bosses are also hear [*sic*] to help us and we can go to them for help" (Value Narrative #1). Beth shared, "I know that my supervisors have my back and will support me if I am unsure how to handle a situation" (Value Narrative #1), while Brandon expanded his feelings of support to his peers by saying, "I feel like I have the support of the other graduate students in the program both in and out of classes" (Value Narrative #1).

These feelings of support continued through the monthly professional learning CoP meetings, as seen when Brandon stated, "The monthly meetings with [GSI Coordinator] made me feel like we had an advocate in the department for the things we needed. I felt more supported and confident in my teaching because of these meetings" (Value Narrative #3). Hazel added that she appreciated that "we got support and advice from [GSI Coordinator] for how to deal with difficult classroom experiences when we shared out [our] classroom experiences" (Value Narrative #3). Beth discussed feeling supported by their peers and their supervisors in the focus group interview:

> It makes me feel supported by my team of other [GSIs] and also like the leadership team, and it makes me feel like, if I have an issue that I'm not sure how to resolve I have multiple people I could go to as resources. Probably gives me more confidence in the classroom also because I feel like I have good ideas or I feel like now I've gotten advice on something and I have a way to deal with it. So just puts me at ease a little bit relieves stress. (Focus Group Interview)

There were also times during professional learning CoP meetings that GSIs felt actively unsupported. Wendy shared one such instance:

> I can, I remember, there was a [GSI] meeting, where… I guess a colleague of mine felt like very specifically like called out by [the GSI Coordinator] and was like really uncomfortable with that, and I think that colleague being uncomfortable like kind of made me uncomfortable because I was sitting with them at the time… They like didn't fill out [a] form correctly, and like [GTA coordinator] like really put this person like on the spot and was like, "like some people don't know how to fill out a form." I think he meant it as a joke. It did not land as a joke, and they felt like really like kind of like personally attacked in a way…I just kind of wish that that had been handled a little differently or that [the GSI Coordinator] would have been like, "oh, like sorry about that I didn't mean to like put you on the spot," just like anything to like kind of follow up and like make sure that that person like didn't feel like they were being so specifically called out for not understanding something that they didn't. Like of course they didn't know how to do it, they've never done it before sort of thing. So I feel like I would have had like more like faith in like feeling supported, I guess, if I had like seen that process be handled like a little more appropriately. (Focus Group Interview)

When discussing support at the course coordination level, GSIs expressed feeling supported to make decisions independently, becoming more comfortable in the classroom, and gaining more confidence in teaching abilities. Wendy exemplified this sentiment when she mentioned, "Overall [sic] I felt very supported. I felt like there was a ton of people [*sic*] I could talk to if an issue came up and as time went on [sic] I feel like I became more confident and independent as a teacher" (Value Narrative #2).

For Beth, in particular, the support she felt through her course coordination group was not something she had experienced before:

> I feel like I wanted to build more professional relationships…Like I never got to see myself in a professional setting where I got to have almost colleagues and like people to collaborate with. So, I knew I wanted that, and that came so quickly – I was actually really surprised how quickly I kind of had a team of people supporting me. And yeah, just getting to kind of test out how I want to be as a teacher, without having to be thrown in on my own so quickly, like I would have if I just got a job at a high school, and because I know how that affected, my friends and how unsupported they felt and how much it just like made them hate their jobs, so. And I'm getting a really good education with really awesome professors that I now have like personal relationships with as well, so growing in every aspect. (Focus Group Interview)

Student Interactions. Student interactions appeared to provoke potential (50%) and student-related (45%) value within GSIs. GSIs in the professional learning CoP were most impacted by their pre-semester training when it came to handling student interactions. One session, in particular, focused on how to appropriately communicate with students. Uriah, a second-year GSI mentioned, "I enjoy being showed [*sic*] different ways to interact with our students. This helps me form relationships with them which overall helps them succeed" (Value Narrative #1). This session greatly impacted Bruno, who shared:

> So there's the story [the Director] told us about this international student who was a little uncareful – not careful with what he told one of his students. I think about that almost every day, to be honest. OK not – almost every day, but whenever I'm trying to

> say something, I think twice through. I try to filter what I say, I guess… I really tried to, you know, even if I do say something that is like on the edge of being inappropriate, I think – I rethink that afterwards, and I think, okay "I'm gonna – I'm not gonna ever say this again." (Focus Group Interview)

When asked why that training stood out to him in particular, he continued:

> Because I'm an international student, and I – it took me at least couple years to learn how people talk and interact between each other in America compared to like my culture and what is appropriate, what is not appropriate, you know? And I'm not even sure if something might just jump out of my mouth that is not appropriate, and, you know, I didn't even know that it was not appropriate, you know? Because that – that happened like dozens of times when I would say something that would not be inappropriate in in [my home country], like, and directly translated to English – say it here and people are like, "Oh, no! Don't say that." (Focus Group Interview)

During this same pre-semester training session, examples of emails that had been sent from former GSIs were shared with current GSIs. These emails included poor examples of communicating with students so the facilitators could highlight specific ways to improve the communication as well as exemplary emails that showed patience and compassion from the author. Second-year GSI Wyatt noted this negatively impacted his view of himself as a teacher, stating, "Some of the example emails caused me to see myself as mediocre (not very 'good') teacher [*sic*] since my emails usually get straight to the point and just answer the students [*sic*] questions without any additional words in the email" (Wyatt, Value Narrative #1).

The course coordination CoP offered much more in-the-moment support for student interactions. Henry remembered an interaction with his coordinator that created a shift in how he viewed student interactions entirely:

> There was a student I had… They're like a basically failing a class, like "is there any hope?" like, "can I like do a bunch of assignments?" you know? And… it was one that I knew was going to be pretty rough. And I actually sent [my response] to [Course Coordinator] before I sent it to the student. And in my email… I did mention – I was like, "at this point I don't think that you'll be able to get a passing grade" … because to me, initially I thought, like, it was important for me to be honest, and like, I don't want to give them false hope. But then [Course Coordinator]'s response was like, … "this sentence is probably a little bit harsh," and [they're] like, "I would start…" and then [they] like edited it, and one of the edits that [they] put in which – [they] just like, [they were] like, "I'm so sorry to hear this has been a hard semester", like, "I totally understand how frustrating, it can be when you put in so much work and you aren't getting the outcomes that you wanted."… To me it was like kind of humbling, you know, but in a in a very good way. Like [Course Coordinator] was like, "hey, like this student needs compassion, right now, not necessarily, like, honesty." Um, I mean obviously it wasn't a lie, but… [they're] like, "what you need to prioritize is compassion with students like this," and that is probably a lesson that'll stick with me throughout my entire teaching career, is on students. Students need compassion, and sometimes that's what they need first in before the honesty. (Focus Group Interview)

Shared Activities and Experiences Summary. While the seven activities and experiences described in this section were influential to learning in both the professional learning and course coordination CoPs, each CoP created value from them in different ways. Based on the responses GSIs shared, GSI interactions and asking questions, discussing issues, and sharing experiences largely influenced the professional learning CoP more than the course coordination one. Similarly, collaboration and coordination meetings had greater influence over learning in the course coordination CoP than in the professional learning CoP.

Most of the activities and experiences also appeared to support value-creation for GSIs in a certain way. Level of support, GSI interactions, collaboration, and asking questions, discussing issues, and sharing experiences all seemed to create immediate value for GSIs. The ability to impact students and student interactions produced potential value for GSIs. Coordination meetings were the only shared activity and experience that caused GSIs to express almost an even value-creation split between immediate and potential value.

While immediate value and potential value were the only primary value-creation codes to stand out among the seven activities and experiences, almost all of the value-creation subcodes proved to support GSI learning in some way. GSIs created personal value based on the level of support they received in their CoPs. Their reactions with one another instilled social value, both positively and negatively. GSIs created skill-related value through their collaborations, coordination meetings, and by asking questions, discussing issues, and sharing experiences. Finally, both student interactions and GSI beliefs in their ability to impact students supported the GSIs in creating student-related value. Context-related value was only referenced minimally when addressing the activities and experiences discussed in this section.

GSIs expressed mostly positive comments when discussing these seven activities and experiences. Pre-semester training left first-year GSIs understanding the importance of their job and the possible impact they could have on their students. As the semester continued, however, some GSIs shared frustrations with the limitations placed on them by their supervisors. Course coordination information left GSIs either feeling empowered and well-prepared to teach or left alone to determine how to teach course content; there was no middle ground when it came to discussing the support felt in course coordination CoPs. Many of the remaining activities and experiences in this section added to a sense of camaraderie among the GSIs and increased confidence in both their instructor and student roles. While many of the GSIs were inspired by the realization they were not alone in how they were feeing on their journey, when these experiences highlighted contradictions with one's own beliefs, they often times cause segregation within the group.

Examining the activities and experiences that proved valuable to GSIs in both their professional learning and course coordination CoPs does not provide a full depiction of each of the cases in this study. In order to better understand the cases, we must also explore the activities and experiences that influenced the learning in one CoPs but not the other.

Value-Creation Unique to the Professional Learning CoP (RQ1b)

In addition to the seven activities and experiences discussed in the previous sections, GSIs reflecting on the professional learning CoP frequently referenced the following 16 activities and experience, highlighting the influence they had on GSI learning within the CoP: (a) ability to impact department, (b) amount/length of meetings, (c) department/teaching duties and expectations, (d) food, (e) gaining experience, (f) general teaching tips, (g) level of

confidence, (h) level of preparation, (i) mathematics education professional development, (j) meeting structure/environment, (k) sense of community, (l) talking about students, (m) teaching demonstrations, (n) teaching feedback, (o) teaching/student balance, and (p) unnecessary/off-topic/inappropriate information.

Table 13 shows how the value-creation primary codes were distributed in comments regarding activities and experiences that uniquely influenced GSI learning in the professional learning CoP.

Table 13

Percent Distribution of Value-Creation Primary Codes in the Professional Learning CoP

Activity/Experience	Primary codes					
	IV	PV	AV	RealV	RefV	MO
Ability to impact department	38	56	0	6	0	0
Amount and length of meetings	29	18	0	0	6	47
Department/teaching duties and expectations	75	17	0	8	0	0
Food	92	0	0	8	0	0
Gaining experience	0	11	0	22	67	0
General teaching tips[a]	26	37	21	11	0	5
Level of confidence	80	16	0	0	4	0
Level of preparation	30	50	0	0	10	10
Mathematics education professional development	8	54	19	4	8	8
Meeting structure/environment	54	8	0	15	0	23
Sense of community	73	15	0	12	0	0
Talking about students	67	13	7	0	7	7
Teaching demonstrations[a]	31	38	0	11	4	16
Teaching feedback[a]	10	30	20	0	20	20
Teaching/student balance	56	0	0	22	11	11
Unnecessary/off-topic/inappropriate information	63	0	0	0	5	32

Note. CoP = Community of Practice; IV = Immediate value; PV = Potential value; AV = Applied value; RealV = Realized value; RefV = Reframing value; MO = Missed opportunity. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes.

[a] I was personally involved in these experiences.

As with the shared activities and experiences, the distribution of value-creation codes fell heavily in the immediate and potential value categories, with 14 of the 16 activities and

experiences having the largest percentage of comments reflecting either immediate or potential value. Exceptions to this pattern occurred in the amount and length of meetings, where most learning came through missed opportunities (47%), and gaining experience, where GSIs reflected on learning through reframing value (67%). While teaching feedback allowed GSIs to mainly create potential value (30%), it should be noted that this was the only activity and experience that also had a fairly high, even distribution (20%) between applied value, reframing value, and missed opportunities.

Table 14 shows the distribution of the value-creation subcodes for these same activities and experiences.

Table 14

Percent Distribution of Value-Creation Subcodes in the Professional Learning CoP

Activity/Experience	Subcodes				
	P	S	Sk	St	C
Ability to impact department	39	0	44	11	6
Amount and length of meetings	35	0	24	0	41
Department/teaching duties and expectations	46	0	31	8	15
Food	13	67	7	0	13
Gaining experience	18	0	36	45	0
General teaching tips[a]	14	5	71	10	0
Level of confidence	79	14	7	0	0
Level of preparation	20	0	80	0	0
Mathematics education professional development	0	0	89	11	0
Meeting structure/environment	15	0	8	8	69
Sense of community	29	57	11	0	4
Talking about students	19	56	6	19	0
Teaching demonstrations[a]	26	4	63	7	0
Teaching feedback[a]	17	0	75	8	0
Teaching/student balance	27	0	64	9	0
Unnecessary/off-topic/inappropriate information	26	26	26	0	21

Note. CoP = Community of Practice; P = Personal value; S = Social value; Sk = Skill-related value; St = Student-related value; C = Context-related value. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

[a] I was personally involved in these experiences.

Almost half (seven of the 16) of the influential activities and experiences unique to the professional learning CoP resulted in the largest proportion of comments reflecting skill-related value for the GSIs, with six of the activities and experiences having the majority of comments fall into this category. Comments focusing on food, a sense of community, and talking about students supported GSIs learning mainly through social-related value. GSIs appeared to create personal value when reflecting on their level of confidence. The meeting structure and environment of the professional learning CoP supported GSI learning as they established context-related value.

The following sections describe how these 12 activities and experiences were enacted in the professional learning CoP.

Ability to Impact Department. The largest percentage of comments GSIs made regarding impact to the department showed potential (56%) and skill-related (44%) value, with personal value (39%) closely following. GSIs expressed a wide variety of feelings regarding their ability to impact the department, with any feelings of having an impact being expressed when GSIs reflected on their pre-semester training experiences. Samantha shared, "I feel like im [*sic*] a member of the department, [*sic*] the trainings made me get used to the fact that i [*sic*] am one now and this is my new job" (Value Narrative #1). Wyatt echoed this sentiment independently when he shared, "My teaching can have the same level of influence as any full-time faculty teaching the same class (i.e., teaching well can make the department look good and teaching badly can make the department look bad)" (Value Narrative #1). Some GSIs also expressed feeling as though they were "important to the team and [were] valued" (Beth, Value Narrative #1), that their "opinion matters" (Brandon, Value Narrative #1) and they "could give

[their] opinion and feedback on things and have them actually make a difference in the [math center]" (Brittany, Value Narrative #1).

Other GSIs, however, felt as though their "lack of knowledge and experience make it feel like [they] do not have the ability to influence what happens in the department" (Oliver, Value Narrative #1). When discussing their impact on the department when reflecting on the monthly professional learning CoP meetings, GSIs resoundingly expressed they felt they did not have an influence on the department.

Amount and Length of Meetings. The amount and length of meetings appeared to provide GSIs with insight to missed opportunities (47%) that were context-related (41%). GSIs expressed feeling exhausted and overwhelmed by their professional learning CoP pre-semester training. Camille expressed:

> [GSI] trainings were long with a lot of information given to us all at once. The huge influx of information and long days of training made it hard to properly digest the information; I found that I forgot a lot of stuff my first week that we had been told because I was trying to remember everything else. (Value Narrative #1)

The focus on teaching during pre-semester training frustrated Samantha, who wanted more time to prepare for her role as a graduate student. She stated:

> I wish more thought was taken into our schedule and the fact that we started classes- our own and ones that we were teaching for the first time-the following week. i [*sic*] was so tired that i [*sic*] didn't have very much time to study for my classes. I wish we had a day off thrown in or less hours each day. Or someone could have expressed how tiring the training would be before we started, such as in an email. (Value Narrative #1)

Mark, however, had a different view of pre-training communication and when asked to share any negative experiences wrote, “Stating how the training would be ‘crazy’ in emails beforehand; The email made me worry that the job would be difficult, but during the training I felt that I had support in case I would need it (Value Narrative #1). Oliver was one of the few GSIs who recognized that the hectic pre-semester training schedule was worth it when he stated, “The training was overwhelming and stressful at times but ultimately helped prepare me for my current position as a GSI” (Value Narrative #1).

