

Uncovering the Social Organization of Women PhD Students' Experiences in Biology: An Institutional Ethnography

by

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Abstract

Biological science programs enroll and graduate more women than other STEM disciplines; nearly 60% of undergraduate students are women, and women and men enter graduate programs at equal rates. This suggests that the field of biological sciences has become more equitable or that gender bias has been minimized. However, the representation of women in senior academic positions drops after graduate school, and women still report gendered experiences in biological science programs. By removing biological sciences from the discourse around gender inequality and the chilly climate in STEM, we lose the ability to identify whether gender biases persist in a gender-balanced field. Therefore, this dissertation addresses that gap.

The purpose of this institutional ethnography was to examine the STEM institutional processes, practices, and discourses that coordinated the experiences of women PhD students in biological sciences at a Southern Research University. Beginning from the standpoint of women PhD students as an entry point into the institution, I explored the everyday work of women PhD students in a gender-balanced field to provide a unique perspective on the institutional structures that coordinate STEM graduate student work. Data collection and analysis began with in-depth interviews with women PhD students and expanded to interviews with faculty members and the analysis of institutional texts (e.g., handbooks, syllabi, web pages). I followed Carspecken's critical ethnographic methodology as an analytical process that began with low-level coding and led to high-level coding and code reorganization.

This analysis led to three key findings. First, participants, faculty, and texts described the characteristics of the ideal graduate student as someone who has an adequate scientific background, prioritizes research, is willing to ask questions, manages their time and

responsibilities well, and is self-motivated. Participants reported challenges with meeting the ideal graduate student and experienced a fear of failure and imposter syndrome as a result. Second, neoliberal discourses coordinated the everyday work of graduate students through productivity, competition, and pressure to “do it all.” Finally, the COVID-19 pandemic changed graduate student work by impacting how their research, coursework, and teaching work were conducted. Findings indicate that the discourses and expectations that coordinated the experiences of women graduate students contributed to the chilly climate in STEM.

Overall, the findings of this dissertation indicate that similar institutional discourses are coordinating the experiences of the participants in different ways. Neoliberal discourses such as productivity, prioritizing research output, competition, and pressure to publish created an educational environment and contributed to the construction of the ideal graduate student as a disembodied, unencumbered worker that has unlimited time and resources to conduct and produce research. Neoliberal discourses in higher education create a high-pressure, competitive, chilly environment and (re)produce an ideal academic as someone willing to conform to the demands of the academic workload, which can differentially impact women graduate students as they try to conform standards that are packaged as normal and neutral but are instead gendered.

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List of Abbreviations

IE	Institutional Ethnography
CIQ	Critical Incident Questionnaire
DBS	Department of Biological Sciences
STEM	Science, Technology, Engineering, & Mathematics
IRB	Institutional Review Board
SU	Southern Research University
GTA	Graduate Teaching Assistantship
GRA	Graduate Research Assistantship
IACUC	Institutional Animal Care and Use Committee

CHAPTER I

INTRODUCTION

Biological science programs enroll and graduate more women than other STEM disciplines; nearly 60% of undergraduate students in biology are women, and women and men enter graduate programs in biological sciences at equal rates (Adamo, 2013; Cheryan et al., 2017; Eddy & Brownell, 2016; Sax et al., 2018). However, gender gaps in academic performance, participation, belonging, and productivity exists within the biological sciences (Ballen et al., 2017, 2018; Eddy et al., 2014a; England et al., 2019; Epstein & Lachmann, 2018; C. W. Fox et al., 2018; Leaper & Starr, 2019; Sullivan et al., 2018). Indeed, one study suggested women are less likely than men to become academic scientists in the field of biology despite entering graduate school in nearly equal numbers (Adamo, 2013). While women obtain 50% of biology PhDs, women are 10-20% less likely to obtain a faculty position than men (Grogan, 2019). Women remain underrepresented in academic spaces within biological sciences and publish less as a lead author than their man peers and colleagues (Brown, 2008; Dizney et al., 2019; Epstein & Lachmann, 2018; C. W. Fox et al., 2016; Walker, 2018). These studies suggest that gender bias in the biological sciences persists despite the increased number of women pursuing biological sciences degrees.

I begin this chapter with a discussion of women's enrollment in higher education and biology education that informed the problem statement that guided this study. Next, I provide a brief description of the problem statement and research purpose. Third, I describe the theoretical framework of feminist standpoint theory that informed the development of this study. Fourth, I provide an overview of the methodology, institutional ethnography, for this study and the research questions. Fifth, I explain the significance of this research. Finally, I examine my

positionality in this research and how it influenced and impacted my decision to pursue this dissertation research.

Women's Enrollment Paradox in Higher Education

Women's enrollment in higher education has been steadily increasing over the last several decades (Buchmann & DiPrete, 2006). From 1960 to 2004, women's enrollment increased by over 25%, surpassing men's enrollment and "reversing" the gender gap in higher education enrollment (Buchmann & DiPrete, 2006). In 2012, women's undergraduate enrollment in higher education was up to 57% and was projected to increase to over 70% in the United States by 2025 (McDaniel, 2012). Furthermore, women were awarded 60% of master's degrees and 51% of doctoral degrees in the United States (McDaniel, 2012). This phenomenon has been termed the "women's enrollment advantage" and has led to an entire area of scholarship that investigated the consequences of and factors related to increasing women's presence within higher education (e.g., Buchmann & DiPrete, 2006; McDaniel, 2012; Riegler-Crumb, 2010; Yakaboski, 2011). The increased enrollment of women in higher education has perpetuated the belief that gender issues are a thing of the past, however, research in higher education has suggested that this is not true. For example, women are more likely to enroll in community colleges, whereas men are more likely to enroll in elite four-year universities (McDaniel, 2012). There are also enrollment and completion gaps in certain fields of study, like physics, computer science, and engineering (Cheryan et al., 2017; McDaniel, 2012; Sax et al., 2018).

Further, the discourse around women's enrollment advantage has used narratives that have penalized women for their successes (Yakaboski, 2011). For example, Yakaboski (2011) examined the language and rhetoric used by newspaper articles to highlight how news media

discourse shaped the public's view on enrollment in higher education. In her critical media discourse, Yakaboski (2011) identified three overarching discourse themes in popular news articles: blaming the decrease in men's college enrollment on a feminized curriculum and differences in behavior between men and women, the assumption that women's success comes at the expense of men's and addressing the gender enrollment gap by centering men's interests in higher education. The rhetoric identified in these news articles reinforced a binary system where men continued to be systematically privileged despite women's successes (Yakaboski, 2011). This encouraged the continuation of stereotypical gendered performance and behaviors that belittled women's achievements and placed men in a position of privilege (Yakaboski, 2011). This, in turn, reinforces gender inequalities for women in higher education as their educational achievements are viewed as happening at the expense of men's educational achievements.

The "women's enrollment advantage" creates a paradox; as women's presence increases, it is expected that gender bias will be mitigated or decrease. However, evidence from research in STEM education suggests otherwise (Begeny et al., 2020; Brown, 2008; Burnett & Combes, 2019; Cabay et al., 2018; Mansfield et al., 2019; Wagner, 2016). Scholars have reported that gender bias is pervasive within STEM fields where women are equally represented, such as biology and veterinary sciences.

Women in Biological Sciences

The women's enrollment paradox appears in biological sciences, a STEM field where women are enrolled in higher numbers than men at the undergraduate and graduate levels (Adamo, 2013; Eddy & Brownell, 2016; Sax et al., 2018). In 2016, 60.4% of biology undergraduates and 52.6% of biology PhD graduates were women (NSF, 2019). This increase in

enrollment and persistence of women in biological sciences has suggested that the field has become more equitable or that gender bias has been minimized (Begeny et al., 2020). This mentality can create a gap in our understanding of the gendered nature of STEM education and the chilly climate that is perpetuated within STEM fields with a higher representation of men. For example, in a double-blind study that tested whether gender bias persisted in veterinary medicine, a field where women are well represented, the authors demonstrated that gender bias persisted despite the increase in the number of women veterinarians (Begeny et al., 2020). Veterinary managers were first asked if they believed gender bias existed in their field and then were asked to assess the competence of a set of employees who were men and women. The managers who believed gender bias was no longer an issue were more likely to rank the woman employees as less competent than an identical man employee (Begeny et al., 2020). This study illustrated that gender bias can persist in fields where women are equally represented and called for research to examine what barriers women may face in fields where they are equally represented. Indeed, by removing the field of biological sciences from the discourse around gender inequality and the chilly climate in STEM, we lose the ability to identify whether the chilly climate exists within biology, especially at the graduate and faculty levels (Cabay et al., 2018; Sax et al., 2018). Therefore, this dissertation contributes to the current research on gender and STEM education by including biological sciences in the conversation.

Despite the increase in enrollment and persistence of women in biological sciences, a significant amount of research has suggested that gender gaps in academic performance, participation, self-efficacy, and sense of belonging persist in undergraduate biology courses (Ballen et al., 2017, 2018; Barthelemy et al., 2015; Cooper et al., 2018; Eddy et al., 2014b; Grunspan et al., 2016; Koester et al., 2016; Matz et al., 2017). For example, Ballen et al. (2017)

found that women underperformed on exams compared to men in an introductory biology course and that the women students reported higher levels of test anxiety but also reported higher course-relevant science interest. They found that test anxiety negatively impacted women's exam performance, but science interest had a positive effect on exam performance (Ballen et al., 2017). Similarly, England et al. (2019) found that anxiety was related to student performance in an introductory course and impacted students' persistence in a biology major. Women in that course reported higher general anxiety and perceived course difficulty and were more likely to leave the major after completing the introductory course (England et al., 2019). These two studies suggest that aspects of biology education continue to disadvantage women despite the increase in enrollment at the undergraduate level.

Furthermore, gender gaps persist at the graduate and faculty levels in biological sciences. Women are less likely than men to obtain faculty positions in biology, and senior faculty or leadership positions are held by more men than women, especially in fields like ecology, computational biology, and medicine (Adamo, 2013; Bonham & Stefan, 2017; Grogan, 2019; Hempenstall et al., 2019). Moreover, evidence has shown that senior men are less likely to work with or publish with women in biology, and women graduate students in biology have a harder time adjusting to and benefitting from their graduate programs than men (Clark et al., 2016; Epstein & Lachmann, 2018; Graddy-Reed et al., 2019; Griffin et al., 2015; Sheltzer & Smith, 2014).

Problem Statement

Graduate STEM education is the location where students learn the accepted norms, values, behaviors, and attitudes of their specific discipline, and this has been theorized to be a gendered process (Gardner, 2008a; Sallee, 2011, 2014). STEM education is rooted in masculine

norms, values, and discourses, and the masculine nature of STEM can create additional barriers for women to fit into these norms as they navigate their educational and professional experiences (Britton, 2017; De Welde & Laursen, 2011; Gonsalves, 2014; Leathwood, 2006; Lindemann et al., 2016; Mars & Hart, 2017; Parson, 2018; Parson & Ozaki, 2018; Steele et al., 2020). Research on the intersections of gender and STEM higher education has focused on the STEM academic climate and structural issues that impact the experiences and persistence of women in fields with a higher representation of men such as physics, computer science, and engineering (Barthelemy et al., 2016; Chao & Cohoon, 2010; Cohoon et al., 2009; Gonsalves, 2014; Litzler et al., 2005, 2014; Logel et al., 2009; Parson & Ozaki, 2018; Perkins et al., 2020), however, little research has examined how gender informs the experiences and persistence of women in fields where they are equally represented, such as the biological sciences.

Although the overall number of women in biological sciences has increased at the undergraduate and graduate levels, research suggests women in the biological sciences continue to experience gender bias and a chilly climate despite the increase in numbers (Adamo, 2013; Ballen et al., 2017; Begeny et al., 2020; Brown, 2008; Eddy et al., 2014b; Grunspan et al., 2016). Indeed, gender bias becomes more apparent as women progress through graduate school, post-doctoral fellowships, and faculty positions where they experience bias in hiring, publishing, recognition for their work, and the acquisition of grant funding, which are important for success in academic science (Bonham & Stefan, 2017; Dizney et al., 2019; Epstein & Fischer, 2017; Epstein & Lachmann, 2018; C. W. Fox et al., 2018; Grogan, 2019; Wagner, 2016; Walker, 2018). Therefore, by examining the educational experiences of women at the institutional level in graduate school, I sought to understand if and how gender was pervasive in the biological

sciences and how that may impact the experiences of women who are pursuing academic science.