GSIs appreciated that the monthly meetings following pre-semester training were short and informal. They also acknowledged the significance of talking about important policies. Some GSIs did not, however, appreciate the day and time of the meetings, as expressed by Camille when she wrote:

> Honestly [*sic*] I felt that the meetings were mostly not useful overall. By Friday afternoon I was exhausted and having to go to a meeting usually didn't help, and it felt like a lot of what was in the meetings could have been summed up in an email. While there were certainly parts of it that were useful, if I had any questions [*sic*] I always know who I can reach out to and how to reach out [*sic*] I would mind the meetings less if they could not be on a Friday afternoon. (Value Narrative #3)

Department/Teaching Duties and Expectations. GSIs expressed immediate (75%) and personal (46%) value when discussing the level of support they received. GSIs felt they “benefited from the tours and time to learn the vernacular” (Wendy, Value Narrative #1) during pre-service training and that “the training was very useful in cleaning up grey areas in teaching procedure and NAU policy” (Sean, Value Narrative #1). They also appreciated that the monthly

meetings allowed the GSI Coordinator to keep them up to date with procedures and expectations as well as answer their questions and concerns. A point of controversy arose, however, regarding university policies on Covid-19 and what GSIs were expected to do in their classrooms. While some GSIs said, "it felt productive to talk about COVID policies [at these meetings]" (Camille, Value Narrative #3), others, like Wendy, felt, "the tension around the vaccine mandate was very stressful to be around" (Value Narrative #3). Henry, in particular, felt bad that the tensions regarding Covid-19 policies took so much energy in the monthly meetings. He shared:

> Last semester got political, and I mean I that's one of the times, [Uriah] sort of stood up and was like, "let's move on," and I'm grateful that he did. I know it affected me – consumed me – a lot, and I, myself, could have focused on other things as well. But I think part of the issue is that, I mean, I mentioned like the administration of [university] – there are sometimes policy issues, and so when we when we are presented with a new policy with very little information, it just caused a lot of, I don't know, tense feelings. And then it seemed like there was nowhere else to turn other than our meeting, so that was hard because I don't feel like, you know, [GSI Coordinator] had all the answers, and I don't blame [them] for that. (Henry, Focus Group Interview).

Food. Providing GSIs with food overwhelmingly provoked immediate (92%) and social (67%) value within the group. Faculty and staff within the department donated food for GSIs during certain times throughout pre-semester training as a way to entice GSIs to socialize with one another and to alleviate financial stress since they had not yet received their first paycheck. GSIs acknowledged the social benefit the food provided and shared it "helped to create a sense

of community" (Hazel, Value Narrative #1). Facilitators did, however, also receive complaints that the food choices did not take dietary restrictions into account, which was "disheartening" (Camille, Value Narrative #1) to some GSIs.

Faculty members continued collaborating throughout the semester to continue providing food for GSIs at their monthly meetings. Many of the GSIs mentioned the impact food had on their experiences, including Harry, who stated, "I liked the meetings where we took a break and got food. I think those are the only ones where I got to socialize with my colleagues" (Value Narrative #3). Kenneth independently added he liked the "opportunity to eat food with colleagues and get to know people a little better. And, yeah, not have to pay for food – It's pretty nice" (Focus Group Interview). Annie took the value food placed on the meetings even further when she wrote "I also thought that the meetings were not as important without food" (Value Narrative #3).

Gaining Experience. Gaining experience was the only referenced activity and experience where the majority of GSI comments focused on reframing value (67%) and student-related value (45%), followed closely by skill-related value (36%). Spending time as an instructor and processing experiences as a teacher impacted GSIs in a variety of ways. For some, like Bruno, it changed their understanding of what it meant to be a teacher and "develop more appreciation for what teachers do" (Focus Group Interview). Bruno continued:

> Because when you're a student, all you care about is yourself … and when, you know, you slept through the test and you're like, "oh this [expletive] professor didn't let me retake it", you know, now, I understand… the reason why he didn't try to retake it, you know? The biggest part of it is not because he – he's an [expletive] and he just hates me

it's because he needs to understand that, you know, there's other – 69 students who are going to be affected by it, might be affected by it, and there is [*sic*] another 20 sections of students with similar situations. [They] could have… come up and the professor didn't let them retake the test. So if you do let it – let the student retake the test, then there is like… some kind of conflict, you know? So, you know, I've developed a lot of a lot more appreciation for – with teachers and course coordinators and you know [administrators] do... Because, you know, once you, once you see behind the scenes, then you understand what it really takes to like coordinate thousands of students.

Gaining experience as an instructor, with the support of a course coordinator, also supported an increase in teaching confidence from GSIs. Kai, a second-year GSI shared:

> I was the most confident the end of this last semester probably just experience, but also all these meetings and, well, knowing the material better and seeing – for me the big one last semester was seeing that the way I was teaching and what I was teaching was actually taking hold… It was just great to see all this [student] development. I'm like, "wow I actually might not be a terrible teacher. This feels really good." And I think that is entirely, you know, the experience – just doing it a bunch, but also meeting with [course coordinator] and asking [them] questions… by the end of the semester I felt so much better about my abilities as a teacher, and that was really, really nice. (Focus Group Interview)

General Teaching Tips. While general teaching tips did not overwhelmingly focus on one primary value-creation category (37% for potential value, followed by 26% for immediate value), the comments were largely skill-related (71%) in value. GSIs mentioned that pre-

semester training sessions introduced them to teaching methods and strategies they had not previously seen. The feedback they received from their peers and supervisors also made them aware of strategies to avoid in the classroom. Oliver mentioned these tips gave him "new perspectives on teaching and ideas for classroom activities and increase[d] student involvement" (Value Narrative #1).

Second-year GSIs, in particular, seemed to appreciate the impact sessions regarding teaching strategies had on their development. Adam found "the two meetings that were centered around teaching techniques helped me the most" (Value Narrative #1), while Henry shared, "I really enjoyed the meetings about improving our teaching, because it gave me a change [*sic*] to reflect on my own teaching beliefs. Hearing the teaching philosophies of different faculty was good too" (Value Narrative #1).

GSIs commented that monthly meetings did not focus on improving teaching like the pre-semester training sessions did. Monthly meetings did, however, provide suggestions for dealing with in-the-moment difficult situations and ideas for improving classroom operations, even if, as Louise mentioned, these suggestions sometimes "felt a little to [*sic*] late" (Value Narrative #3).

Level of Confidence. GSIs made it clear that their level of confidence evoked immediate (80%) and personal (79%) value. GSIs left pre-semester training with increased confidence to start the semester. This feeling surprised Brandon, as he shared, "I feel much more comfortable teaching than I initially thought I would" (Value Narrative #1). This was a common sentiment among first-year GSIs. They attributed this increase in confidence to a variety of experiences, ranging from the training sessions themselves, to the level of support they felt, to interactions

with peers or supervisors. Second-year GSIs who were involved in supporting their first-year peers expressed that their involvement in first-year GSI training boosted their confidence "since it was the moment that I recognized how much I have improved since last year" (Adam, Value Narrative #1). Not all GSIs, however, felt confident starting the semester. Kai lacked confidence as a first-year GSI, which continued into the start of his second year. He wrote:

> I am not a very good teacher and have almost no experience. I lack confidence in both my understanding of the content and my ability to teach others. I don't think the experiences from GSI training impacted me very much either way. I am still not confident in either of the areas mentioned before. I am still excited for the semester but more in a general sense, not necessarily in a teaching aspect. (Value Narrative #1)

Almost all mentions of feeling confident stemmed from pre-semester training reflections, with Brandon being the only GSI to mention feeling confident in his teaching as a result of monthly meetings as well.

Level of Preparation. Fifty percent of the comments regarding GSIs' level of preparation centered on potential value, with 80% of comments being skill-related. Many GSIs felt the pre-semester training left them feeling prepared to start the semester. Samantha felt the trainings equiped her in both her student and teacher roles:

> The trainings gave me a better understanding of what teachers do and the life of a teacher. As a grad student, they helped in the way that they prepared us to talk in front of others and to present our ideas, thoughts, and feelings. (Value Narrative #1)

Some GSIs like Oliver (Value Narrative #1), however, needed more practice speaking in front of their peers to feel ready to stand in front of a classroom full of students.

Mathematics Education Professional Development. The mathematics education professional development allowed GSIs to learn through creating potential value (54%) that was skill related (89%). The impact of this experience was far-reaching as demonstrated by GSIs mentioning it in their first value narratives, semester value-creation stories, and focus group interviews. Leonard remembered verbatim what the facilitators told him, and his big takeaway from the session was, "'the way we understand it is NOT the way we should teach it'" (Value Narrative #1). Beth felt the session closely aligned with her own values regarding teaching and "appreciated the workshop for how to teach math in an engaging/inquiry based [*sic*] way because… that can be hard to do in strongly coordinated courses" (Value narrative #1).

Numerous GSIs mentioned a change in outlook based on the professional development session. Wyatt wrote:

> This [session] changed my attitude towards teaching by highlighting just how differently everyone approached the same problem. It made me realize I need to show more than one way to approach a problem so that students can use the method that works best for each individual student. (Value Narrative #1)

Kenneth added independently:

> The activity where we went over all the different ways to teach a specific topic (the tables at a restaurant activity) was very positive. That specific activity made me realize how many different correct perspectives there are on any given problem, and that incorporating multiple perspectives is very beneficial to student learning. I plan to incorporate this into my teaching style. (Value Narrative #1)

While Kenneth used Value Narrative #1 to mention his plan to incorporate these pedagogical strategies, many GSIs mentioned in later reflections that they, in fact, did change their teaching style to incorporate ideas from this session. Uriah said:

> [The session] really helped us get students to be interested in a problem that doesn't seem really that big of a deal, but then you start showing – you start showing different results [and] it's like, "oh… you can do this many different ways." And I really enjoyed it because it actually gave us a tool in hand to take to our classrooms. On my first day of class that's the problem I gave as a fun little problem to get people involved and I really felt like it helped break the ice. (Focus Group Interview)

Samantha was the only GSI to have a negative outlook on the experience. She mentioned:

> The content was about making students feel good about themselves when they had the correct answer or a unique answer by going around the room and looking at their work and asking them to present if they had a good idea, but my table and my work was never even looked at, which made me feel ignored and the opposite of good. (Value Narrative #1)

Meeting Structure/Environment. The largest percentage of comments GSIs made referencing CoP meeting structure and environment showed immediate (54%) and context-related (69%) value. The comments regarding the structure of professional learning CoP meetings only occurred when referencing the monthly meetings that continued after pre-semester training had ended. While some GSIs appreciated meetings were "short and sweet and only happened when necessary" (Beth, Value Narrative #3), this left other GSIs frustrated

they were “having to spend time going over things [they] already knew or get [*sic*] could have been in an email” (Wyatt, Value Narrative #3).

GSIs also mentioned frustration with how group discussions were handled during their monthly meetings. Sabrina shared:

> I felt like whatever the majority of the people feel is what is discussed in the meeting and then people that don’t just – don’t agree with it, just like have to feel bad about themselves and just make the time pass. (Focus Group Interview)

Whitney suggested a solution to this issue separately:

> I think there should be par[t]s of the meetings where individuals are able to talk to the higher ups alone. This way important issues could be spoken of without others having their own opinion and creating their own beliefs about their peers, whether they be wrong or right beliefs. (Value Narrative #3)

Sense of Community. GSIs expressed immediate (73%) and personal (58%) value when discussing the sense of community established within the professional learning CoP. Leonard appreciated “there was always a ‘we are working for the common good’ vibe during CoP meetings” (Value Narrative #3). Leroy mentioned independently, “I felt like having a good community to support our teaching was important and these meetings added to that” (Value Narrative #3). Oliver was a bit more specific in that “learning from other [GSIs’] stories and ideas” (Value Narrative #3) added to feeling like part of a team. Being part of a team was a sentiment repeated by many of the GSIs. The importance of developing a sense of community was strengthened when some GSIs highlighted that a lack of community negative impacted

their experiences. Fiona was the sole GSI in the M.S. in Mathematics Education program when she was a first-year GSI. She recounted:

> When I was a student, it was just me in the math ed, and so I think my first semester, I find it – I think I just felt like ousted a little bit, like off to the side. Like there's not a group for me to like do homework with or a group for me to like, you know, pool my discussions with or just like have conversations about what I'm doing in my class… I just felt like I didn't have the community that everyone else is talking about. (Focus Group Interview)

This feeling was reminiscent of the comment Henry made earlier about the impact of feeling alone while you were "sinking on the Titanic" (Focus Group Interview).

Talking About Students. Talking about students appeared to produce immediate (67%) and, unexpectedly, social (56%) value among GSIs. Since GSIs had not interacted with students during their pre-semester training, it makes sense that the comments regarding this experience all came from reflecting on the monthly professional learning CoP meetings. GSIs used professional learning CoP monthly meetings to debrief on their experiences in the classroom. Many second-year GSIs expressed frustration with how their less experienced peers approached these conversations in a professional group setting. Beth shared:

> I felt like many of the [GSIs] would complain about students and [*sic*] it was a very negative environment at times. I think a lot of [GSIs] used it as a space to talk poorly about students instead of learn from one another and grow. It brought me closer to some colleagues but also created a divide between me and some others. (Value Narrative #3)

Henry similarly shared:

> It boosted my confidence whenever I heard other graduate students express positive opinions of their students. It helped me know I wasn't alone in my love for students, and also gave me hope that good teaching is a priority to some of my colleagues… I felt disappointed whenever I heard graduate students express negative opinions of their students. It made me feel disappointed to be associated with a program that doesn't discourage negative ideas about students. (Value Narrative #3)

The tension caused by these discussions was not lost on some first-year GSIs. Brandon, for example, tried to highlight the value of venting, but acknowledged there was a fine line surrounding its appropriate use. He wrote, "The 'venting' sessions were bonding in a way since they reminded me that we're all going through the same things together… Sometimes the venting could become very negative and unproductive which I feel lead [*sic*] to friction between some colleagues" (Value Narrative #3).

Teaching Demonstrations. GSIs created both immediate (31%) and potential (38%) value from their teaching demonstrations, as well as skill-related (63%) value. Both first-year and second-year GSIs had lots of comments regarding the teaching demonstrations that occurred during the first-year GSI pre-semester training. Wendy felt teaching so quickly into training was beneficial for her experience as a first-year GSI:

> I also liked that we were expected to teach on day 2 and 3… I was nervous about teaching going into training and [*sic*] having us rip the band-aid off on the second and third days by having us teaching for 15 and 5 minutes was a good way to just push past

that anxiety, and the environment for those teaching demos was supportive and helpful. (Value Narrative #1)

Brandon acknowledged the benefit of this experience as well, reflecting on how much better he felt after the experience versus how he felt going into it:

> I mean the teaching demos – I did like that I was definitely really nervous for it, and especially, like, getting my assignment one night and then doing 15 minutes the next day is definitely scary. But I think it also showed me that, you know, I could – I could definitely do it, so… I felt better coming out of it than I did going into it. I was just nervous about, you know, like doing a good job, but then afterwards, like, I felt like I had the reassurance that, you know, I didn't like completely screw up. And so that made me more comfortable going into that first day of classes. (Focus Group Interview)

Samantha had a wide range of feelings regarding the teaching demonstrations. Her reflections oscillated between positive and negative thoughts regarding the experience. She wrote:

> Watching my classmates teach and seeing things they do wrong is kind of frustrating since i [*sic*] know that none of us have experience teaching with a few exceptions, but i [*sic*] can see what it would be like to be their student which is a viewpoint I [*sic*] need to have as a teacher. It helped to make me consider how i [*sic*] should say things or present things to students so they don't feel like I'm being a poor teacher…The presentations were especially exhausting because we didn't get very much time to prepare for them and we had no idea if what we were doing was wrong or not so it made us- or at least me-very anxious before presenting. (Value Narrative #1)

Sean, on the other hand, found watching other novice teachers to be very valuable to his own teaching. He noted:

> From seeing the other [GSIs] teach, I knew what not to do, if that makes sense. Obviously no one was perfect but some were less close to perfect than others. So I took their "negatives" into account and only let the good things influence me. (Value Narrative #1)

The teaching demonstrations the second-year GSIs completed during their first-year GSI experience stuck with many of them as well. Henry said:

> One of, I think, the most valuable trainings was… [the] mini teaches. Having to teach in front of the peers was really, really great, and I think that was one of the biggest things to help make the first day of teaching your students not as overwhelming because you already have taught something, even if it was just for 10 minutes. It's just getting up there feeling the pressure because there's a lot of pressure, and it is scary like the very first time. So it's nice that your first time teaching in the classroom is the first time that you've ever taught in front of somebody, so I really think that the mini teachers were valuable. (Focus Group Interview)

Kai, however, disagreed with Henry right away and commented:

> Okay, so can I say one thing on the mini teaches? I absolutely hated those, and… I didn't think they gave me any benefit in any way… I think that's like a personal thing to me because I have no problem speaking in front of people as long as I know what I'm talking about. And so, to me, it's much more valuable that I spend time knowing what I'm talking about rather than practicing talking in front of people… That activity didn't give

> me anything, but it may be a gift – give [Henry] a bunch of confidence, right? Whereas the only thing that would have inspired confidence in me is, "oh you're teaching MATH 130? Well, here's the MATH 130 book. Learn your stuff," you know, or something along those lines. And so that activity not only was like super stressful for me because it's like, "oh yeah, here's a topic. Teach it." And you're like – that there's no guidelines. I've never taught anything before – spoken publicly, but I've never done anything before, so I have no idea what I'm doing, and so… to me, it didn't help much at all. So just another side of that same story. (Focus Group Interview)

Adam appreciated the additional opportunity as a second-year to demonstrate teaching for the first-year GSIs and suggested second-year GSIs be required to do it as well. He shared:

> I know there's [*sic*] other things that I can work on, and if I were to like challenge myself or do in a different way – like learn different teaching methods, which I could… do during like the sample teach, I think… it would just make us a better teacher. I don't know. Like I thought being able to go up in front everybody… it actually helped me. So I would like that, as a second year, too... My teaching can get better. I can – and, I don't know, help more students… If we added teaching things again, I – I would love that. (Focus Group Interview)

Teaching Feedback. While the value created through teaching feedback was split between immediate value (10%), potential value (30%), applied value (20%), reframing value (20%), and missed opportunities (20%), the experience clearly influenced GSIs in creating skill-related value (75%). GSIs received feedback from their peers after they completed their teaching demonstrations during pre-semester training. Sean appreciated that the feedback also

came in written form “so we knew what worked and what didn't” (Value Narrative #1). Leroy found the feedback to be useful and wrote, “Any criticism felt constructive, and I felt like I had learned something that would help me with my teaching” (Value Narrative #1). Samantha, on the other hand, was not a fan of the feedback. She shared, “The comments towards my teaching presentation made me more self-conscious and made me question my teaching abilities” (Value Narrative #1).