Research Purpose

The purpose of this dissertation was to examine the institutional practices of graduate STEM education from the standpoint of women graduate students in the biological sciences. More specifically, I sought to understand how institutional processes, policies, practices, and discourses coordinated the experiences of women graduate students in biology. This dissertation responded to calls for research on the persistence of gender bias in STEM fields where women's representation has increased and the need to understand how disciplinary culture and institutional structures can impact women's success and belonging in graduate STEM programs (Begeny et al., 2020; Epstein & Lachmann, 2018; Ferreira, 2003; Fisher et al., 2019; Gardner, 2008b, 2008a). Furthermore, I focused on graduate education as the context of this research because the purpose of graduate school is to train students to be professionals in academia, regardless of the student's career goals (Austin, 2002; M. F. Fox, 2001; Gardner, 2008a; Weidman et al., 2001; Weidman & Stein, 2003). Disciplinary culture and institutional structures inform how the everyday work of doctoral students is organized in graduate school (Austin, 2002; Gardner, 2008a; Golde, 2005; Sallee, 2011, 2014; Weidman & Stein, 2003). Therefore, by examining how graduate STEM education is coordinated by STEM institutional policies, practices, procedures, and discourses, and how that process may be gendered, I can identify if and how graduate school contributes to the decreased persistence of women in academic faculty positions in biology.

Theoretical Framework

This institutional ethnography used feminist standpoint theory (Hesse-Biber, 2014; Smith, 2005) as a lens to examine the processes, practices, and discourses associated with

graduate education in biological sciences through the standpoint of graduate women. Next, I discuss the key tenets of feminist standpoint theory and how it is used as a lens in institutional ethnography to examine the institutional practices, including how I used institutional ethnography and feminist standpoint theory to examine the educational experiences of graduate women in biology.

Feminist Standpoint Theory

This dissertation explored the graduate school experiences of women graduate students in biological sciences through the framework of feminist standpoint theory (Harding, 2004; Hesse-Biber, 2014; Smith, 2005). Feminist standpoint theory emerged in the 1970s and 1980s during the women's movement as a critical theory about the relations between power and the production of knowledge (Harding, 2004). Feminist standpoint theorists reworked Marx's materialism to understand how power, domination, and knowledge are gendered in particular ways and emphasized the "importance of situating knowledge in women's experiences" (Hesse-Biber, 2014, p. 24). By situating knowledge in women's experiences, feminist standpoint theorists position women as the knower about their own experiences with power structures that contribute to their marginalization. Scientific research has focused on objectivity and generalizability that privileged a white, middle-class, heterosexual, androcentric point of view that marginalized and undervalued other forms of knowing (Hesse-Biber, 2014). However, feminist standpoint theory was designed to challenge these dominant ways of knowing by considering women's ways of knowing as a valid form of scientific inquiry (Harding, 2009; Hesse-Biber, 2014).

Research framed through feminist standpoint theory often considers the intersections of social identities such as gender, race, and class to explore knowledge-power relations through the daily lives of the oppressed, exploited, or marginalized (Harding, 2009; Hesse-Biber, 2014). This

encourages marginalized groups to share their daily experiences and shed light on how society functions in a way that might not be readily available to non-dominant groups (Harding, 2009). Standpoint theory then is an entry point for inquiry that makes the unknown or unseen visible to members of a social group that are traditionally oppressed (Smith, 2005). The embodied knower is the expert of their everyday activities and experiences but is not necessarily an expert in the relations that organize their everyday life (Smith, 2005). Therefore, inquiries that use feminist standpoint theory seek to bridge that gap and understand how women's everyday lives are socially organized by knowledge and power structures (Campbell & Gregor, 2004; Smith, 2005). Research that uses feminist standpoint theory seeks to begin inquiry from the experiences of women in their everyday lives and views experience as a site for researchers to uncover disjunctures in women's lived experiences and identify how gendered structures, power, and knowledge systems are creating those disjunctures (Hesse-Biber, 2014; Smith, 2005).

Institutional Ethnography

Institutional ethnography (IE) is a sociology that aims to critically examine the organization and structure of institutions through the standpoint of the people that are involved within it to understand the policies, practices, and discourses that coordinate their everyday activities (Figure 1; Campbell & Gregor, 2004; Smith, 2005). Institutional ethnographic work seeks to uncover, explore, and describe how people's everyday action "may be organized without their explicit awareness but still with their active involvement" by conceptualizing how power and knowledge are a part of that social organization (Campbell & Gregor, 2004, p. 43).

Understanding how power plays a role in the organization of a group of people's daily lives is an important component of institutional ethnographic work and involves first examining people's day to day activities and actions at the local level and then expanding to an exploration of how

their actions are socially organized through discourse at trans-local sites where power is held (Campbell & Gregor, 2004).

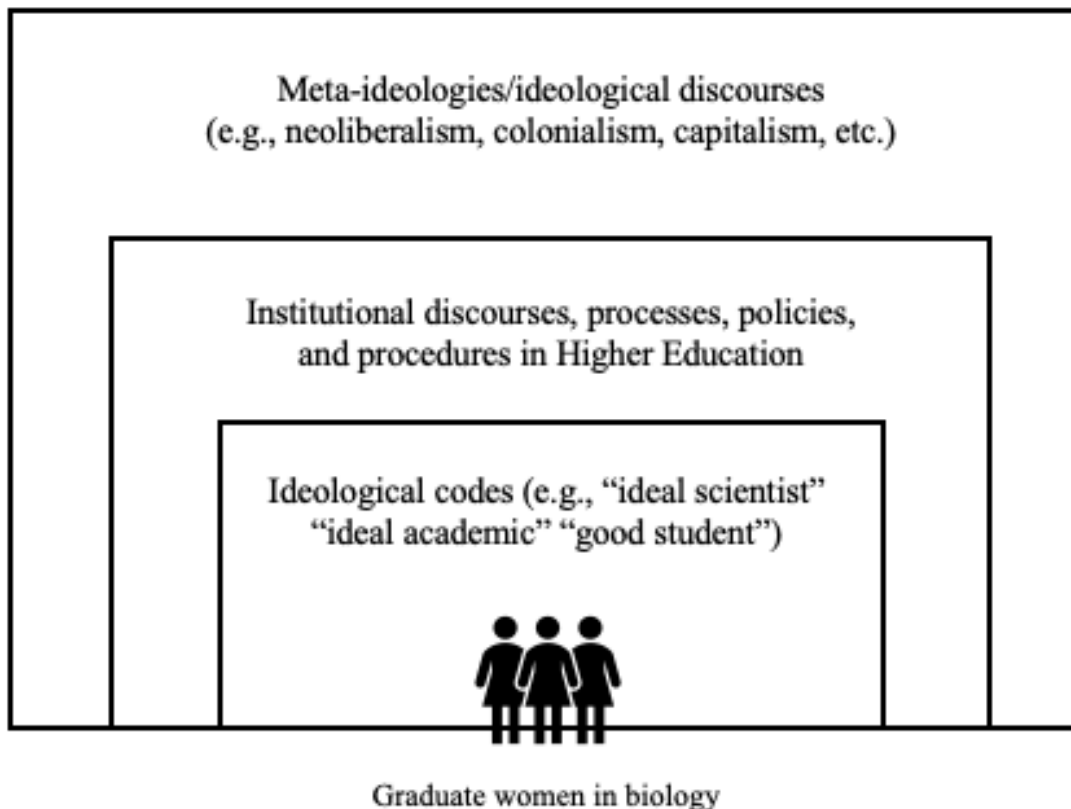


Figure 1: Viewing the social organization of the STEM institution through the standpoint of women graduate students in biology. Adapted from (Smith, 2006)

Feminist standpoint theory provides the theoretical underpinnings of IE as a lens to view the organization of knowledge and activities within an institution. Institutions in IE are defined as “functional complexes” that are organized around a particular function, such as education, science, or government (Smith, 2005, p. 68). Therefore, I examined how knowledge and discourses within graduate biology education are organized within the STEM “institution” through the lens of women who are involved within graduate biology education. Standpoint theory in IE aims to examine the knowledge-power relations between people and within social

contexts through the lived experiences of those who are oppressed or marginalized (Harding, 2004, 2009). Furthermore, feminist standpoint theory situates knowledge in women's experiences and seeks to understand how knowledge and power structures are gendered (Hesse-Biber, 2014; Smith, 2005). Women are considered the expert of their reality, even if they are not an expert in the organizing processes of their reality (Smith, 2005). Therefore, IE framed through feminist standpoint theory seeks to critically examine the discursive practices and structures that coordinate women's everyday lives (Smith, 2005).

Research Questions

Using institutional ethnography, this study explored the everyday work of women PhD students in biological sciences at a Southern Research University (pseudonym SU) to understand the STEM institutional processes, practices, policies, and discourses that coordinated their everyday work. This dissertation was guided by the following overarching research question: How do the STEM education institutional processes, policies, practices, and discourses organize and inform the experiences of women graduate students in biological sciences at SU?

Data collection and analysis were guided by the following sub-research questions:

1. What is the everyday work of women PhD students in biological sciences?
2. What challenges emerged from the coordination of women PhD students' everyday work? What processes, policies, and discourses coordinated those challenges?
3. How is gender associated with the coordination of the everyday work of women PhD students in biological sciences?

Overview of Study

This study used institutional ethnography through the lens of feminist standpoint theory to examine the STEM education institutional policies, practices, procedures, and discourses that

characterized the everyday experiences of women PhD students in biological sciences at SU (Hesse-Biber, 2014; Harding, 2009; Smith, 2005). I began my inquiry from the standpoint of women PhD students in biology as an entry point to explore the invisible social relations that organized their experiences in graduate school. Data collection and analysis focused on how the interface between graduate women and STEM education was organized by first exploring the everyday work of a PhD student in biological sciences and then explicating how their everyday work was coordinated by translocal processes. The research design follows the guidelines for conducting institutional ethnography outlined in Campbell and Gregor (2004) and Smith (2005).

Context

This study took place at SU, a public land-grant research university in the Southeastern United States. SU is classified as an R1 institution, meaning it has the highest level of research output and has undergraduate, master's, and doctoral programs (The Carnegie Classification of Institutions of Higher Education, n.d.). I selected SU as the setting for this study because it is a public land grant university with graduate programs in STEM fields, and it is a site that I had access to. SU is a large public-land grant university with over 30,000 students enrolled (SU Website). SU's graduate school has over 115 graduate programs across thirteen colleges.

Department of Biological Sciences

The Department of Biological Sciences (DBS) at SU is held in the college of science and mathematics. The department teaches over 500 undergraduate students and has three major concentrations for undergraduates: marine biology, microbial, cellular & molecular biology, and organismal biology. According to SU's institutional research website, in Fall 2019, DBS had a total of 397 undergraduates enrolled as biology majors. Of those 397 undergraduates, 276 (70%) of them were women. Additionally, the department has over 100 graduate students with research

concentrations in Behavior, Ecology, Evolution, and Conservation; Evolutionary Genetics and Systematics; Physiological Adaptation and Functional Genomics; and Host-Microbial Interactions. According to SU's institutional research website, there were 126 graduate students enrolled in biological sciences in Fall 2019, 74 (58%) of which were women. DBS has 33 tenured/tenure-track faculty, 3 research faculty, 7 lecturers, and 5 course coordinators. Of the tenured/tenure-track faculty, 13 (39%) are women and 20 (60%) are men.

Participant Recruitment and Sample

Institutional ethnographic research begins in the actuality of people's everyday lives to explore the local settings they are involved in (Campbell & Gregor, 2004; Smith, 2005). Therefore, this study began from the standpoint of women PhD students in biological sciences to understand how their everyday work was coordinated by the institution of graduate STEM education. Recruitment of participants for this study involved identifying informants that have experience with and/or are knowledgeable about the processes of doctoral student education in biology (DeVault & McCoy, 2014). I used purposeful and snowball sampling to identify and recruit graduate student and faculty participants. Following approval from the SU Institutional Review Board (IRB) in fall 2020, I reached out to prospective graduate student participants via the DBS graduate student listserv with a recruitment email and asked interested participants to email me. Eligible participants were master's thesis and PhD students in biological sciences across all research concentrations. Because this dissertation focused on the experience of women graduate students as a point through which to view the institution, emphasis was placed on recruiting women for participation.

Participants included six women PhD students in biological sciences and two faculty members (Appendix A for participant descriptions). Graduate students participated in three

interviews throughout the fall 2020 and spring 2021 semesters to gain a comprehensive understanding of their daily work and how that changed over time. Additionally, I identified faculty participants through interviews with the graduate student participants. Faculty were included in this study due to their knowledge about the processes that inform graduate student education (Campbell & Gregor, 2004; DeVault & McCoy, 2014; Smith, 2005).

Data Collection

The goal of data collection in institutional ethnography is to use the standpoint of the participants as a window to view the institutional processes, practices, and discourses that organize and inform their everyday work (Campbell & Gregor, 2004; DeVault & McCoy, 2014; Smith, 2005). Data collection in institutional ethnography is an iterative process that builds upon itself and informs the collection of new data. DeVault and McCoy (2002) described institutional ethnographic inquiry as finding a thread and pulling it to see where it takes you. For this study, I collected two types of data: entry-level data and level-two data (Campbell & Gregor, 2004). Entry-level data included information about the local setting, the individuals, and their experiences whereas level-two data investigated how the setting works through organizational processes that may not be readily visible to participants (Campbell & Gregor, 2004). I collected entry-level data through interviews with graduate student participants. These interviews focused on the activities that characterized the everyday work of women PhD students in biology. Data collection and preliminary analyses occurred simultaneously during the interview and transcription process to inform the collection of level-two data. I collected level-two data through additional interviews with graduate student participants, interviews with faculty members, graduate participant journal entries, and the collection of institutional texts.