Every GSI is also observed each semester by either the GSI Coordinator, the Director of the math center, or their course coordinator. Afterwards, the GSI debriefs the evaluation with their observer. Brandon used feedback from this meeting to incorporate new teaching strategies in his classroom:

> I've tried to incorporate a lot more of my students going up to the board like they've gone up to the board in their groups every single class. And, you know, that was something that [the Director] and I had talked about after my evaluation last semester and like, I wasn't really sure how to do that. But coming into this semester I knew like, you know, it's like a fresh start, so if I can get them into it, then that was something that they wouldn't have a problem doing for the rest of the semester. (Focus Group Interview)

Harry had similar experiences getting teaching feedback in a one-on-one setting, as opposed to a larger group meeting:

> The monthly meetings do not really influence how I teach. Some other meetings that have influence how I teach are smaller and more personalized. For example, I had a meeting with [the Director] when [they] did my evaluation that significantly improved

> the way I teach. I've also asked [my coordinator] a lot of questions regarding ways to teach. The answers provided in response to my questions from the people I've asked helped a lot, but the meetings don't really help me. (Value Narrative #3)

Teaching/Student Balance. The largest percentage of comments GSIs made regarding a teaching/student balance showed immediate (56%) and skill-related (64%) value. Balancing being a student and an instructor proved to be a lot for many of the GSIs. Louise wrote, "I see my role as a very brand new [*sic*] teacher who also has to balance being a student, and all of that requires a lot of responsibility" (Value Narrative #1). This sense of responsibility was shared by Samantha, who stated, "Overall, being a teacher and grad student makes me feel overwhelmed sometimes from the high expectations and many tiring, time consuming things we have to do" (Value Narrative #1). Camille was surprised at how many of her colleagues felt this same way:

> I hung out in the graduate lounge in the [building] most days of the week during first semester, and a lot of other [GSIs] did too. A lot of times we talked about teaching together or how our teaching was going and getting to talk about it with each other. In one particular instance one of my colleagues told me that they were struggling to balance being a student and a teacher and hadn't found the right rhythm yet. This stuck with me because I was also in the same boat, and didn't know other people were also trying to find that balance. It was surprisingly eye opening for me to realize that my experience was actually pretty universal. (Value-Creation Stories)

While the overall experience of balancing these responsibilities proved to be a lot, Annie acknowledged the amount of support GSIs had in navigating their two roles successfully. Even

though GSI training was mainly focused on the teaching components of the GSI role, she mentioned, “Everyone is concerned about how we are managing our mental health that goes along with our course load, which is super nice” (Value Narrative #1).

Unnecessary/Off-Topic/Inappropriate Information. Unnecessary, off-topic, and inappropriate information produced immediate value (63%) for GSIs. In terms of value-creation subcodes, however, there was an almost even distribution between personal, social, and skill-related value (26% each) and context-related value (21%). There were two conversations that occurred during the monthly meetings that came up as negatively impacting experiences in every focus group interview and in numerous value narratives: university Covid-19 vaccination requirements and student attire in class. Beth summarized the impact these conversations had on her and the impact she perceived they had on her peers:

> I feel like we've had a few [meetings] that like I leave afterwards, and I'm just like really in like a negative headspace. Like we've had a few get really political, or we've had a few like bring up situations of students that I just don't think should have been brought up because they shouldn't have been an issue in the first place. But they're also just kind of inappropriate, and then we would get stuck on it, and I would just be wishing that it was over… It would just bring down the atmosphere of all the [GSI]s, I feel like, and make people like continue to get upset and like emotional and political at times, and I don't think that that was beneficial to like building a community environment for everyone. (Focus Group Interview)

Kai felt the unnecessary and inappropriate conversations could have been avoided with more facilitator regulation. He shared:

> Yeah, I definitely think [open conversations during the monthly CoP meetings] serves – it could serve a purpose … to be able to talk to each other about certain – certain things that happen in the classroom. I think it's a valuable thing, but again like, like [Uriah] is kind of pointing out, it has to be constructive. It has to be like, you know – these kind of offshoot stories that don't matter that, you know, you're just saying because you think it's a cool thing talk about or whatever is probably not really valuable. And, you know, I mean I that story [about a student's attire], in particular, it's like, you should never mention that again. Like, why are you even talking about that, you know? I mean, but then other times, you know, it's like, "Oh, I had this student who would stand up a few minutes early and try and leave before every class," and it's like, "okay, well let's talk about that. Well, how do we stop that, or should we stop that?"... There was [*sic*] other stories kind of like that, where it's like, this is a learning opportunity, not just for the person who's having the problem, but maybe for everyone else, or at least a few other people that are having similar problems or might have similar problems in the future. So, it definitely could serve a purpose. I just don't know that we were probably – just probably not doing the best at, you know, kind of regulating that, maybe. (Focus Group Interview)

Professional Learning CoP Activities and Experiences Summary. As with the activities and experiences that influenced learning in both CoPs, the additional activities and experiences influencing learning in just the professional learning CoP appeared to heavily support value-creation for GSIs in the immediate value and potential value categories. Again, skill-related value was the most-referenced subcode, with six of the 16 activities and experiences having the

majority of comments fall into that category. Each of the other subcodes had the most comments for between one and three other activities and experiences, and these were not always the majority, just the largest percentage represented.

Pre-semester training left most GSIs feeling their role was important and valued within the department, although as the semester went on, this feeling lessened for some. The teaching focus during pre-semester training that came through teaching demonstrations, teaching tips, and mathematics education-specific professional development was very influential to GSI learning. For many GSIs, the teaching demonstrations were when many of them experienced formalized teaching for the first time. While this intimidated almost everyone, the experience was overwhelming for a select few. Those who were looking to improve their teaching skills appreciated the teaching feedback and general teaching tips, and the mathematics education professional development even caused some GSIs to try new teaching techniques in their classrooms.

Monthly meetings allowed GSIs to align with peers who expressed similar teaching philosophies and grow with them. The political climate brought on when navigating the Covid-19 pandemic negatively impacted GSIs through the uncertainty regarding policies and conflicting outlooks on the situation within the group. Some GSIs found monthly professional learning meetings to be a waste of their time and offered suggestions like incorporating one-on-one meetings and actively discouraging longwinded conversations. Food, however, was one of the monthly meeting staples that lessened tensions and allowed the GSIs to socialize in a relaxing environment. This socialization supported building a sense of community, which, in and of itself, was important to the GSI experience.

While the teaching demonstrations from pre-semester training provided an opportunity for many of the GSIs to use a teacher lens for the first time, navigating through the semester and gaining experience in their roles allowed many GSIs to shift their mindset from student to instructor and feel like they were growing in their teaching abilities.

The professional learning CoP had goals of focusing on the general development of GSIs as teachers, supporting them in being successful graduate students, and attempting to build a sense of community among its members (GSI Coordinator, Coordinator Interview), while the course coordination CoP focused on preparing GSIs to teach their assigned courses from one week to the next Differing purposes between the two CoPs suggests GSIs would find different value within their participation in each of them.

Value-Creation Unique to the Course Coordination CoPs (RQ1b)

There were fewer activities and experiences that uniquely impacted GSI learning in the course coordination CoP. In addition to the ones mentioned jointly with the professional learning CoP, GSI learning in the course coordination CoP mentioned they were influenced by the following: (a) advice from coordinator; (b) direct faculty supervisor; (c) feeling heard, valued, and respected; (d) general student support; (e) general support from coordinator; (f) level of coordination; (g) meetings with full-time faculty; and (h) resources provided. Table 15 shows the percent distribution of value-creation primary codes and subcodes from the comments regarding each of the top activities and experiences unique to the course coordination CoP.

Table 15

Percent Distribution of Value-Creation Primary Codes and Subcodes in the Course Coordination CoP

Activity/Experience	Primary codes						Subcodes				
	IV	PV	AV	RealV	RefV	MO	P	S	Sk	St	C
Advice from coordinator	23	42	8	8	15	4	7	0	69	24	0
Direct faculty supervisor	67	11	0	22	0	0	60	10	20	0	10
Feeling heard, valued, and respected	30	0	0	60	10	0	80	0	10	0	10
General student support	10	20	30	30	10	0	0	0	30	70	0
General support from coordinator	47	20	0	33	0	0	41	0	35	12	12
Level of coordination	33	13	0	27	7	20	6	0	69	0	25
Meetings with full-time faculty[a]	30	40	10	10	10	0	8	23	46	23	0
Resources provided	25	25	38	13	0	0	13	0	88	0	0

Note. GSI = Graduate Student Instructor; IV = Immediate value; PV = Potential value; AV = Applied value; RealV = Realized value; RefV = Reframing value; MO = Missed opportunity; P = Personal; S = Social; Sk = Skill-related; St = Student-related; C = Context-related. Primary codes were adapted from Wenger et al. (2011). Missed opportunity was added by the researcher to the Wenger et al. codes. Subcodes were adapted from Dingyloudi et al. (2019). Student-related value was used in place of study-related value for the current study.

[a] I was a member of a course coordination CoP.

Unlike with the shared activities and experiences and those unique to the professional learning CoP, value creation in the course coordination CoP was widespread. Only two of the activities and experiences produced a majority of comments falling into one of the primary value-creation codes, and the rest had the largest percentage of comments distributed between each of the codes. There were very few comments referencing missed opportunities, with student interactions being the only activity or experience to receive comments in that category.

The value-creation subcodes, on the other hand, were a bit more defined within the course coordination CoP. A group's direct faculty supervisor and feeling heard, valued, and respected influenced personal value for GSIs (60% and 80%, respectively). General student support appeared to evoke student-related value (70%) for GSIs. GSIs created skill-related value through the resources provided in course coordination CoP meetings and advice from their coordinator (88% and 69%, respectively). The three remaining activities and experiences did not have a majority of comments fall into one value-creation subcode category, and two of those activities and experiences had a similar percentage of comments fall between two of the categories.

The following sections describe how these seven activities and experiences were enacted in the course coordination CoP.

Advice from Course Coordinator. The largest percentage of value regarding advice from a course coordinator was potential value (42%). The majority of GSI comments in this category also demonstrated skill-related value (69%). Samantha appreciated the advice given to her by her course coordinator on a weekly basis during their CoP meetings. She stated:

> My coordinator brings up [their] opinions about how [they] would teach a topic or introduce it to the class. This affects the way i [*sic*] plan to teach as i [*sic*] try to incorporate [their] advice into my own teaching to make the experience better for my students. [They] gave me ideas on how to teach my class and makes [*sic*] me reflect a lot as a teacher. It's made me really like the teaching profession as someone who never thought they would like it. (Value Narrative #2)

Samantha's comments were not the only ones to reflect GSIs making a shift from student to teacher based on interactions and advice from course coordinators. During their focus group interview, Wendy and Sean shared a shift in their thinking based on the advice of their coordinator:

> Wendy: When [coordinator]'s going through like the content for the week we occasionally get to like an activity that [they] want to do in groups. [They'll] sometimes preface that by saying, like, "You should let them struggle with this a bit." I think that's definitely part of being a student is like, struggling, is like figuring out – see if you can figure out the problems on your own… and so just letting them, [coordinator] says, let them struggle, and I think that's like – at least not for too long till they get frustrated, but definitely letting them think about it, and hopefully they do.

> Sean: I mean just to like piggyback off of that a little bit I feel like… it was, like, really hard for me to like want to let people struggle, I felt like I was like not doing a good job, or like I had explained something badly if, like, they're struggling to understand something so I would immediately want to like go in and fix it and like explain

everything in detail to them. So, yeah, it was like definitely a learning curve to get to the point where it's like you know if they don't understand something that's not necessarily a reflection of like me as a teacher or a tutor or anything like that it's just math is a struggle, you know? I've like struggled with it my whole life, and they have to struggle with it, too, and that's okay.

Advice from a course coordinator also went beyond teaching duties. Some GSIs received advice that supported them as students as well. Leroy appreciated advice from his coordinator regarding the timing of pursuing a Ph.D and said, “It was kind of nice to know that [they] – it seemed like [they] actually cared about like how we do as like students and people, so that was nice” (Focus Group Interview).

While most comments concerning advice from a coordinator were positive, it was frustrating for GSIs when they sought advice but did not receive it, leaving them feeling they were alone in resolving an uncertain situation. It was even more frustrating to them if their coordinator followed up with criticisms on how the situation was handled. GSIs were also disheartened when they showed enthusiasm for their teaching duties and were dissuaded from taking on too much. Whitney wrote:

I was told that doing something that I wanted to do, was alot [sic] of work, and that I was not expected to do it. I was told that it would be nice, but [sic] seemed to be too much work and that the person did not recommend me doing it. this [sic] made me a bit angry given that I wanted to do it for my students [sic] I didn't care about the work, and really I just cared about what they were taking away from the course. I felt like it was

bad to care for the students [sic] success. I felt like the person was trying to sway me to not care as much. (Value Narrative #2)

Direct Faculty Supervisor. GSIs expressed immediate (67%) and personal (60%) value when discussing their direct faculty supervisor in their course coordination CoPs. GSIs mentioned the impact their course coordinator had on their experience as an instructor in their specific course. They appreciated prepared coordinators, which in turn made them feel more prepared for the week. Camille discussed how her coordinator took away the stress of teaching:

> I came into these meetings stressed as heck thinking I was going to have to construct a full lesson plan for each class that I taught, but [coordinator] was always prepared, answered questions really timely, and generally made me feel less stressed about having to teach twice a week and instead made me look forward to it. I think it made me a better teacher because I think being able to shave off that stress instead of projecting it onto my students made the class feel a lot more comfortable, and I found that I taught better. (Value Narrative #2)

Not only could coordinators impact a GSI's outlook on teaching, but how coordinators interacted with their GSIs seemed to support the movement from novice into full participation within their CoP. Uriah mentioned:

> [Our coordinator] made us feel important they made me…feel like I was actually doing something at NAU, so I think it makes a world of difference with who your coordinator is… [They] made us feel like we were equals. Like [they] would ask us for our input, and the input mattered… It just felt like, like I was a teacher, not a glorified tutor. (Focus Group Interview)

Feeling Heard, Valued, and Respected. GSIs made it clear that feeling heard, valued, and respected evoked realized (60%) and personal (80%) value. GSIs expressed feeling this way when they actively saw change in the courses they taught based on their own contributions. Camille shared:

> [Coordinator] would ask for our input on test questions, how the final should look, how lenient we should be on grading and actually listened to our input and incorporated it into the lesson, so it definitely felt that we were helping with the structure of our particular classes. (Value Narrative #2)

Sean independently added how surprised he was "that faculty actually consider our feedback and advice on things" (Value Narrative #2). This feeling was shared from multiple GSIs in multiple coordination CoPs. There were also specific instances where GSIs did not feel like they were being heard by their coordinator. Mark, for example, wrote, "I had suggestions of helping students on an individual basis, but my suggestions were not brought to [the Director] for consideration" (Value Narrative #2). These instances, however, seemed few and far between.