I used three forms of data collection methods to gather data about the everyday work of women PhD students in biology and the challenges they faced (entry-level data), and the processes and institutional structures that coordinated their work (level-two data). First, I conducted semi-structured interviews with graduate student participants to identify and describe their everyday life within their graduate program (Appendix B). After obtaining the participants' informed consent, I conducted three interviews with graduate student participants over Zoom. The first interview focused on the day-to-day activities of a graduate student in biology and included questions about their course experiences, research and teaching responsibilities and expectations, and interactions with professors and peers. The second interview followed up on the topics discussed in the first interview and included clarification about their typical day and how that may or may not have changed. The third interview focused on how graduate students found the information they needed to be successful (e.g., what texts they referred to for their degree progress, expectations from their courses or advisor, how they interacted and learned from peers and faculty members, etc.), how their work was going, and how their identities impacted their experiences as PhD students. I also conducted one interview each with two faculty members in biology to ask about the processes and policies that were identified in the graduate student interviews. The faculty interviews provided me with additional information on how graduate student work was coordinated at the department, college, and institutional levels.

I also used graduate student journals in the form of a modified Critical Incident Questionnaire (CIQ) to collect data. CIQs are a qualitative data collection tool that is primarily used in teaching and learning to assess learning, the development of critical thinking, and to promote student reflection of the learning process (Gilstrap & Dupree, 2008). The CIQ makes use of critical incidents, which are events or happenings in the daily lives of people that are

produced by how an individual interprets the significance of that event or happening (Gilstrap & Dupree, 2008). I used a modified CIQ modeled after the critical incident journals used by Cabay et al. (2018) that asked graduate student participants to describe a specific event that happened, an action they took, and their reaction and/or reflection of that event (Appendix C).

Finally, data collection involved the identification and collection of institutional texts. Texts are important sites for inquiry in institutional ethnography because texts coordinate what people do and how they know what to do (Campbell & Gregor, 2004; Smith, 2005). Texts were referred to during interviews with participants and were a part of collecting level-two data. The collection and subsequent analysis of texts allowed me to shift the focus of the study from the everyday activities of women graduate students to the policies, procedures, and discourses that coordinated the work of graduate students in biology (Campbell & Gregor, 2004; Smith, 2005). The texts I examined included the DBS and graduate school website, course requirements and SU's course bulletin, the graduate student policy handbook, graduate course syllabi, and university policies (Appendix D). The collection of texts occurred simultaneously with participant recruitment and interviews after IRB approval. I continued to collect institutional texts throughout the data collection and analysis process as new information about institutional texts emerged from interviews with graduate students and faculty participants.

Data Analysis

Data analysis in institutional ethnography is an iterative process and began immediately upon data collection and transcription of interviews with analytical memos (Campbell & Gregor, 2004; Hesse-Biber, 2014). During the interview process, I took notes on salient events and phrases. The interviews were transcribed immediately afterward using the Otter.ai transcription software (Otter.ai, 2020). I took notes in the form of analytical memos to note any emergent

themes or important information during the transcription process. Once an interview was fully transcribed and the first stage of data collection and analysis was complete, each interview was uploaded into Atlas.ti for subsequent data analysis and coding.

The overarching question that guided the data analysis process of this dissertation was, “What does it tell me about how this setting or event happens as it does?” (Campbell & Gregor, 2004, p. 85). To answer this question, I used Carspecken’s (1996) analytical methods of critical ethnography. The further analysis of graduate student and faculty interviews, CIQ, and institutional texts provided insight into the rules, policies, organizing structures, norms, values, expectations, and discourses associated with the STEM graduate education process (Campbell & Gregor, 2004; Smith, 2005).

My analysis began with low-level coding, which followed closely with the primary record being analyzed and was generally objective (Carspecken, 1996). Low-level codes involved descriptions of graduate student work, such as lab and/or fieldwork, teaching and research responsibilities, coursework, meetings, and interactions with faculty and peers (Appendix F). Low-level coding led to high-level coding, which involved higher levels of abstraction to generalize findings and reconstruct meaning (Carspecken, 1996). I used high-level codes to identify themes of institutional practices, policies, procedures, norms, values, and discourses that were associated with the coordination of women graduate students’ everyday work (Appendix G). One aspect of the high-level coding process included color-coding the codes based on what was coordinating the everyday work of the participants (Appendix E). Color-codes corresponded with one of the following: policy, documents, and texts; work of informants and others (research, teaching, coursework, service); institutions, people, organizations, and

committees; ideological codes, institutional discourses, and ideological discourses; COVID-19. Of the 378 total codes, 304 were low-level codes and 74 were high-level codes.

Finally, data analysis involved code reorganization via code mapping and code diagramming (Appendix H; Campbell & Gregor, 2004; Carspecken, 1996; Smith, 2005). The low- and high-level codes were grouped into a few large categories that corresponded with my research questions. Some of the codes were grouped into more than one category and overlapped across themes. I then organized the categories into three themes: 1) STEM institutional discourses and the ideal graduate student, 2) the social coordination of graduate student work, and 3) how the COVID-19 pandemic changed graduate student work. Throughout the data collection and analysis process, I used analytical memos to keep track of my analysis, the decisions I made, and how I made connections between the codes and research questions (Saldaña, 2016).

Research Significance

This dissertation examined the STEM institutional processes, practices, and discourses that coordinated the experiences of women PhD students in biological sciences at SU. This research contributed a unique perspective on the gendered nature of STEM education by examining how gender was embedded in the everyday work of graduate students in a STEM discipline that is considered gender balanced. Although women make up nearly 60% of undergraduate biology students and enter graduate school at equal numbers to men, gender bias and gaps persist in graduate, post-doctoral, and faculty experiences within biological sciences (Adamo, 2013; Bonham & Stefan, 2017; Brown, 2008; C. W. Fox et al., 2018; Maher et al., 2020; Wofford & Blaney, 2021). By examining the experiences of graduate women in biological sciences and how their everyday work was coordinated by STEM institutional policies,

processes, and discourses, I aimed to uncover if and how gender contributed to gendered experiences in graduate education. The goal of institutional ethnography is to view the organization of institutional structures through the standpoint of those who work within the institution and identify disjunctures between the experiences of the individuals within the institution and their expected reality (Campbell & Gregor, 2004; Smith, 2005). This research critically examined if and how graduate STEM education is gendered, how structures and discourses inform that gendered process, and how the gendering of that process can create challenges for women who pursue graduate degrees and professional careers in biology.