General Student Support. The largest percentage of comments GSIs made referencing general student support fell in both the applied and realized value (30% each) categories, followed by potential value (20%) and immediate and reframing value (10% each). The value-creation subcode of student-related value was much more defined, with 70% of comment falling into that category. GSIs experienced different situations regarding students throughout the semester. Course coordination CoP meetings were a place where GSIs could receive the support they needed to properly handle such situations. Annie stated:

> For me, when, during coordination meetings it very quickly became apparent that you need to be like polite but firm in a lot of in a lot of situations. It was also like sometimes you need to be that metaphorical shoulder for them to cry on sometimes you need to be there to just listen to the student's rant... Or sometimes like waving hello to them when I'm like walking to classes and stuff made them feel like, "oh my teacher knows who I am and, you know, I feel seen." Because I had a student who had some medical problems who had to drop out, and he came and found me and he was like… "I didn't really tell my other professors, but I wanted to tell you because you noticed that I was gone and you like checked in with me." And I was like, during this coordination meeting without, you know, without hearing kind of like the you need to be there for your students… I might not have. (Focus Group Interview)

The GSIs in MATH 105 felt there was an extra focus on student support in their coordination meetings. Brittany wrote:

> We focused a lot in our coordination meetings about how we can support students to be successful in [MATH 105]. I was really happy that a major part of my job as a [MATH 105] instructor was to be a cheerleader for students. (Value Narrative #2)

General Support from Coordinator. Almost half (47%) of comments regarding general support from a CoP coordinator fell into the immediate value category, with comments being closely shared between personal (41%) and skill-related (35%) value. GSIs expressed looking for support from coordinators when unanticipated situations regarding content, course structure, or student situations occurred. For many, they felt a general sense of support from their

coordinator and appreciated they had someone they knew they could turn to when questions arose. Samantha noted:

> My coordinator never makes me feel dumb for asking a question and always responds right away to my questions and makes me feel confident about how to approach any problems with my classes. These activities made me feel more confident as a first-time graduate instructor and like i [*sic*] wasn't alone in any issue i [*sic*] was having. (Value Narrative #2)

There was, however, a fine balance between GSIs having the freedom to make choices in their classroom and feeling supported through the decision-making process. GSIs were negatively impacted when they felt this lack of support. Sabrina, for example, longed for the guidance she had from previous coordinators. She shared:

> I would forward [my coordinator] student emails and be like, “how should I answer this?” and [they] would never answer those emails. And then, if I ran into [them] in the hallway [they] would just be like, “Oh, did you answer that student, finally?”… And if I said no then [they] would just give me like some advice on how I should answer it, but nothing like too helpful, and then I would just like not have much input from that experience… The other two coordinators I've had were so like exact and precise with their answers that it felt like very natural asking them for help, and I always got the support I needed. And now I feel like I don't have any support anymore. (Focus Group Interview)

Whitney later clarified:

> I just want somebody who's going to be there, basically through the good and the bad. Like who will be by you and say, “Okay, I agree with your decision,” especially if you inform them on your decisions and why you made them. I think that's the biggest thing, and maybe they could advise me like strictly, “do not do that.” And if [they] were to say that, like, “do not do that, this is the reason,” then of course I'm not going to do that. But if [they] just say like, “Well I do this because, you know, like people have hard times,” like, okay, no. In my eyes, no. (Focus Group Interview)

Level of Coordination. The largest percentage of comments GSIs made referencing level of coordination fell in both the immediate (33%) and realized value (27%) categories, with the majority of comments also falling into the skill-related value (69%) category. While much of the previously mentioned appreciated support came from the coordinated nature of these courses, when GSIs mentioned the level of coordination, the comments were framed in a negative light. Ben wrote, “There was too much micromanagement. The meetings were a waste of my time. I was told how to grade test corrections contrary to my personal judgement. My previous teaching experience was discounted” (Value Narrative #2). Victor felt similarly at first, but when reflecting later in the year saw the reason for the high level of coordination in the space. He shared:

> I would have benefited from a more clear [*sic*] explanation of what "highly coordinated" meant. I realize that most people who do this job have little or no experience teaching and therefore have not developed any processes of their own. I was used to having autonomy in how I teach and choose to make a small change in the material based on what I saw with my particular classes. This caused a significant amount of trouble for my

> fellow [GSIs] when my students went to the lab for assistance in the class. I did learn from this that it is better in this environment to stick to the program provided because there are so many hands in the pot. I also learned that I can control the order and speed things are covered in the classroom but not the material covered or the way it is covered. (Value-Creation Stories)

While GSIs with more experience liked being part of CoPs that gave them more freedom, some, like Kai, felt more structure was necessary so that he could best support student success in his class, although he also acknowledged how the experience helped him grow. He said:

> [Our coordinator] allows us to have a bunch of freedom, which for those who already know what they are doing is excellent. But for me, who probably needs a little more guidance, it has been tough. I think I would prefer a little more structure. Like, for example, if we all had the same exams, then I would only be responsible for teaching my students a set of content rather than that, plus creating exams, determining the value of questions, etc... However, I will say that I am much better at doing these things now than at the beginning of the semester. (Focus Group Interview)

Meetings with Full-Time Faculty. The influence of faculty in CoP meetings was wide-ranging when mentioned by GSIs, with the largest percentage of comments falling into the potential (40%) and skill-related (46%) subcode categories. According to Sean:

> Non-[GSI] faculty members are also involved in the [coordination] meetings, which is very helpful because we get to hear some of their experiences with students and how they choose to deal with it...There would be a few moments when [one particular

> faculty member] would speak up [they] would…intentionally say the wrong thing to answer a question… to give [the course coordinator] a chance… to like correct them… as if a student was to give that in real life as a way to set out like how you would handle that… More often than not, he'd be correct in the sense like we'd teach the content and, sure enough, someone would have – do exactly what he said. (Focus Group Interview)

Not all conversations with faculty were as productive, however. While faculty may have shared how they taught content in other course coordination CoPs, there was a disconnect for some GSIs with how to apply that information in a useful way. Whitney shared that the faculty members in her CoP are "not coordinated – they're just like free" (Focus Group Interview). Adam then added:

> [Having faculty in the meetings] could be helpful if it was actually coordinated… we end up just asking them what they do, they just tell us, and it's over. [The course coordinator]'s like, "okay what'd you guys talk about?" and, like, that's just it. (Focus Group Interview)

Resources Provided. The largest percentage of comments GSIs made regarding the resources they were provided showed applied value (38%) and overwhelmingly fell into the skill-related value (88%) category. GSIs appreciated the course resources provided by their coordinators. Most of the time these resources were shared through some cloud interface, such as Dropbox or Google Drive, so they were easily accessible to all members of the CoP. Sean shared, "How I teach pretty much comes from these [coordination] meetings. I usually don't stray from the given powerpoint [*sic*]/activities that are planned for the week" (Value Narrative #2). Sean was also appreciative of the additional resources provided for when classes

did not go as planned or he needed something extra to fill the time. Whitney had a similar experience in her CoP. She commented:

> [When using] coins and cards [to teach probability], I did every single game [the course coordinator] proposed… There was just like ample days of review in my class… I can't cancel class, and we did a fun activity. And after you Google them for so long, you kind of just run out of activities, but [the course coordinator] would always have an extra one of those to use all the time, and I really liked that part of [coordination meetings]. (Focus Group Interview)

Course Coordination CoP Activities and Experiences Summary. While there were fewer activities and experiences uniquely impacting the course coordination CoP than the ones uniquely impacting the professional learning CoP, the primary value-creation codes for those associated with only the coordination CoP were more widespread, with all but missed opportunity being a top category for at least one activity or experience mentioned. The value-creation subcodes also showed widespread distribution when examining these activities and experiences, with the majority of GSIs comments referencing personal value when they discussed their direct faculty supervisor (60%) and feeling heard, valued and respected (80%), skill-related value when they discussed resources provided (88%) and level of coordination (69%), and student-related value when they discussed general student support (70%).

GSIs appreciated coordination CoPs where the coordinator was organized and provided resources. They longed for clear direction and advice in novel situations and wanted to feel they always had the support of their coordinator. An especially empowering experience was

when a coordinator made GSIs feel like they were peers in the coordination CoP and created an environment where feedback was encouraged and became a catalyst for changes in the course.

Coordination meetings provided an environment where GSIs could learn appropriate ways to support and interact with students, but GSIs did not always fully comprehend the idea of highly-coordinated courses and the importance of consistent policies across sections. While most second-year GSIs appreciated the freedom that came with teaching less highly-coordinated courses, some of them felt lost without more explicit direction. When additional faculty were included in course coordination CoPs, they had the ability to support GSI learning if they approached meetings with a pedagogical lens and discussed how students best learned the course content instead of using meetings to solely discuss content itself. These differences between how the course coordination CoP influenced GSI learning when compared to the professional learning CoP make sense given the different purpose of each group.

Chapter Summary

GSIs mentioned 71 unique activities and experiences when reflecting on the Fall 2021 semester. Their comments largely reflected immediate (43%) and potential (22%) value. The comments regarding potential and applied value, as well as missed opportunities, overwhelmingly focused on skill-related value (74%, 75%, and 78%, respectively). With such a large number of unique activities and experiences, I adapted the 80/20 Principle (Koch, 1997) to identify the ones that established the top 80% of responses, resulting in the 25 items shown in Figure 12.

Knowing the different purposes of the professional learning and course coordination CoPs, I explored similarities and differences in how learning was influenced within the two

groups. When separated by CoP, the immediate and potential value remained similar all responses combined. Forty-three percent of professional learning CoP responses reflected immediate value, and 23% of responses reflected potential value. Examining the professional learning CoP comments for value-creation subcodes showed skill-related value was the primary focus when GSIs references potential (71%), applied (73%), and reframing (50%) value, as well as missed opportunities (73%). Thirty-seven percent of course coordination CoP responses reflected immediate value, and 19% of responses reflected potential value. The value-creation subcodes for the course coordination CoP showed similar results to the professional learning CoP, with skill-related value being the primary focus when GSIs referenced potential (80%) and applied (76%) value and missed opportunities (95%).

I again incorporated the 80/20 Principle (Koch, 1997), this time for each CoP separately, and compared the results. I was then able to determine which of the 25 activities and experiences in Figure 12 were influential to both CoPs and to each CoP separately. The shared activities and experiences and those unique to influencing learning in the professional learning CoP continued to focus on immediate and potential value, with the majority of them also bringing skill-related value. The course coordination CoP, on the other hand, showed more widespread value with only direct faculty supervisor (67% immediate value) and feeling heard, valued, and respected (60% realized value) reflecting a majority of responses in one category. Subcodes from the course coordination CoP responses showed more definitive outcomes.

Chapter 5: Discussion

In this chapter I discuss significant findings from the study, their place in previous research, important implications, and suggestions for future research. I also share limitations associated with the study. The findings, here identified as specific patterns in the data, that I address are:

1. Supportive interactions significantly influence the professional learning that occurs within a CoP.
2. The intended purpose of the CoP plays a role in the type of value GSIs place on their professional learning within a CoP.
3. There are distinctions in how first-and second-year GSIs create value for their professional learning within a CoP.

After discussing each pattern, I will present its implications. These implications are meant to support faculty and administrators working directly with GSIs. Before addressing the meaning of these findings, I first describe why examining the data through a situated learning perspective through community of practice and value-creation frameworks was necessary to draw my conclusions.

Examining GSI Learning Through a CoP Perspective

While a CoP framework did not allow for such tools as a pre- and post-assessment or quantitative analysis in this study, the CoP and value-creation frameworks were instrumental in discovering the patterns discussed in this chapter due to the definitions of learning and value creation associated with them. Wenger et al. (2011) argued that learning is the process of members within a CoP creating and negotiating value for themselves and for the collective

group. They used the term *value creation* to describe the value created, and therefore learning that occurred, by participating in a CoP. Exploring value creation thus gave me insight into how the activities and experiences within the professional learning and course coordination CoPs supported GSI professional learning and growth.

There are numerous reasons a situated learning framework was best for this study. The research took place in a university context, where use of the CoP framework has increased in recent years (Tight, 2015). According to Adams et al. (2023), CoPs provide a range of benefits to instructors in higher education. Applying this framework to novice instructors therefore aligns with how professionals in the field learn and work. While a few participants received formal training as undergraduates in mathematics education, the majority of participants had backgrounds in mathematics or statistics. The CoP framework has proven to be beneficial particularly to instructors not formally trained in teaching and learning (Tierney et al., 2020), making it an appropriate framework for this study.

The CoP framework also allowed me to explore the professional learning of GSIs through an asset-minded, and not deficit-minded, perspective. I was interested in the value GSIs themselves placed on their CoP activities and experiences, not on comparing them to an external standard of value. This framework allowed me to explore what GSIs took from their professional learning experience and not what deficits they may have held as instructors.

Using a value-creation framework was also critical to analyzing my data for similar reasons I presented when discussing the CoP framework. Value creation is asset-focused and centers the learners themselves, as peripheral value cannot be forced upon someone. A value-creation framework emphasized the participant's role in the study and allowed me to better

understand the wants and needs of study participants. The CoP and value-creation frameworks allowed me to use the data from this study to establish the activities and experiences that influenced GSI learning within their professional learning and course coordination CoPs and present the following patterns that stemmed from this learning.

Pattern #1: Supportive Interactions Significantly Influence Professional Learning

Regardless of which CoP the GSIs participated in, the presence or absence of supportive interactions was a noteworthy pattern in the data, implying support within a CoP significantly influences the professional learning process. Five of the seven shared CoP activities and experiences (see Figure 12) connected to supportive interactions: asking questions/discussing issues/sharing experiences; collaboration; coordination meetings (course information, structure, and content); GSI interactions; and level of support. Four of the seven course coordination CoP activities and experiences also connected to supportive interactions: feeling heard, valued, and respected; general student support; general support from coordinator; and resources provided. Only six of the 16 professional learning CoP activities and experiences connected to support, and almost all were focused on pre-semester training of this CoP: general teaching tips, level of confidence, level of preparation, sense of community, teaching demonstrations, and teaching feedback.

The pre-semester training was where first-year GSIs became acclimated to their environment, commented on usefulness of teaching demonstrations, and mentioned their training left them feeling more confident and prepared for their role as an instructor. These results are similar to those of Ridgeway et al. (2017) who claimed both graduate students and faculty members stressed the usefulness of an orientation and those of Young and Bippus

(2008) and Rivera (2018) who found orientation programming increased confidence in graduate students before they formally took on their teaching duties. While Harris et al. (2009) found increased confidence at the end of a semester-long course, GSI comments in this study suggest increased confidence occurred after pre-semester training and not as a result of monthly professional learning meetings continuing through the semester.

The suggestion that supportive interactions significantly influence learning is consistent with the claims of Kensington-Miller et al. (2014). Novice instructors in that study viewed CoPs a place for suggestions, support, and encouragement, leading the researchers to state those characteristics in a CoP were vital to effective and long-term change. I argue that the activities and experiences I listed earlier focus on support for CoP members. These activities and experiences afforded GSIs the opportunity to create and negotiate meaning (i.e., value creation), allowing professional learning to occur. The ability to ask questions and discuss issues within CoPs allowed GSIs to come forward with their struggles, allowing other CoP members to provide support through sharing their own experiences. Collaboration provided an opportunity for CoP members to support one another in establishing the group's practice.

Support in coordination meetings came mainly from course coordinators in how they empowered GSIs, prepared GSIs for the upcoming content, and incorporated faculty members in meetings to provide additional support. In fact, GSIs focused mainly on their course coordinator when discussing faculty, even in the course-specific CoPs where almost half of the participants were faculty members. These faculty members should have been the knowledgeable others who were assisting novice instructors in moving away from the periphery along the learning situated learning continuum discussed in Chapter 2. The lack of discussion

about faculty other than the course coordinator could imply faculty members were not actively participating in the CoP and were instead just attending meetings or that GSIs struggled to find value in what faculty members were contributing and instead looked at the course coordinator as the sole expert within the group.

Regardless of which faculty were mentioned, GSIs expressed strong feelings regarding the support, or lack thereof, they felt within these meetings. GSI interactions presented the same strong emotions with peer interactions, resulting in GSIs developing a clear understanding of whose advice and support they would appreciate versus whose advice they would prefer to avoid. When GSIs sought help in handling student interactions they again expressed either feeling supported through the experience or a lack of support. The most explicit comments of support came when discussing the pre-semester training. As previously mentioned, this support left GSIs feeling prepared and expressing increased confidence regarding their dual roles.

These supportive interactions assisted GSIs in moving towards full participation in a CoP. Support through novel experiences allowed GSIs to develop skills through others' behaviors they would not have had access to outside of the CoP, which is where Lave and Wenger (1991) believed learning occurs. For the GSIs, this support came from multiple sources including their peers, their course coordinator, the GSI Coordinator, and faculty members within the CoP. These results mirrored those of Surrette (2020) who saw a positive impact of having a variety of mentors within a CoP. The results are also consistent with those of Kleiner (2013) who found GSIs often turned to peers for support. Many GSIs equated the large impact peer relationships had on them to feeling as though they were a full participant within their CoPs.

Implications of Supportive Interactions

Faculty, administrators, and staff who are charged with supervising GSIs should be aware of the importance of ensuring continual supportive interactions as these novice instructors navigate their roles. It may be easy for seasoned faculty to take for granted the skills they have developed through experience and believe GSIs will naturally come to understand the instructor aspects of their role on their own. Approaching GSI support through an apprenticeship of observation (Lortie, 1975) lens, however, fails to provide GSIs with the support they expressed they needed in the study data as it assumes approximately two decades of being in a classroom is enough to learn how to be an effective instructor. GSI comments regarding support show they desire explicit direction as they navigate the decision-making process of teaching and appreciate feedback on their instructional perspectives and performance.

As seen in the data, GSIs required safe spaces to ask questions and share experiences, and they value knowing they are not alone in their struggles. When they did not feel they were in a supportive environment, whether they saw a peer being publicly shamed, albeit jokingly, for making a mistake, experienced criticisms from faculty who could have instead mentored them through their classroom decisions, or felt lack of direction from their direct supervisor, the motivation to be an active participant within the CoP diminished and their professional learning suffered. MATH 130 GSIs made direct connections between the support they received in their coordination meetings and their increased motivation and confidence in fulfilling their duties, while also developing a strong sense of purpose in their role. These feelings supported

GSIs involvement in the CoP and moving from the CoP's periphery towards its center, becoming a full, active participant of the group. The lack of support felt by GSIs in the STAT 250 CoP contributed to demotivation and frustration with their experience, deterring GSIs from moving toward full participation in the higher education instructional community.

Pattern #2: A CoP's Purpose Impacts the Type of Professional Learning that Occurs

Few studies have examined GSI professional learning through simultaneous participation in multiple CoPs. When examining the responses from each CoP separately, the list of activities and experiences (Figure 12) that influenced the professional learning CoP was noticeably larger than those that influenced the course coordination CoPs. This could imply, as discussed by Chung and McLarney (2000), a lack of operational excellence, or being as efficient as possible through understanding the customer, on the part of CoP facilitators. Complaints regarding the CoPs were similar to findings from Chung and McLarney, with GSIs referring to certain CoP meetings as a "waste of time". When complaints occurred regarding the course coordination CoP, it was clear that GSIs felt the meetings did not prepare them to teach the content. Complaints regarding the professional development CoP were vague, indicating the purpose and goals of those meetings were not clear to GSIs in the first place.

It is worth noting that there was an uneven distribution of value-creation codes and subcodes when examining the two CoPs independently. These are similar findings to those of Bertram et al. (2014) and Dingyloudi et al. (2019). While an uneven distribution of value creation may initially cause concern among CoP facilitators, Bertram et al. argued the type of value creation does not matter, as long as the value creation is happening in the first place. The primary code and subcode distributions within the two groups were similar when exploring the

entirety of comments within each group. This was not the case, however, when looking at the activities and experiences that uniquely influenced learning within each group separately. Determining when GSIs created their value through primary codes was much easier within the professional learning CoP than in the course coordination CoP. The primary codes in the course coordination CoP were more evenly distributed, with only two activities and experiences resulting in a majority of comments falling into one category. Wenger et al. (2011) suggested that tracking experiences described in the data through their five value-creation cycles adds reliability to the claim CoPs create value for its members. Therefore, the widespread distribution of the primary codes within each activity and experience category suggests the course coordination CoP provided GSIs with more value-creation opportunities than the professional learning CoP.

When looking more closely at the activities and experiences unique to the professional learning CoP, those that had a focus on teaching (i.e., teaching demonstrations, teaching feedback, and general teaching tips) produced a wider range of primary code responses than the others. Based on Wenger et al.'s (2011) suggestion regarding their framework, this implies those particular experiences produced the most learning for the GSIs in that CoP. When GSIs mentioned other experiences more often, their comments referenced fewer value-creation categories.

Implications of CoP Purpose

A CoP with a clear purpose is necessary for learning to occur within that group. Not only must that purpose be clear, but, as Chung and McLarney (2000) argued, that purpose must exhibit stakeholder intimacy. Less focused CoPs may not be as influential to learning since GSIs

cannot see the explicit connection between what they are doing in those groups and the skills they need for their role. While it is important to establish an environment within a CoP where members feel comfortable and safe asking questions and getting support in their role, practitioners in the field also need to be explicit about the purpose of CoP activities and how they connect to what members are required to do outside of group meetings. This recommendation echoes that of Wheeler et al. (2015) who found GSIs experienced a similar disconnect between their CoP experiences and their assigned duties. With this disconnect relating to discontent with GSI duties, GSI supervisors could best support their GSIs by making these connections explicit.

Pattern #3: There are Distinctions in how First- and Second-Year GSIs Create Value

Both first- and second-year GSIs commented on the value they created from the teaching and learning professional development (PD) they experienced. Handelsman et al. (2007) argued the need for GSIs to participate in pedagogically-focused PD in their study. While this need is an external value placed on GSI training, the findings in this study support the internalized value GSIs create through pedagogical experiences as well.

First- and second-year GSIs also focused heavily on skill-related activities and experiences when discussing what influenced their learning. These results are consistent with Dingyloudi et al. (2019) who found CoP members' comments were heavily weighted in the skill-related category. Unlike Dingyloudi et al., however, the current study did not result in context-related comments comprising a large portion of data. While these few similarities stood out in the data results, there were also noticeable differences between the comments first- and second-year GSIs made when discussing influential activities and experiences.

It is not unique that first- and second-year GSIs had different views when reflecting on their CoP experiences, especially since Lave and Wenger (1991) stated newcomers respond differently than old-timers within a CoP due to the fact they have yet to negotiate meaning of many of the experiences they would likely face. In this study, second-year GSIs struggled with the learning pains of their first-year peers. Instead of trying to provide suggestions for improving or avoiding situations, second-year GSIs commented negatively on the outlook of the more novice GSIs.

First-year GSIs did not necessarily detect these second-year GSI frustrations. In fact, first-year GSIs tended to make more comments experiencing support and a sense of community, despite the feelings of their second-year peers. The positive nature when reflecting on pre-semester training echoes the findings of Pentecost et al. (2012) who stated graduate students in their study found pre-semester training valuable and wanted continued support throughout the year. Faculty from the Pentecost et al. study also claimed pre-semester training supported camaraderie, which was a finding in this study as well. The focus first-year GSIs placed on camaraderie and support could be due to the stress and anxiety that come with taking on a new role and the uncertainty of what that role entails. Feeling supported at the start of their journey was a very positive experience for first-year GSIs, and the reduced stress that came with feeling a part of the community provided them the capacity and mindset to allow professional learning to occur.

While first-year GSIs focused on the environment they were entering, second-year GSIs, in particular, were vocal about wanting to hone in on their teaching skills. This could explain their frustrations with monthly professional learning CoP meetings because those meetings

involved more open check-ins and offering advice when it was asked as opposed to structured PD.

Implications of Similarities and Differences in the Needs of First-Year and Second-Year GSIs

The common focus for first- and second-year GSIs on skill-related activities can support GSI supervisors in meeting the needs of GSIs within their CoPs. GSIs have a strong desire to feel confident in the classroom and to understand how to teach their assigned content. CoP facilitators can best support learning within their CoP by keeping this focus in mind when designing activities that facilitate learning within the group. The findings in this study appear to highlight a cycle between personal and skill-related value creation. When GSIs expressed personal value creation (e.g., feeling more confident, feeling supported, etc.), it may have reduced their cognitive load and provided them with the space to learn new skills. Seeing improvement in their skills then appeared to add to their personal value creation by increasing their confidence. Facilitating focused conversations that allow GSIs to publicly reflect on how they have implemented something in the classroom and how they have improved on a skill is a way GSI supervisors can support the cycle just described.

While GSI supervisors can better meet the common needs of first- and second-year GSIs, they must also actively address the varying needs of these CoP members in order to keep the momentum of professional learning within the group. The Beisiegel et al. (2019) study provides insight as to why these varying needs exist: GSIs, while not formally educated in teaching and learning, still progress through Katz's (1972) stages of teacher growth (survival, consolidation, renewal, and maturity). The learning of first-year GSIs in survival mode during pre-semester training was most influenced by activities and experiences that instilled

confidence and a sense of community. Second-year GSIs, on the other hand, exhibited needs of teachers in the consolidation stage, looking to master the skills they began developing in their first year.

With second-year GSIs remaining in the early stages of teacher development themselves, they had difficulty empathizing with and supporting their peers still in the survival stage. Similar to the need for supervisors to explicitly link CoP activities to what GSIs are asked to do in their roles, GSI supervisors should explicitly discuss their desire for experienced CoP members to support novice members moving along the learning continuum as they become full participants within the community. Second-year GSIs did not see their role as one of mentor or experienced member who could help first-year GSIs better understand their role. Instead, they were still trying to grow and develop themselves. Some full-time faculty CoP members were able to see their role as a mentor to share experiences with GSIs, while others appeared to assume GSIs already knew appropriate pedagogy behind teaching their content. The lack of continued mentorship, whether that be in general teaching support or content-specific support, and the lack of an explicitly-defined second-year GSI role appeared to cause numerous second-year GSI frustrations.

The differences in the needs of novice and experienced GSIs require differentiation on the part of GSI supervisors. Establishing a balance of whole group and small group professional learning CoP meetings may be a way for supervisors to accomplish this. Assigning mentors between first- and second-year GSIs may be a way to support second-year GSIs in better understanding their more experienced role. It would also be important, however, for GSI supervisors to ensure second-year GSIs had teaching mentors as well.

Study Limitations

While the present study was thoughtful in design, there are natural limitations that should be highlighted to the reader as they negotiate the meaning of these findings.

Limited Population

I examined one group of GSIs during one specific academic year. This academic year also happened to be a transitional year in higher education where institutions and the students attending them were adjusting to in-person instruction after the COVID-19 pandemic. The timing of the study could have impacted the data from GSI reflections. These limitations could be addressed by conducting a longitudinal study that allows researchers to look for similar patterns over time and by examining different groups of GSIs located at different universities. I believe, however, the connections these results have to previous research in the field add to the trustworthiness of the conclusions I have made.

Role of the Researcher

As mentioned in Chapter 3, I had a direct role in the pre-semester GSI training and was involved in one of the course coordination CoPs during the semester this data was collected. I also observed some of the GSIs for their semester evaluation and provided feedback to them on the department's observation form. While I did not directly supervise any of the GSIs, they more than likely saw me as a supervisor and authority figure due to my role in the department. While GSIs were told their responses posed no threat to their semester evaluations or to their position, they were aware their responses were not anonymous and that I would be the person reading them, which may have impacted how they reacted to my prompts. All GSIs responded to the data collection questions, regardless of their participation in the study. The ability to opt

out of being a participant, which some GSIs did, hopefully limited the impact my role had on GSI responses.

Restructuring Semester Stories

The semester stories were less successful in having participants reflect on CoP experiences than I had hoped. While GSIs provided stories they remembered throughout the semester, these stories did not always reference involvement in their CoPs and therefore were unable to contribute to meaningful data within the study. If I were to conduct a similar study in the future, I would rewrite the semester story questions to address this issue.

Recommendations for Future Research

The results presented in Chapter 4 bring forth ideas for research that extend beyond the present study. One such topic is the difference between CoPs for GSIs pursuing a doctorate versus those working towards their master's degree. Many of the prior studies mentioned focused on graduate students in doctoral programs, largely in mathematics education. Since students in a doctoral program anticipate teaching in the future, whereas students in a master's program do not necessarily plan to teach, examining the effectiveness of CoPs in learning in these two different populations may produce useful results.

This study focused on perceptional data collected from the participants. A future study could expand upon the learning that happens within a CoP by examining the participation that occurs within the CoP along with collecting perceptional data. This would allow researchers to better understand how comments participants make relate to their participation, whether it is active or not, within the group and connect the type of participation to the resulting learning reflected within the perceptional data.

Another possible study could examine the path of one cohort through years of CoP participation. Second-year GSIs in this study appeared to have issues seeing themselves move from the role of novice to more experienced CoP member. Examining a cohort's progression through their CoP experience may provide insight to how supervisors could support returning CoP members in continued value-creation as they increase their level of experience. This proposed study could also allow CoP facilitators to better understand GSI needs as they move through Katz's (1972) stages of teacher growth.

The final future study I propose would be to examine the effect of participation in multiple CoPs on professional learning. The previous research in this area involved members participating in one CoP. This study includes participants active in two simultaneous CoPs. The differences in responses from the two groups leads me to question if participation in multiple CoPs of differing purposes at the same time impacts the effectiveness each CoP to create value for its members.

Conclusion

GSIs have been, and will continue to be, a staple in higher education instruction. Supporting GSI learning and growth as educators should be a focus of anyone tasked in supervising their instruction and charged with the success of the undergraduates they teach. This study examined GSI value creation through their participation in CoPs that focused on their professional learning and the courses they were assigned to teach. I found that supportive environments were necessary for learning to occur, CoP supervisors should explicitly share the purpose of each CoP and how it relates to the role of CoP members, and practices in CoPs should be differentiated to meet the needs of newcomers and intermediate members alike.

Supervisors of GSIs can use these findings to develop CoPs that meet the needs and support the learning of its participants. The practice of using GSIs as primary instructors in classrooms is not expected to stop in the near future, making GSI learning and development an area of utmost importance for faculty and administrators in higher education who focus on student success.

References

Abigail, L. K. M. (2016). Do communities of practice enhance faculty development. *Health Professions Edcuation*, *2*, 61–74.

Adams, S., Tesene, M., Gay, K., Brokos, M., McGuire, A., Rettler-Pagel, T., & Swindell, A. (2023). *Communities of practice in higher education: A playbook for centering equity, digital learning, and continuous improvement.* Every Learner Everywhere. https://www.everylearnereverywhere.org/resources/communities-of-practice-in-higher-education/

Beisiegel, M. (2011). Obstacles to teacher education for future teachers of post-secondary mathematics. In S. Brown, S. Larsen, K. Marrongelle, & M. Oehrtman (Eds.), *Proceedings of the 14th Annual Conference on Research in Undergraduate Mathematics Education, Volume 3* (pp. 19–23).

Beisiegel, M., Gibbons, C., & Rist, A. (2019). Examining obstacles to mathematics graduate students' development as teachers. In S. Otten, A. G. Candela, Z. de Araujo, C. Haines, & C. Munter (Eds.), *Proceeding of the 41st Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 490–496).

Beisiegel, M., & Simmt, E. (2012). Formation of mathematics graduate students' mathematician-as-teacher identity. *For the Learning of Mathematics*, *32*(1), 34–39.

Bernard, H. R. (2011). *Research Methods in Anthropology: Qualitative and Quantitative Approaches* (5th ed.). AltaMira Press.

Bertram, R., Paquette, K. J., Duarte, T., & Culver, D. (2014). Assessing the value created through participating in a graduate studies Community of Practice. *Transformative Dialogues:*

Teaching and Learning Journal, *7*(1), 1–14.