Researcher Positionality

Reflexivity is an important part of the qualitative research process, as it allows the researcher to acknowledge their background and biases but to also think about how those roles and biases inform the research and analytical process (Hesse-Biber, 2014; Onwuegbuzie & Leech, 2007). Feminist research centers on the relationship between the researcher and the participants to balance power and authority in the research process (Hesse-Biber, 2014). Researcher bias can impact all stages of the research process, such as the identification of the research problem, construction of the research questions, the methods, analysis, and interpretation of findings. Therefore, it is important to practice reflexivity often throughout the research processes to identify biases and examine the effects of those biases on research (Hesse-Biber, 2014). My reflexive practice involved identifying how my social and professional background and biases informed my decisions for my dissertation research.

My background and academic history are important for understanding why I decided to pursue higher education research and this dissertation study. I have many social identities, and each one of them has shaped my experiences and will continue to inform the space I occupy as a

researcher and as a person. I identify as a white, heterosexual, cis-gender, woman and I acknowledge the space that I occupy and the privilege I carry in my professional and personal life. I am also a first-generation college student and am the first in my family to obtain a bachelors and master's degree and pursue a PhD. My first-generation status came with many challenges: learning to navigate the college experience on my own, financially support myself through college, and making decisions about life and career goals without familial input. This also allowed me to be a role model for other family members who decided to attend college after me.

In this research, I am both an insider and an outsider. For institutional ethnographic research, I position myself as the researcher, but as a graduate student who was also a graduate student in biology, I am also positioned as a knower (Smith, 2005). Because of my positioning as both an insider and outsider, I found it difficult to not participate in institutional capture with the women that participated in this dissertation study. Institutional capture refers to when both the researcher and informant are familiar with the institutional discourses under study and can lose sight of the purpose of the research (Smith, 2005). Therefore, to address institutional capture, I used multiple interviews with participants spread out over two semesters to gain a broad understanding of the participant's experiences and I used the subsequent interviews as a method of member checking to clarify what was discussed in previous interviews. Furthermore, I maintained a researcher journal where I noted how I knew about the discourses identified in my research, such as if it was something based on my own knowledge of graduate biology education or if it was something I learned from the participants. I also believe my positioning as a graduate student helped me build a relationship of trust with the women that participated in my study, and

they may have felt more comfortable sharing with someone who understood their experiences from the graduate student perspective.

Inquiry in institutional ethnography starts from the position of the people who are a part of the institution to examine how their everyday lives and activities are coordinated by ruling relations (Campbell & Gregor, 2004; Smith, 2005). By framing this research through feminist standpoint theory, I explored the STEM institution through the experiences of the women who are tied into its processes, procedures, and discourses. My position as a knower is informed by my experiences as a woman in STEM. I have a bachelor's and master's degree in biological sciences, which also informs why this is the discipline I decided to study for my dissertation and future research. My personal experiences within the biological sciences are broad but have informed my decision to pursue a degree in higher education and the reason I chose this topic for my dissertation. I wanted to understand the salient experiences during my master's degree. Why I felt like I did not belong, or that I was not good enough. Why I felt like a failure for leaving and pursuing another degree despite my successes and love of biology.

During and immediately after I completed my master's, I did not have the knowledge or language to understand my own experiences. I began to ask questions and read the available scholarship that examined the experiences of women in STEM. I felt seen and heard when I read articles about women's experiences of leaving STEM or being pushed out. I also grappled with the shame I experienced because I felt like I was not dedicated enough to deal with the culture of STEM graduate education. Higher education research gave me the tools I needed to examine my experiences critically and question why STEM education is the way that it is. My knowledge about higher education, feminist research, and STEM education positions me as an outsider in my research because it gives me the tools to analyze the experiences of other women scientists

and to view STEM education through a lens I did not have before. Through my own standpoint, I know information about my own experiences within biological sciences and STEM education, but I also know information about how structural factors impact the persistence of women in STEM and how to examine those structures critically. My positionality within this institutional ethnography begins from my own experiences as a woman in biological sciences and higher education and expands out to the institutional practices, processes, and discourses that organized my own experience and the experience of the participants I interacted with. By recognizing my own experiences both as a standpoint, but also as a bias, I recognize how my experiences influenced how I approached my positionality and data analysis throughout the dissertation process.

Conclusion

In this chapter, I have described the relevant background information of the research problem, the purpose of this dissertation, research questions, theoretical framework, and an overview of the methodology I used to address the research problem and questions. I have also discussed the significance of this research and my positionality as a researcher. This dissertation is organized into three articles. Each article focuses on different institutional practices, policies, and discourses that organized and informed the experiences of women PhD students in biological sciences at SU. All three articles draw from the same sample and data but use different analytical samples and theoretical frameworks to identify and examine the problematics and disjunctures that emerged from the experiences of women PhD students in biological sciences at SU.

In Chapter 2, I examined the discourse of the “ideal graduate student” and how graduate student experiences were shaped by and constituent of that discourse. Using Acker’s (1990; 2012) theory of gendered organizations, and specifically the gendered substructure of the ideal

worker, I defined the characteristics of the ideal graduate student and examined how the ideal graduate student discourse created challenges for women PhD students in biology. Through interviews with faculty and graduate student participants and the analysis of institutional texts, I found that the ideal graduate student was characterized as someone with an adequate scientific background who prioritizes research, could manage their time and multiple responsibilities well, was willing to ask good questions, and was self-motivated. Graduate student participants described the challenges they experienced with meeting the standards of the ideal graduate student, such as a fear of failure and imposter syndrome. Additionally, I explored how the ideal graduate student discourse was related to the ideal student and ideal faculty member. Implications from this study suggest the need to reexamine graduate student expectations and how those may contribute to a chilly climate for women in STEM.

In Chapter 3, I explored how the meta-ideological discourse of neoliberalism was coordinating the work of women PhD students in biological sciences at SU. Using feminist standpoint theory (Harding, 2009) as the theoretical framework, I examined how neoliberal discourses were embedded in the work of graduate women in biology and how texts mediated their work. Through interviews with graduate students and faculty and the analysis of institutional texts, I defined the everyday work of women PhD students within the context of research, coursework, and teaching and identified how neoliberal discourses created a hierarchy that prioritized research work and productivity as a means for success for graduate students. The participants' everyday work was coordinated by the discourses of productivity, competition, and pressure to be busy, which increased the pressure and anxiety participants felt to publish and keep up with the demands of graduate school. The discourses of productivity and competitiveness contributed to the chilly climate experienced by women by promoting an

unencumbered ideal that could meet the demands of academic work and reinforced the ideal graduate student described in chapter 2. These discourses also devalued teaching as a rewarding form of work and instead rewarded research output and productivity through an annual evaluation of graduate student productivity. Implications of this study show the complexities of graduate education in the neoliberal university and suggest that recommendations should focus on providing clear, explicit instructions for success to empower traditionally marginalized students to make decisions about how they proceed with their work.