Bettinger, E. P., Long, B. T., & Taylor, E. S. (2016). When inputs are outputs: The case of graduate student instructors. *Economics of Education Review*, *52*, 63–76. https://doi.org/10.1016/j.econedurev.2016.01.005

BrckaLorenz, A., Wang, R., & Nelson Laird, T. F. (2020). Graduate Student Instructors, the Courses They Teach, and the Support They Value. *New Directions for Teaching and Learning*, *2020*(163), 25–34. https://doi.org/10.1002/TL.20407

Burmila, E. M. (2010). Graduate students as independent instructors: Seven things to know about teaching your own course while in graduate school [Article]. *PS: Political Science & Politics*, *43*, 557–560. https://doi.org/10.1017/S1049096510000806

Cervantes, M. V., & Inlow, A. R. (2022). Navigating Challenges and Teaching Through Lived Experiences as Graduate Student Instructors. *Teaching and Learning Inquiry*, *10*. https://doi.org/10.20343/TEACHLEARNINQU.10.29

Chase, J. L. (1970). *Graduate teaching assistants in American universities: A review of recent trends and recommendations*. U.S. Department of Health, Education, and Welfare. https://files.eric.ed.gov/fulltext/ED043274.pdf

Chung, E., & McLarney, C. (2000). The classroom as a service encounter: Suggestions for value creation. *Journal of Management Education*, *24*, 484–500. https://doi.org/10.1177/105256290002400407

Cuddapah, J. L., & Clayton, C. D. (2011). Using Wenger's Communities of Practice to explore a new teacher cohort. *Journal of Teacher Education*, *62*, 62–75. https://doi.org/10.1177/0022487110377507

Deshler, J. M., Hauk, S., & Speer, N. (2015). Professional development in teaching for mathematics graduate students. *Notices of the American Mathematical Society*, *62*, 638–643. https://doi.org/10.1090/noti1260

Dingyloudi, F., Strijbos, J. W., & de Laat, M. F. (2019). Value creation: What matters most in Communities of Learning Practice in higher education. *Studies in Educational Evaluation*, *62*, 209–223. https://doi.org/10.1016/j.stueduc.2019.05.006

Dragisich, V., Keller, V., & Zhao, M. (2016). An intensive training program for effective teaching assistants in chemistry. *Journal of Chemical Education*, *93*, 1204–1210. https://doi.org/10.1021/acs.jchemed.5b00577

Dunn-Haley, K., & Zanzucchi, A. (2012). Complicity or multiplicity? Defining boundaries for graduate teaching assistant success. *New Directions for Teaching and Learning*, *131*, 71–83. https://doi.org/10.1002/tl.20028

Eison, J., & Vanderford, M. (1993). *Enhancing GTA Training inAcademic Departments: SomeSelf-Assessment Guidelines* (Vol. 277). http://digitalcommons.unl.edu/podimproveacadhttp://digitalcommons.unl.edu/podimproveacad/277

Ellis, J., Deshler, J., & Speer, N. (2016). Supporting institutional change: A two-pronged approach related to graduate teaching assistant professional development. *The 19th Annual Conference on Research on Undergraduate Mathematics Education*, 729–735.

Fontaine, M. A., & Millen, D. R. (2004). Understanding the benefits and impact of Communities of Practice. In P. M. Hildreth & C. Kimble (Eds.), *Knowledge Networks: Innovation Through Communities of Practice* (pp. 1–13). Idea Group Inc.

Gebert, A., & Joffee, M. (2007). Value creation as the aim of education: Tsunesaburo Makiguchi and Soka education. In D. T. Hansen (Ed.), *Ethical Visions of Education: Philosophies in Practice* (pp. 132–170). Teachers College Press.

Gleason, J., Livers, S., & Zelkowski, J. (2017). *Investigations in Mathematics Learning Mathematics Classroom Observation Protocol for Practices (MCOP 2): A validation study*. https://doi.org/10.1080/19477503.2017.1308697

Gourlay, L. (2011). New lecturers and the myth of "communities of practice." *Studies in Continuing Education*, *33*(1), 67–77. https://doi.org/10.1080/0158037X.2010.515570

Handelsman, J., Miller, S., & Pfund, C. (2007). *Scientific Teaching*. Freeman.

Hanks, W. F. (1991). Forward by William F. Hanks. In *Situated learning: Legitimate peripheral participation* (pp. 13–24). Cambridge University Press.

Harding, T. S. (1999). Training graduate student instructors effectively: The University of Michigan model. *Proceedings of the 1999 ASEE Annual Conference & Exposition*. https://strategy.asee.org/8002

Harris, G., Froman, J., & Surles, J. (2009). The professional development of graduate mathematics teaching assistants. *International Journal of Mathematical Education in Science and Technology*, *40*, 157–172. https://doi.org/10.1080/00207390802514493

Iverson, J. O., & McPhee, R. D. (2008). Communicating knowing through communities of practice: Exploring internal communicative processes and differences among CoPs. *Journal of Applied Communication Research*, *36*, 176–199. https://doi.org/10.1080/00909880801923738

Katz, L. G. (1972). Developmental stages of preschool teachers. *The Elementary School Journal*,

73, 50–54.

Kensington-Miller, B., Sneddon, J., & Stewart, S. (2014). Crossing new uncharted territory: Shifts in academic identity as a result of modifying teaching practice in undergraduate mathematics. *International Journal of Mathematical Education in Science and Technology*, *45*, 827–838. https://doi.org/10.1080/0020739X.2013.872305

Kirkpatrick, D. (1996). Great ideas revisited. Techniques for evaluating training programs. Revisiting Kirkpatrick's four-level model. *Training & Development*, *50*(1), 50–59.

Knott, G., Crane, L., Heslop, I., & Glass, B. D. (2015). Training and support of sessional staff to improve quality of teaching and learning at universities. *American Journal of Pharmaceutical Education*, *79*(5), Article 72. https://doi.org/10.5688/ajpe79572

Koch, R. (1997). *The 80/20 principle: The secret of achieving more with less*. Nicholas Brealey Publishing.

Lai, Y., Smith, W. M., Wakefield, N. P., Miller, E. R., Goar, J. S., Groothuis, C. M., & Wells, K. M. (2016). Characterizing mathematics graduate student teaching assistants' opportunities to learn from teaching. In J. Dewar, P. Hsu, & H. Pollatsek (Eds.), *Mathematics Education, Association for Women in Mathematics Series 7* (Vol. 7, pp. 73–88). Springer. https://doi.org/10.1007/978-3-319-44950-0_6

Lambson, D. (2010). Novice teachers learning through participation in a teacher study group. *Teaching and Teacher Education*, *26*, 1660–1668. https://doi.org/10.1016/j.tate.2010.06.017

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Lortie, D. C. (1975). *Schoolteacher: A Sociological Study* (2nd ed.). The University of Chicago Press.

Mackertich, A. (1970). Teaching assistants. *Improving College and University Teaching*, *18*, 223–226. https://doi.org/10.1080/00193089.1970.10532995

McDermott, R. (2002). Measuring the impact of communities: How to draw meaning from measures of Communities of Practice. *Knowledge Management Review*, *5*(5), 26–29.

McKellar, K. A., Pitzul, K. B., Yi, J. Y., & Cole, D. C. (2014). Evaluating communities of practice and knowledge networks: A systematic scoping review of evaluation frameworks. In *EcoHealth* (Vol. 11, pp. 383–399). Springer New York LLC. https://doi.org/10.1007/s10393-014-0958-3

Meanwell, E., & Kleiner, S. (2013). The emotional experience of first-time teaching: Reflections from graduate instructors, 1997–2006 [Article]. *Teaching Sociology*, *42*, 17–27. https://doi.org/10.1177/0092055X13508377

Miller, E. R., Rogers, K. C., & Yee, S. P. (2020). Analyzing collegiate mathematics observation protocols: Attending to the instructional triangle and inquiry-based mathematics education practices. *23rd Annual Conference on Research in Undergraduate Mathematics Education*.

Miller, E. R., Uhing, K., Hass, M., Zigterman, R., Quigley, K., Wakefield, N., & Lai, Y. (2018). Graduate student instructors' growth as teachers: A review of the literature. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, & S. Brown (Eds.), *21st Annual Conference on Research in Undergraduate Mathematics Education* (pp. 185–197).

Mittendorff, K., Geijsel, F., Hoeve, A., de Laat, M., & Nieuwenhuis, L. (2006). Communities of

practice as stimulating forces for collective learning. *Journal of Workplace Learning*, *18*, 298–312. https://doi.org/10.1108/13665620610674971

Musante, S. (2013). Networking to Boost the Skills of Graduate Teaching Assistants. *BioScience*, *63*(10), 788–788. https://doi.org/10.1525/bio.2013.63.10.3

Musgrave, S., & Carlson, M. P. (2017). Understanding and advancing graduate teaching assistants' mathematical knowledge for teaching. *The Journal of Mathematical Behavior*, *45*, 137–149. https://doi.org/10.1016/J.JMATHB.2016.12.011

Nicklow, J. W., Marikunte, S. S., & Chevalier, L. R. (2007). Balancing pedagogical and professional practice skills in the training of graduate teaching assistants. *Journal of Professional Issues in Engineering Education and Practice*, *133*(2), 89–93. https://doi.org/10.1061/(ASCE)1052-3928(2007)133:2(89)

Nistor, N., & Fischer, F. (2012). Communities of practice in academia: Testing a quantitative model. *Learning, Culture and Social Interaction*, *1*, 114–126. https://doi.org/10.1016/j.lcsi.2012.05.005

Parker, M. A., Ashe, D., Boersma, J., Hicks, R., Bennett, V., Parker, / M A, Ashe, D., Boersma, J., Hicks, R., & Bennett, V. (2015). Good teaching starts here: Applied learning at the Graduate Teaching Assistant Institute. *Canadian Journal of Higher Eduation*, *45*(3), 84–110. https://files.eric.ed.gov/fulltext/EJ1085405.pdf

Parker, P. (2014). An Examination of the Impact of Pedagogical Preparation, Teaching Experience and Future Career Plans on Mathematics Graduate Teaching Assistants' Efficacy. In *Dissertation*. http://scholarworks.gsu.edu/msit_diss/133

Pentecost, T. C., Langdon, Laurie, S., Asirvatham, M., Robus, H., & Parson, R. (2012). Graduate

teaching assistant training that fosters student-centered instruction and professional development. *Journal of College Science Teaching*, *41*(6), 68–75. http://eds.b.ebscohost.com/ehost/detail/detail?vid=0&sid=6db3fe29-2170-4499-a8d0-6b6da4f152b5%40pdc-v-sessmgr03&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=76599879&db=eft

Pilgrim, M. E., Apkarian, N., Milbourne, H., & O'Sullivan, M. (2020). From rough waters to calm seas: The challenges and successes of building a graduate teaching assistant professional development program. *PRIMUS*, 1–24. https://doi.org/10.1080/10511970.2020.1793851

Reeves, T. D., Marbach-Ad, G., Miller, K. R., Ridgway, J., Gardner, G. E., Schussler, E. E., & William Wischusen, E. (2016). A conceptual framework for graduate teaching assistant professional development evaluation and research. *CBE - Life Sciences Edition*, *15*, 1–9. https://doi.org/10.1187/cbe.15-10-0225

Ridgway, J., Ligocki, I., Horn, J., Szeyller, E., & Breitenberger, C. (2017). Teaching assistant and faculty perceptions of ongoing, personalized TA professional development: Initial lessons and plans for the future. *Journal of College Science Teaching*, *46*, 73–83. https://doi.org/10.2505/4/jcst17_046_05_73

Rivera, S. (2018). A summer institute for STEM graduate teaching assistants: Exploring teaching perceptions. *Journal of College Science Teaching*, *48*(2), 28–32. https://doi.org/10.2505/4/jcst18_048_02_28

Rogers, K. C., Petrulis, R., Yee, S. P., & Deshler, J. (2019). Mathematics Graduate Student Instructor Observation Protocol (GSIOP): Development and validation study. *International Journal of Research in Undergraduate Mathematics Education*, 1–27.

https://doi.org/10.1007/s40753-019-00106-4

Rogers, K. C., & Yee, S. P. (2018). Peer mentoring mathematics graduate student instructors: Discussion topics and concerns. *Annual Conference on Research in Undergraduate Mathematics Education*. https://par.nsf.gov/biblio/10058549

Saldaña, J. (2016). *The Coding Manual for Qualitative Researchers* (3rd ed.). SAGE.

Shannon, D. M., Twale, D. J., & Moore, M. S. (1998). TA teaching effectiveness. *The Journal of Higher Education*, *69*, 440–466. https://doi.org/10.1080/00221546.1998.11775144

Sim, C. (2006). Preparing for professional experiences - Incorporating pre-service teachers as "communities of practice." *Teaching and Teacher Education*, *22*(1), 77–83. https://doi.org/10.1016/j.tate.2005.07.006

Smith, E. R., Calderwood, P. E., Storms, S. B., Lopez, P. G., & Colwell, R. P. (2016). Institutionalizing faculty mentoring within a community of practice model. *To Improve the Academy*, *35*(1), 35–71. https://doi.org/10.1002/tia2.20033

Smith, S. U., Hayes, S., & Shea, P. (2017). A critical review of the use of Wenger's Community of Practice (CoP) theoretical framework in online and blended learning research, 2000-2014. *Online Learning*, *21*(1), 209–237. https://doi.org/10.24059/olj.v21i1.963

Stake, R. E. (1995). *The Art of Case Study Research*. SAGE Publications.

Surrette, T. N. (2020). Influence of mentoring and professional communities on the professional development of a cohort of early career secondary mathematics and science teachers. *School Science and Mathematics*, *120*, 175–188.

Tierney, A., Aidulus, D., Park, J., & Clark, K. (2020). Supporting SoTL development through communities of practice. *Teaching and Learning Inquiry*, *2*, 32–52.

https://doi.org/http://dx.doi.org/10.20343/teachlearninqu.8.2.4

Tight, M. (2015). Theory application in higher education research: The case of communities of practice. *European Journal of Higher Education*, *5*, 111–126. https://doi.org/https://doi.org/10.1080/21568235.2014.997266

Trotter II, R. T. (2021). Designing focus group data collection: Process and decision points. *SHERC Research Infrastructure Core Workshop*.

von Hoene, L. M. (2020). From Orientations to Outcomes: Articulating a Comprehensive and Systematic Approach to Preparing Future Higher Education Instructors. *New Directions for Teaching and Learning*, *2020*(163), 13–23. https://doi.org/10.1002/TL.20406

Weaver, J. E. (2020). The Short Course as a Model for Teaching STEM Graduate Student Instructors About Course Design. *New Directions for Teaching and Learning*, *2020*(163), 99–106. https://doi.org/10.1002/TL.20413

Wenger-Trayner, E., & Wenger-Trayner, B. (2015). *Introduction to communities of practice: A brief overview of the concept and its uses*. https://wenger-trayner.com/introduction-to-communities-of-practice/

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wenger, E., Trayner, B., & De Laat, M. (2011). *Promoting and assessing value creation in communities and networks: A conceptual framework*. https://www.asmhub.mn/uploads/files/11-04-wenger-trayner-delaat-value-creation.pdf

Wheeler, L. B., Maeng, J. L., & Whitworth, B. A. (2015). Teaching assistants' perceptions of a training to support an inquiry-based general chemistry laboratory course †. *Chemistry*

Education Research and Practice, *16*, 824–842. https://doi.org/10.1039/c5rp00104h

Yee, S., Deshler, J., Rogers, K. C., Petrulis, R., Potvin, C. D., & Sweeney, J. (2021). Bridging the gap between observation protocols and formative feedback. *Journal of Mathematics Teacher Education*. https://doi.org/10.1007/s10857-020-09485-x

Yee, S. P., Deshler, J., Rogers, K. C., Papalia, N., & Lamarche, A. (2020). Interpreting undergraduate student complaints about graduate student instructors through the lens of the Instructional Practices Guide. *Proceedings of the Annual Conference on Research in Undergraduate Mathematics Education*, 673–680. https://par.nsf.gov/biblio/10172843-interpreting-undergraduate-student-complaints-about-graduate-student-instructors-through-lens-instructional-practices-guide

Yee, S. P., & Rogers, K. C. (2017). Training graduate student instructors as peer mentors: How were mentors' views of teaching and learning affected? In T. Olson & L. Venenciano (Eds.), *Proceedings of the 44th Annual Meeting of the Research Council on Mathematics Learning* (pp. 33–40).

Young, S. L., & Bippus, A. M. (2008). Assessment of graduate teaching assistant (GTA) training: A case study of a training program and its impact on GTAs. *Communication Teacher*, *22*, 116–129. https://doi.org/10.1080/17404620802382680

Appendices

Appendix A

IRB Approval

NAU NORTHERN ARIZONA UNIVERSITY
Office of Research Compliance

Institutional Review Board for the Human Research Protection Program

525 S Beaver St
PO Box: 4062
Flagstaff AZ 86011
928-523-9551
https://www.nau.edu/IRB

To:	Gina Nabours
From:	NAU IRB Office
Approval Date:	August 16, 2021
Project:	Graduate Student Instructor Communities of Practice
Project Number:	1768646-3
Submission:	Amendment/Modification
Action:	APPROVED
Project Risk Level:	MINIMAL RISK
Approval Expiration Date:	June 20, 2026
Next Report Date:	
Review Category/ies:	**The project is not federally funded or supported and has been deemed to be no more than minimal risk.**

This project has been reviewed and approved by an IRB Chair or designee.

- Northern Arizona University maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00000357).
- All research procedures should be conducted in full accordance with all applicable sections of the guidance.
- The Principal Investigator should notify the IRB immediately of any proposed changes that affect the protocol and report any unanticipated problems involving risks to participants or others. Please refer to Guidance Investigators Responsibility after IRB Approval, Reporting Local Information and Minimal Risk or Exempt Research.
- All documents referenced in this submission have been reviewed and approved. Documents are filed with the HRPP Office within IRBNet. If subjects will be consented, the approved consent(s) are available within IRBNet upon approval notification from the HRPP Office.

Important

The principal investigator for this study is responsible for obtaining all necessary approvals before commencing research. Please be sure that you have satisfied applicable external and University requirements, for example (but not limited to) data repositories, listserv permission, records request, data use agreement, conducting University surveys, data security, international, conflicts of interest, biological safety, radiation safety, HIPAA, FERPA, FDA, sponsor approval, clinicaltrials.gov, tribal consultation, or school approval. IRB approval does not convey approval to commence research in the event that other requirements have not been satisfied.

Appendix B

GSI Consent Form

Project Number: 1768646-2
Approval Date: July 9, 2021
This stamp must be on all consenting documents

NAU NORTHERN ARIZONA UNIVERSITY
Office of Research Compliance

Consent to Participate in Research

(Graduate Student Instructor)

Study Title: Graduate Student Instructor Communities of Practice

Principal Investigator: Gina Nabours

You are being asked to participate in a research study. Your participation in this research study is voluntary and you do not have to participate. This document contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

Why is this study being done? The purpose of this research study is to gain understanding of the learning that occurs and the value Graduate Student Instructors (GSIs) find through their participation in Communities of Practice (CoPs). Graduate Student Instructors (GSIs) play an essential role in higher education. GSIs in the Department of Mathematics and Statistics at Northern Arizona University (NAU) are responsible for teaching almost half of the undergraduate courses offered through the department, having a direct impact on the undergraduate student experience. If GSIs are used to meet the demand for teaching lower-level collegiate courses, university administrators and faculty tasked with student success must determine ways to support the learning and development of GSIs as educators.

What will happen if I take part in the study? If you choose to participate in this study, the following records from your GSI experience will be accessed by the Principal Investigator

- Personal Value Narratives
- Value-creation Stories
- Fall Semester Teaching Observation Form (completed by a faculty member)
- Demographic Information (self-reported to help describe the different CoPs in the study)
- Orientation and Training Observation Field Notes (taken by the investigator)
- Coordination Meeting Observation Field Notes (taken by the investigator)
- Monthly GSI Meeting Observation Field Notes (taken by the investigator)

In addition, you will be invited to participate in a follow-up focus group interview with the project investigator either in-person or via Zoom. The purpose of the interview will be to learn more about participants' experiences participating in a CoP and how those experiences have impacted their learning as educators. Interview participants will be grouped by the course they teach. This means there will be 4-12 GSIs asked to participate in each focus group interview.

How long will I be in the study? All GSIs will be completing the Personal Value Narratives and Value-creation Stories as part of their GSI meetings. GSIs will also be observed in their first

semester of teaching and required to attend all of the aforementioned meetings. These activities will require no additional work or time on your part. Participants agreeing to participate in the focus group interview will spend an additional 60-90 minutes completing the interview in the Spring 2022 semester.

How many people will take part in this study? All GSIs in the Department of Mathematics and Statistics at Northern Arizona University as well as their respective coordinators and faculty on each coordination team are being invited to participate. There are a total of 30 graduate students and between 6-11 faculty who are being invited to participate in the study.

Can I stop being in the study? Your participation is voluntary. You do not need to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you, and you will not lose any of your usual benefits. Your decision will not affect your future relationship with Northern Arizona University. If you are a student or employee at the Northern Arizona University, your decision will not affect your grades or employment status. Your decision will not impact any sort of evaluation of your job duties.

What risks or benefits can I expect from being in the study? There is minimal risk if you choose to participate in the study. It is possible some survey or interview questions could make you feel uncomfortable. You will have the option to skip any questions that you do not feel comfortable answering and you can stop participating in the focus group interview at any point if you choose.

Participation in this project will offer you the opportunity to reflect on the training you receive and its impact, if any, it has on your teaching knowledge and practices. Reflective practice has been identified as a positive support for teachers, therefore you may reasonably expect to benefit from these opportunities. This study will benefit the field of undergraduate mathematics education by informing supervisors of GSIs what is most impactful to novice educators as they learn how to teach undergraduate mathematics courses.

Will I be paid for participating in the study or experience any costs? You will not be paid for participating in the study but food will be provided during the focus group interviews.

Will my study-related information be kept confidential? If you consent to have your data used in this project, all identifying information will be removed from your online survey submissions. Your name will not be used in any report. Identifiable research data will be encrypted and password protected. Your responses will be assigned a code number. The list connecting your

name to this code will be kept in an encrypted and password protected file. Only the research team will have access to the file. When the study is completed and the data have been analyzed, the list will be destroyed.

If you choose to participate in the focus group interview, with your permission, I would like to videotape the interview so that I can make an accurate transcript. Once I have made the transcript, I will erase the recordings. Your name will not be in the transcript or my notes. A separate focus group interview will be scheduled for anyone wanting to participate in the focus group interview but not wanting to be videorecorded. If there are enough participants from your coordination group who do not wish to be videorecorded, there will be a separate focus group interview specifically for your coordination group. If

there are not enough participants from your course, your focus group will consist of GSIs across different courses who do not wish to be videorecorded.

You will not be identified in any report or publication of this study. Even though we will tell all participants in the study that the comments made during the focus group should be kept confidential, it is possible that participants may repeat comments outside the group. Because of the nature of the data, it may be possible to deduce your identity; however, there will be no attempt to do so and your data will be reported in a way that will not identify you.

The information that you provide in the study will be handled confidentially. However, there may be circumstances where this information must be released or shared as required by law. Northern Arizona University Institutional Review Board may review the research records for monitoring purposes.

For questions, concerns, or complaints about the study you may contact ***Gina Nabours (Gina.Nabours@nau.edu).*** You may also contact ***Dr. Shannon Sweeny (Shannon.Sweeny@nau.edu)*** in the College of Education.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Research Protection Program at 928-523-9551 or online at http://nau.edu/Research/Compliance/Human-Research/Welcome/.

AGREEMENT TO PARTICIPATE

I have read (or someone has read to me) this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I affirm that I am at least 18 years of age and voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject	**Signature of subject**	**Date**

AGREEMENT TO BE VIDEORECORDED

Subject Signature:_____ Date:_____

Appendix C

Faculty Consent Form

Project Number: 1768646-2
Approval Date: July 9, 2021
This stamp must be on all consenting documents

NAU NORTHERN ARIZONA UNIVERSITY
Office of Research Compliance

Consent to Participate in Research

(Faculty)

Study Title: Graduate Student Instructor Communities of Practice

Principal Investigator: Gina Nabours

You are being asked to participate in a research study. Your participation in this research study is voluntary and you do not have to participate. This document contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

Why is this study being done? The purpose of this research study is to gain understanding of the learning that occurs and the value Graduate Student Instructors (GSIs) find through their participation in Communities of Practice (CoPs). Graduate Student Instructors (GSIs) play an essential role in higher education. GSIs in the Department of Mathematics and Statistics at Northern Arizona University (NAU) are responsible for teaching almost half of the undergraduate courses offered through the department, having a direct impact on the undergraduate student experience. If GSIs are used to meet the demand for teaching lower-level collegiate courses, university administrators and faculty tasked with student success must determine ways to support the learning and development of GSIs as educators.

What will happen if I take part in the study? If you choose to participate in this study, the following records will be accessed by the Principal Investigator

- Your completed Fall Semester Teaching Observation Form if you observe any GSIs
- Demographic Information (self-reported to help describe the coordination group)
- Orientation and Training Observation Field Notes (taken by the investigator)
- Coordination Meeting Observation Field Notes (taken by the investigator)
- Monthly GSI Meeting Observation Field Notes (taken by the investigator)

In addition, you may be invited to participate in a follow-up interview with the project investigator either in-person or via Zoom. The purpose of the interview will be to learn more about GSI experiences participating in a CoP and what CoP facilitators hope to provide the members of their groups.

How long will I be in the study? Faculty observe GSIs during the first 4-6 weeks of the semester, so this particular set of data will require no additional work or time on your part. Participants agreeing to participate in the follow-up interview will spend an additional 30-45 minutes completing the interview in the Fall 2021 semester.

How many people will take part in this study? All GSIs in the Department of Mathematics and Statistics at Northern Arizona University as well as their respective coordinators and faculty on each coordination team are being invited to participate. There are a total of 30 graduate students and between 6-11 faculty who are being invited to participate in the study.

Can I stop being in the study? Your participation is voluntary. You do not need to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you, and you will not lose any of your usual benefits. Your decision will not affect your future relationship with Northern Arizona University. If you are a student or employee at the Northern Arizona University, your decision will not affect your grades or employment status. Your decision will not impact any sort of evaluation of your job duties.

What risks or benefits can I expect from being in the study? There is minimal risk if you choose to participate in the study. It is possible some survey or interview questions could make you feel uncomfortable. You will have the option to skip any questions that you do not feel comfortable answering and you can stop participating in the focus group interview at any point if you choose.

Participation in this project will offer you the opportunity to reflect on your own how you support the growth and learning of GSIs. This study will benefit the field of undergraduate mathematics education by informing supervisors of GSIs what is most impactful to novice educators as they learn how to teach undergraduate mathematics courses.

Will I be paid for participating in the study or experience any costs? You will not be paid for participating in the study.

Will my study-related information be kept confidential? If you consent to participate in this study all identifying information will be removed from any field notes, interview responses, and observations you complete. Your name will not be used in any report. Identifiable research data will be encrypted and password protected. Your responses will be assigned a code number. The list connecting your name to this code will be kept in an encrypted and password protected file. Only the research team will have access to the file. When the study is completed and the data have been analyzed, the list will be destroyed.

If you choose to participate in the interview, with your permission, I would like to videotape the interview so that I can make an accurate transcript. Once I have made the transcript, I will erase the recordings. Your name will not be in the transcript or my notes. You will not be identified in any report or publication of this study. Because of the nature of the data, it may be possible to deduce your identity; however, there will be no attempt to do so and your data will

be reported in a way that will not identify you.

The information that you provide in the study will be handled confidentially. However, there may be circumstances where this information must be released or shared as required by law. Northern Arizona University Institutional Review Board may review the research records for monitoring purposes.

For questions, concerns, or complaints about the study you may contact ***Gina Nabours (Gina.Nabours@nau.edu).*** You may also contact ***Dr. Shannon Sweeny (Shannon.Sweeny@nau.edu)*** in the College of Education.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Research Protection Program at 928-523-9551 or online at http://nau.edu/Research/Compliance/Human-Research/Welcome/.

AGREEMENT TO PARTICIPATE

I have read (or someone has read to me) this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I affirm that I am at least 18 years of age and voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject	Signature of subject	Date

AGREEMENT TO BE VIDEORECORDED

Subject Signature:_____ Date:_____

Appendix D

Peer GSI Evaluation Form

Presenter: _____ **Topic:_____**

Was the GSI prepared?

How was the GSI's time management? Did topics proceed too quickly or too slowly?

Was the GSI enthusiastic about the material?

Did the GSI speak clearly and loudly? Were there any issues understanding the GSI?

How well did the GSI use the room space?

Did the GSI lecture to students or did the presentation involve student participation?

How well did the GSI respond to questions?

What were the strengths of the presentation?

How can the GSI improve their presentation?

Appendix E

Demographics Information

1) First Name (Preferred):
2) Last Name:
3) I am a: First-Year GTA Second-Year GTA
4) Have you worked in the [Name] Mathematics Center before? Yes No
5) Age: 20-24 25-29 30-34 35-40 40+ Prefer not to say
6) What gender do you identify as: Male Female Non-binary Prefer not to say Prefer to self-describe:
7) Please specify your ethnicity: Caucasian African-American Latino or Hispanic Asian Native American Native Hawaiian Unknown Two or More Prefer not to say

   Prefer to self-describe:
8) Where is your country of origin? I'm from the United States North America (NOT the U.S.) South America Europe Africa Asia Australia Caribbean Islands Pacific Islands

   Prefer not to say Prefer to self-describe:
9) Please state your undergraduate degree(s) and major(s):
10) Please state any undergraduate minors you may have (if none, please state N/A):

11) Please state any other degrees you have earned (if none, please state N/A):

12) Please describe any prior teaching/tutoring experience you may have (if none, please state N/A):

13) Please describe any industry experience you may have (if none, please state N/A):

Appendix F

Value Narrative #1 Questions

Use these questions for describing your overall experience of participation in this group. This is merely a guide for telling your story. You do not have to force an answer for every question, only the ones where you have something to say. For instance, if you did not experience something during this time that changed your relationship with your colleagues, just write "N/A".

1. Experience as a Professional
    a) What were some positive experiences (activities, interactions, etc.) from GSI training that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    b) What were some negative experiences (activities, interactions, etc.) from GSI training that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    c) How did these activities and experiences impact you (either positively or negatively) and how you view yourself as a teacher and graduate student?
2. Relationships with Colleagues
    a) What were some positive experiences (activities, meetings, interactions, etc.) from GSI training that affected your relationships with your colleagues?
    b) What were some negative experiences (activities, meetings, interactions, etc.) from GSI training that affected your relationships with your colleagues?

c) How did these activities and experiences impact you (either positively or negatively) and your relationships with your colleagues?

3. Professional Practice

    a) What were some positive experiences (activities, meetings, interactions, etc.) from GSI training that have influenced how you plan to teach?

    b) What were some negative experiences (activities, meetings, interactions, etc.) from GSI training that have influenced how you plan to teach?

    c) Describe any ideas or insights (either positive or negative) that came as a result of these activities and experiences.

4. Relationship with your Organization

    a) What were some positive experiences (activities, meetings, interactions, etc.) from GSI training that gave you insight into your role as a Graduate Student Instructor and the influence you could have in the department or at [university]?

    b) What were some negative experiences (activities, meetings, interactions, etc.) from GSI training that gave you insight into your role as a Graduate Student Instructor and the influence you could have in the department or at [university]?

    c) Describe how you see your role and your ability or inability to influence what happens in the department, your classroom, etc.

Appendix G

Value Narrative #2 Questions

Use these questions for describing your overall experience of participation in this group. This is merely a guide for telling your story. You do not have to force an answer for every question, only the ones where you have something to say. For instance, if you did not experience something during this time that changed your relationship with your colleagues, just write "N/A".

1. Experience as a Professional
    a) What were some positive experiences (activities, interactions, etc.) from your weekly course coordination meetings that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    b) What were some negative experiences (activities, interactions, etc.) from your weekly course coordination meetings that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    c) How did these activities and experiences impact you (either positively or negatively) and how you view yourself as a teacher and graduate student?
2. Relationships with Colleagues
    a) What were some positive experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that affected your relationships with your colleagues?

b) What were some negative experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that affected your relationships with your colleagues?

c) How did these activities and experiences impact you (either positively or negatively) and your relationships with your colleagues?

3. Professional Practice

a) What were some positive experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that have influenced how you taught or planned to teach?

b) What were some negative experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that have influenced how you taught or planned to teach?

c) Describe any ideas or insights (either positive or negative) that came as a result of these activities and experiences.

4. Relationship with your Organization

a) What were some positive experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that gave you insight into your role as a Graduate Student Instructor and the influence you could have in the department or at [university]?

b) What were some negative experiences (activities, meetings, interactions, etc.) from your weekly course coordination meetings that gave you insight into your role as a

Graduate Student Instructor and the influence you could have in the department or at [university]?

c) Describe how you see your role and your ability or inability to influence what happens in the department, your classroom, etc.