In Chapter 4, I focused on how the COVID-19 pandemic changed how graduate students experienced graduate work and the implications for moving forward after the pandemic. The impacts of the COVID-19 pandemic was a common theme across participant experiences, and thus was identified as a topic for further study. Using feminist standpoint theory as the theoretical framework (Harding, 2009), this study explored how the COVID-19 pandemic organized and informed the changes to graduate student work from the standpoint of six women PhD students in biology. This study highlighted how the COVID-19 pandemic impacted translocal organizing processes that informed how graduate work was conducted and how it changed. Participants described the challenges of adjusting to the new expectations coordinated by the pandemic and how they navigated new policies and changes to their dissertation and graduation timeline. Participants also described the decrease in social interactions and the increased feelings of isolation that impacted their work. The analysis of the data suggested similar discourses that were identified in chapter 2 and chapter 3, such as productivity and the prioritization of research, coordinated the work of the participants during the COVID-19 pandemic. Furthermore, the lack of emphasis on community that was a result of the pandemic reflected the priorities of the institution, as teaching and research responsibilities were the first

institutional activities to return when it was considered safe to do so. Implications from this study point to a need to further examine the impact of the COVID-19 pandemic on higher education and graduate student well-being, mental health, and productivity. Furthermore, more studies are needed to understand how ideological discourses, institutional discourses, and policies informed how the COVID-19 pandemic response was enacted and experienced in higher education.

Finally, in Chapter 5, I conclude this dissertation by summarizing and synthesizing the three articles into the overarching themes that emerged from this study. This chapter discusses how the three articles are interconnected and build off each other. Based on the themes, I offer recommendations for higher education professionals, faculty members, and researchers to better support graduate students and move towards changing how we construct graduate student expectations and ideologies. Finally, I conclude with my researcher reflection and my experiences of conducting and writing a dissertation, with the additional challenge of conducting a research study during a global pandemic and how that impacted my work.

Key Terms

Discourse: can be denoted as “little-d” discourse and “big-D” Discourse. “Little-d” discourse is language in use (oral or written language) that is used to formulate and recognize objects in distinctive ways (Gee, 2004; Smith, 2005). “Big-D” Discourse is a distinctive way of communicating and interacting with others, objects, tools, and technologies “to enact specific socially recognizable identities” (Gee, 2004, p. 37). Discourse in IE refers to “translocal relations coordinating the practices of definite individuals talking, writing, reading, watching, and so forth, in particular local places at particular times” (Smith, 2005, p. 224).

Ideological discourse: “generalized and generalizing discourses, operating at a metalevel to control other discourses” (e.g., neoliberalism) (Smith, 2005, p. 224).

Ideological code: “a replicable schematic understanding that structures the language of texts and textually mediated discourses (Smith, 2012). Ideological codes provide a discursive framework that organizes people’s talk and actions, and to which people hold themselves accountable” (Nilsen, 2021, p. 366).

Institutional capture: “can occur when both informant and researcher are familiar with institutional discourse, know how to speak it, and hence can easily lose touch with the informant’s experientially based knowledge” (Smith, 2005, p. 225).

Disjuncture: “different versions of reality – knowing something from a ruling versus an experiential perspective” (Campbell & Gregor, 2002, p. 48). Differences between what is supposed to happen and what actually happens.

Work: the daily actions and activities of people that take time and effort, is done under definite conditions and is not always equivalent to paid labor (Smith, 2005). These daily actions and activities are socially organized by ruling relations (Campbell & Gregor, 2002).

Feminist Standpoint: a theoretical framework that situates knowledge in women’s experiences to examine knowledge-power structures that can contribute to women’s marginalization (Harding, 2004, 2009; Hesse-Biber, 2014; Smith, 2005).

Gender: a socially constructed identity; “it is produced by interactions with others rather than being a ‘natural’ quality of the body” (Kessler & McKenna, 2006, p. 165). Gender is also considered a repetitive performance of acts to construct a social identity (Butler, 1988). Gender is different from biological sex and does not exist as a binary but is instead a

spectrum that fluidly differentiates between masculinity and femininity and may or may not correspond to an individual's sex assigned at birth.

Institution: "functional complexes" (Smith, 2005, p. 68); the complexes of an organization that are organized around a particular function.

Intersectionality: a framework that addresses the multiple dimensions of social identity and social contexts, how those intersect with one another, and how they relate to structures of inequality such as racism, classism, sexism, etc. (Crenshaw, 1991). Intersectional identities include race, social class, gender, sexual orientation and identity, ability and/or disability status, age, socioeconomic status, religion or spirituality, ethnicity, national origin, among others. Intersectional identities can also include varying privileged contexts that intersect with oppression (Collins & Bilge, 2016).

Problematic: the focus of institutional ethnography is on how people participate in institutional relations and is framed through the standpoint of people who work within the institution of interest (Campbell & Gregor, 2004; Smith, 2005).

Ruling Relations: "objectified forms of consciousness and organization, constituted externally to particular people and places, creating and relying on textually based realities" (Smith, 2005, p. 227); "the socially-organized exercise of power that shapes people's actions and their lives" (Campbell & Gregor, 2002, p. 32)

Translocal: "outside of the boundaries of one's everyday experience" (Campbell & Gregor, 2002, p. 29)

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CHAPTER II

STEM INSTITUTIONAL DISCOURSES AND THE IDEAL GRADUATE STUDENT

Women are well represented in biological science higher education programs compared to other science, technology, engineering, and mathematics (STEM) programs. Women make up over 60% of undergraduates and over 50% of graduate students in biological sciences, however, the numbers begin to decrease as women get into postdoctoral and faculty positions (Adamo, 2013; Cheryan et al., 2017; Eddy & Brownell, 2016; Grogan, 2019; Martinez et al., 2007; Sax et al., 2018). Although biology is considered a gender-balanced field, women are 10-20% less likely to obtain a faculty position in biology than men (Grogan, 2019), are underrepresented in certain subfields, such as computational biology (Adamo, 2013; Bonham & Stefan, 2017; Dizney et al., 2019; Hempenstall et al., 2019), and publish less as lead author compared to their man peers and colleagues (Epstein & Lachmann, 2018; Walker, 2018). This suggests the climate in biology may still be chilly towards women despite the increased number of women pursuing biology.