Appendix H

Value Narrative #3 Questions

Use these questions for describing your overall experience of participation in this group. This is merely a guide for telling your story. You do not have to force an answer for every question, only the ones where you have something to say. For instance, if you did not experience something during this time that changed your relationship with your colleagues, just write "N/A".

1. Experience as a Professional
    a) What were some positive experiences (activities, interactions, etc.) from the monthly meetings that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    b) What were some negative experiences (activities, interactions, etc.) from the monthly meetings that affected how you view yourself as a teacher and graduate student (teaching beliefs, attitude toward teaching, self-confidence, feelings, etc.)?
    c) How did these activities and experiences impact you (either positively or negatively) and how you view yourself as a teacher and graduate student?
2. Relationships with Colleagues
    a) What were some positive experiences (activities, meetings, interactions, etc.) from the monthly meetings that affected your relationships with your colleagues?
    b) What were some negative experiences (activities, meetings, interactions, etc.) from the monthly meetings that affected your relationships with your colleagues?

c) How did these activities and experiences impact you (either positively or negatively) and your relationships with your colleagues?

3. Professional Practice

    a) What were some positive experiences (activities, meetings, interactions, etc.) from the monthly meetings that influenced how you taught or planned to teach?

    b) What were some negative experiences (activities, meetings, interactions, etc.) from the monthly meetings that influenced how you taught or planned to teach?

    c) Describe any ideas or insights (either positive or negative) that came as a result of these activities and experiences.

4. Relationship with your Organization

    a) What were some positive experiences (activities, meetings, interactions, etc.) from the monthly meetings that gave you insight into your role as a Graduate Student Instructor and the influence you could have in the department or at [university]?

    b) What were some negative experiences (activities, meetings, interactions, etc.) from the monthly meetings that gave you insight into your role as a Graduate Student Instructor and the influence you could have in the department or at [university]?

    c) Describe how you see your role and your ability or inability to influence what happens in the department, your classroom, etc.

Appendix I

Value-Creation Story Template

Value-creation story: empty template for any professional

Note that the story does not need to start at 1, or go all the way to 5.

Name	
Typical cycles	**Your story:**
1. **Activity**: Describe a meaningful activity you participated in and your experience of it (e.g., a conversation, a working session, a project, etc.)	
2. **Output**: Describe a specific resource this activity produced for you (e.g., an idea or a document) and why you thought it might be useful.	
3. **Application**: Tell how you used this resource in your practice and what it enabled that would not have happened otherwise.	
4. **Outcome**: a. **Personal**: Explain how it affected your success (e.g., being a better professional, job satisfaction,) b. **Organizational**: Has your participation contributed to the success of your organization (e.g., metrics they use)	
5. **New definition of success**: Sometimes, such a story changes your understanding of what success is. If it happened this time, then include this here.	

(Wenger et al., 2011)

Appendix J

Focus Group Interview Questions

Orientation and training (pre-semester and monthly)

1) Describe a typical monthly meeting for GSIs
    a. What events occur?
    b. What does participation look like?
2) What were significant events you can remember from your training experiences this year, both from the beginning of the semester and the monthly GSI meetings?

    Supporting questions:

    a. How did you participate?
    b. How was it relevant to you?
    c. What connections did you make that were influential to you?
3) How do you feel these events have impacted you personally?

    Supporting questions:

    a. What new skills or knowledge have you acquired?
    b. How did this experience inspire you or affect your confidence?
    c. How did this experience impact your social relationships?
4) How did these events impact you as an instructor or graduate student?

    Supporting questions:

    a. How did you use these new skills?
    b. How did you implement an idea from this experience?

5) How did these events affect your ability to achieve your goals or bigger goals within the department?

   Supporting questions:

   a. Are you more successful?

   b. What has happened within the department as a result of your participation?

   c. How did this experience impact your social relationships?

6) How did these events change your understanding, or the department's understanding, of what matters?

   Supporting questions:

   a. Are there new ways in which you define success based on these events?

Weekly Coordination meetings

7) Describe a typical coordination meeting for your course.

   a. What events occur?

   b. What does participation look like?

8) What were significant events you can remember from your coordination meetings?

   Supporting questions:

   a. How did you participate?

   b. How was it relevant to you?

   c. What connections did you make that were influential to you?

9) How do you feel these events have impacted you personally?

   Supporting questions:

   a. What new skills or knowledge have you acquired?

b. How did this experience inspire you or affect your confidence?

c. How did this experience impact your social relationships?

10) How did these events impact you as an instructor?

Supporting questions:

a. How did you use these new skills?

b. How did you implement an idea from this experience?

11) How did these events affect your ability to achieve your goals or bigger goals within the course?

Supporting questions:

a. Are you more successful?

b. What has happened within the department as a result of your participation?

c. How did this experience impact your social relationships?

12) How did these events change your understanding, or your coordinator's understanding, of what matters?

Supporting questions:

a. Are there new ways in which you define success based on these events?

Appendix K

Course Coordinator Interview Questions

1) How would you describe your coordination philosophy?
    a. What is your role?
    b. What expectations do you have for graduate students teaching your course?
2) What do you view as the goals of your coordination meetings?
3) Describe a typical coordination meeting for your course.
    a. What events occur?
    b. What does participation look like?
4) What are the reasons GSIs come to you outside of coordination meetings?
5) How have you seen the GSIs you work with change, if at all, since you first started working with them?

Appendix L

GSI Coordinator Interview Questions

1) How would you describe your coordination philosophy?
    a. What is your role?
    b. What expectations do you have for the graduate students you supervise?
2) What do you view as the goals of the beginning of the year training sessions?
3) What do you view as the goals of the monthly GSI meetings?
4) Describe a typical monthly meeting with GSIs.
    a. What events occur?
    b. What does participation look like?
5) What are the reasons GSIs come to you outside of the trainings and monthly meetings?
6) How have you seen the GSIs you work with change, if at all, since you first started working with them?

Appendix M

Frequency of Activity and Experience Codes

Activity or experience	Frequency of Code
1-on-1 meetings	3
Ability to impact students	32
Ability to impact department	28
Academic dishonesty	3
Advice from coordinator	13
Advice from peers	12
Amount/length of meetings	24
Asking questions/discussing issues/sharing experiences	58
Being consistent with students	1
Building relationships with students	1
Building relationships with supervisor	3
Classroom management	12
Collaboration	20
Compensation for training	3
Coordination meetings (course information, structure, and content)	31
Course evaluations	2
Department/teaching duties and expectations	21
Desire to contribute	3
Direct faculty supervisor	7
Disability Resources	7

Activity or experience	Frequency of Code
Disconnect between words and actions	12
Disrespectful behavior	1
Dress code	5
Equity presentation	2
Feeling heard, valued, and respected	11
Feeling overwhelmed	4
Food	21
Free work time	3
Gaining experience	15
General sense of enjoyment	4
General sense of excitement	8
General student support	7
General support from coordinator	3
General support from department	2
General teaching tips	27
Graduate student issues	3
GSI Interactions	81
Honest communication	7
In-person teaching	2
Level of communication	1
Level of confidence	29
Level of coordination	15
Level of motivation	2

Activity or experience	Frequency of Code
Level of preparation	18
Level of support	54
Level of trust	1
Mathematics education professional development	37
Maturity of peers	2
Meeting structure/environment	16
Meetings with full-time faculty	8
Online resources	2
Open to suggestions	1
Practicing lessons	6
Public criticism	2
Resources provided	1
Self-reflection	1
Sense of community	32
Student interactions	19
Switching from student to teacher mindset	1
Tailoring training to feedback	1
Talking about students	26
Teaching demonstrations	67
Teaching feedback	16
Teaching first-year college students	11
Teaching/student balance	16
Technology	4

Activity or experience	Frequency of Code
Testing room	3
Time management	3
Training in general	15
Trying something new in the classroom	1
Unnecessary/off topic/inappropriate information	49
Total	962

Note. GSI = Graduate Student Instructor.

Appendix N

Frequency of Activity and Experience Codes for the Professional Learning CoP

Activity or experience	First-year GSI responses		Second-year GSI responses		Total professional learning CoP responses		
	P	N	P	N	P	N	Total
1-on-1 meetings	0	0	2	0	2	0	2
Ability to impact students	10	2	5	4	15	6	21
Ability to impact department	6	3	5	6	11	9	20
Academic dishonesty	0	1	0	0	0	1	1
Advice from coordinator	3	0	3	1	6	1	7
Advice from peers	3	1	2	1	5	2	7
Amount/length of meetings	3	12	2	1	5	13	18
Asking questions/discussing issues/sharing experiences	21	2	13	8	34	10	44
Building relationships with supervisor	1	0	1	0	2	0	2
Classroom management	1	0	3	3	4	3	7
Collaboration	9	1	3	1	12	2	14
Compensation for training	1	0	0	0	1	0	1
Coordination meetings (course information, structure, content)	14	3	3	1	17	4	21
Course evaluations	1	0	0	0	1	0	1

Activity or experience	First-year GSI responses		Second-year GSI responses		Total professional learning CoP responses		
	P	N	P	N	P	N	Total
Department/teaching duties and expectations	12	2	0	1	12	3	15
Desire to contribute	1	1	0	0	1	1	2
Direct faculty supervisor	1	0	2	1	3	1	4
Disability Resources	1	0	2	1	3	1	4
Disconnect between words and actions	0	5	0	2	0	7	7
Dress code	0	2	0	1	0	3	3
Equity presentation	1	0	0	0	1	0	1
Feeling heard, valued, and respected	3	0	3	1	6	1	7
Feeling overwhelmed	1	2	0	0	1	2	3
Food	11	2	2	0	13	2	15
Free work time	2	0	0	0	2	0	2
Gaining experience	5	0	4	0	9	0	9
General sense of enjoyment	1	0	2	0	3	0	3
General sense of excitement	2	1	3	0	5	1	6
General student support	1	0	3	0	4	0	4
General support from coordinator	1	0	0	1	1	1	2

Activity or experience	First-year GSI responses		Second-year GSI responses		Total professional learning CoP responses		
	P	N	P	N	P	N	Total
General support from department	1	0	0	0	1	0	1
General teaching tips	13	1	6	0	19	1	20
Graduate student issues	0	1	1	0	1	1	2
GSI Interactions	45	4	20	5	65	9	74
Honest communication	0	0	2	2	2	2	4
In-person teaching	0	0	1	0	1	0	1
Level of confidence	9	2	9	1	18	3	21
Level of coordination	1	3	2	2	3	5	8
Level of motivation	1	0	0	0	1	0	1
Level of preparation	6	2	3	0	9	2	11
Level of support	18	2	7	2	25	4	29
Mathematics education professional development	12	1	14	0	26	1	27
Maturity of peers	0	0	0	1	0	1	1
Meeting structure/ environment	4	2	2	3	6	5	11
Meetings with full-time faculty	2	0	3	0	5	0	5
Online resources	0	1	0	0	0	1	1

Activity or experience	First-year GSI responses		Second-year GSI responses		Total professional learning CoP responses		
	P	N	P	N	P	N	Total
Practicing lessons	2	2	0	0	2	2	4
Public criticism	0	1	0	0	0	1	1
Self-reflection	0	0	0	1	0	1	1
Sense of community	18	1	5	3	23	4	27
Student interactions	1	3	6	2	7	5	12
Switching from student to teacher mindset	1	0	0	0	1	0	1
Tailoring training to feedback	0	0	1	0	1	0	1
Talking about students	2	2	6	9	8	11	19
Teaching demonstrations	33	11	4	4	37	15	52
Teaching feedback	7	0	2	1	9	1	10
Teaching first-year college students	3	0	4	0	7	0	7
Teaching/student balance	5	5	0	0	5	5	10
Technology	0	3	0	0	0	3	3
Testing room	2	0	0	1	2	1	3
Time management	1	0	1	1	2	1	3
Training in general	6	0	0	2	6	2	8

Activity or experience	First-year GSI responses		Second-year GSI responses		Total professional learning CoP responses		
	P	N	P	N	P	N	Total
Unnecessary/off-topic/ inappropriate information	1	11	1	16	2	27	29
Total	310	98	163	90	473	188	661

Note. GSI = Graduate Student Instructor; P = positive response; N = negative response; CoP = Community of Practice.

Appendix O

Frequency of Activity and Experience Codes for the Course Coordination CoPs

Activity or experience	Responses														
	MATH 105		MATH 110		MATH 115		MATH 120		MATH 130		STAT 250		Combined total		
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	Total
Ability to impact students	4	0	3	1	0	0	0	0	1	1	1	0	9	2	11
Ability to impact department	0	0	1	1	0	0	0	0	1	1	0	0	2	2	4
Academic dishonesty	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Advice from coordinator	1	0	9	0	3	0	1	0	3	0	2	6	19	6	25
Amount/length of meetings	0	0	0	0	0	2	0	0	0	0	0	0	0	2	2
Asking questions/ discussing issues/sharing experiences	4	0	3	0	1	0	4	0	0	0	0	2	12	2	14
Being consistent with students	2	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Building relationships with students	3	0	0	0	0	0	0	0	0	0	0	0	3	0	3
Classroom management	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1

Activity or experience	Responses														
	MATH 105		MATH 110		MATH 115		MATH 120		MATH 130		STAT 250		Combined total		
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	Total
Collaboration	5	0	11	0	4	1	6	0	3	1	3	1	32	3	35
Coordination meetings (course information, structure, content)	10	3	8	0	5	1	7	1	3	0	1	7	34	12	46
Course evaluations	0	0	1	0	0	0	0	0	0	0	1	0	2	0	2
Department/teaching duties and expectations	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1
Direct faculty supervisor	0	0	0	0	4	0	0	0	3	1	0	1	7	2	9
Disconnect between words and actions	0	3	0	0	0	1	0	0	0	0	0	0	0	4	4
Disrespectful behavior	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Feeling heard, valued, and respected	1	0	1	1	5	0	1	0	2	0	0	0	10	1	11
Gaining experience	1	1	0	0	1	0	0	0	0	0	0	0	2	1	3
General sense of enjoyment	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1

Activity or experience	Responses														
	MATH 105		MATH 110		MATH 115		MATH 120		MATH 130		STAT 250		Combined total		
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	Total
General student support	6	0	0	0	1	0	1	0	0	0	0	0	8	0	8
General support from coordinator	0	0	4	0	0	0	3	0	0	0	0	7	7	7	14
General teaching tips	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1
Graduate student issues	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
GSI Interactions	0	0	0	2	2	0	1	1	0	0	1	0	4	3	7
Honest communication	2	0	1	0	0	0	0	0	0	0	0	0	3	0	3
Level of communication	0	0	1	1	0	0	0	0	1	0	0	0	2	1	3
Level of confidence	1	0	2	0	1	0	0	0	0	1	0	0	4	1	5
Level of coordination	0	0	1	5	0	1	0	0	1	2	2	1	4	9	13
Level of preparation	3	0	1	0	1	0	0	0	0	0	0	0	5	0	5
Level of support	5	0	0	0	2	0	0	0	0	0	1	0	8	0	8

Activity or experience	Responses														
	MATH 105		MATH 110		MATH 115		MATH 120		MATH 130		STAT 250		Combined total		
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	Total
Level of trust	1	0	0	0	0	0	1	0	0	0	0	0	2	0	2
Meeting structure/ environment	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Meetings with full-time faculty	0	0	0	0	4	0	0	0	0	0	4	2	8	2	10
Open to suggestions	1	0	0	0	2	0	2	0	0	0	0	0	5	0	5
Resources provided	1	0	0	0	4	0	0	0	0	0	2	0	7	0	7
Self-reflection	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Sense of community	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1
Student interactions	4	1	4	0	1	2	0	2	1	0	0	2	10	7	17
Teaching demonstrations	0	0	0	0	0	0	0	0	1	0	0	1	1	1	2
Teaching feedback	0	0	0	0	0	0	0	0	3	0	0	2	3	2	5
Teaching/student balance	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1

Activity or experience	Responses														
	MATH 105		MATH 110		MATH 115		MATH 120		MATH 130		STAT 250		Combined total		
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	Total
Trying something new in the classroom	0	0	0	0	0	0	1	0	1	0	1	0	3	0	3
Unnecessary/off-topic/ inappropriate information	0	0	0	1	0	1	0	0	0	0	0	0	0	2	2
Total	57	8	52	14	42	9	29	5	25	8	20	32	225	76	301

Note. CoP = Community of Practice; GSI = Graduate Student Instructor; P = positive response; N = negative response.