Research on the gendered structure of STEM higher education has focused on the masculine nature of fields with a higher representation of men, such as computer science, physics, engineering, geology, agriculture, and mathematics (Fairchild et al., 2021; Friedensen et al., 2020; Gonsalves, 2014; Hart, 2016; Mars & Hart, 2017; Parson et al., 2021; Parson & Ozaki, 2018; Steele et al., 2020). These studies point to gendered discourses and ideals that favor men and masculine characteristics over women and feminine characteristics to be successful in STEM. While the field of biological sciences is considered gender-balanced with more women than men pursuing undergraduate and graduate degrees in biology (Sax et al., 2018), gendered discourses and ideals may still be prevalent, albeit more subtle, in biological sciences than other

STEM fields. Gender gaps continue to persist in biology despite the increase in women (Ballen et al., 2017; Barthelemy et al., 2015; Eddy et al., 2014; Ferreira, 2003), and other studies have shown subtle and overt gender biases in fields with a higher representation of women (Cabay et al., 2018; Maher et al., 2019, 2020). Therefore, examining how gendered discourses and ideals may contribute to the persistent gender gaps and bias in biological sciences is critical for improving women's persistence in advanced careers.

The purpose of this study was to better understand how STEM institutional discourses coordinated the experiences of women doctoral students in biology and if and how those institutional discourses created challenges for women as they pursued their PhD. The field of biology provides a unique opportunity to study the gendered nature of STEM graduate education because women's enrollment has exceeded men's at the undergraduate and graduate levels (Sax et al., 2018). Framed through Acker's (1990; 2012) theory of gendered organizations, I sought to examine how gendered STEM institutional discourses were present in a STEM field that has a higher representation of women. Additionally, my goal was to understand how the concept of the "ideal graduate student" was constructed through the everyday work and expectations of a graduate student in biology. Then, I sought to uncover if and how the expectations of the ideal graduate student created challenges for women doctoral students in biology and if those expectations were gendered.

STEM Education as a Gendered Organization

Feminist scholars argue that the culture of STEM is inherently masculine in its structure, epistemology, and methodology (Blickenstaff, 2005; Parson & Ozaki, 2018; Sallee, 2014; Seron et al., 2018). Some scientific fields may be more masculine than others, and the masculinity of STEM fields exists on a spectrum (Blickenstaff, 2005). For example, engineering and

mathematics are viewed as more masculine than biology. The structures, values, and behaviors in some STEM fields privilege masculine characteristics in their community. For example, Sallee (2014) argued that the values in an aerospace and mechanical engineering department are masculine in nature and privileged competition, hierarchy, and the objectification of women as appropriate behaviors. Students were socialized into a culture that was inherently biased against women and modeled aggressive and competitive behaviors as appropriate. Similarly, Parson and Ozaki (2017) examined the gendered STEM institution and how women undergraduate students experienced gendered ideals in STEM. They showed that the ideal STEM student is gendered because the characteristics mentioned by women students as “ideal” reflected the characteristics of an unencumbered man worker. These characteristics included the willingness to speak up, a willingness to fail, and devotion of time to coursework (Parson & Ozaki, 2018). Independence and competition are also masculine ideals for students since students are expected to learn on their own and compete (Leathwood, 2006; Sallee, 2014; Sanabria & Penner, 2017). Women may find it difficult to meet these standards, which can contribute to a decreased sense of belonging for women in STEM fields.

The inherent masculinization of STEM culture socializes students to believe these are the characteristics valued in STEM, and thus women that do not fit in with those standards may feel incompatible with STEM and choose to leave or persist. The gendered structures of STEM can create barriers for women to persist in STEM as they progress along the academic or professional pathway. Understanding how these barriers interact to marginalize women is important for moving forward with work on changing the culture and values within STEM to be more welcoming toward women. Most of the research on gendered structures and organizations in STEM focus on undergraduate STEM education, but graduate education and higher education,

in general, would benefit from more research on gendered organizations and the influence of masculine ideals on women in graduate programs.

Gendered Experiences in Graduate School

While graduate school is a challenging experience for most students, women have reported dissatisfaction with their overall experiences in STEM education and the chilly climate as barriers to their success in graduate school (Chao & Cohoon, 2010; Cohoon et al., 2009; De Welde & Laursen, 2011; Litzler et al., 2005). The chilly climate is described as an environment where individuals are not treated equally or fairly, which results in individuals feeling like they do not belong (Blackburn, 2017). Components of the chilly climate within graduate school manifest as a gendered experience for women; a majority of the cultural and climate issues within STEM institutions disproportionately impact individuals that identify as women while elevating or supporting men (Banchefsky et al., 2016; Cohoon et al., 2009; De Welde & Laursen, 2011; Grogan, 2019; Logel et al., 2009; Mansfield et al., 2019). For example, in a study on women's experiences in science and engineering doctoral programs, women participants were more likely than men to report feeling isolated, managing a greater workload, maintaining a quicker pace, and experiencing gender discrimination in STEM graduate school programs (Litzler et al., 2005). Altogether, gender bias and a chilly climate in graduate school influence decisions related to pursuing a career in academia or the STEM workforce, pushing women away from the field and decreasing diversity of thought and experience in the workforce.

It has been argued that although STEM is typically presented as gender-neutral, the characteristics used to describe scientists are masculine traits (Gonsalves, 2014). Practices within STEM claim to be gender-neutral by "neutralizing interactions and identity categories that are fundamentally masculine," however, by packaging traits that are fundamentally masculine as

gender-neutral, women who do not perform masculinity are discouraged from persisting in the sciences (Gonsalves, 2014, p. 466; Sallee, 2014). For example, Sallee (2014) found that women who displayed stereotypically feminine characteristics in STEM settings were discouraged or devalued, implicitly informing women that those characteristics were not appropriate behaviors for a scientist (Gardner, 2008; Sallee, 2014). Indeed, some women experienced a contradiction between their identity as a woman and their identity as a scientist (Gonsalves, 2014; Goldman, 2012).

Gendered Ideals in Higher Education

Gendered ideals within higher education have been described across fields of study and professional careers. Higher education programs communicate to students what behaviors, attitudes, norms, and values are appropriate to be successful in their field, and this is especially true for STEM fields and advanced academic career stages (Friedensen et al., 2020; Hart, 2016; Lund, 2012; Parson et al., 2021; Wong et al., 2021). Previous research has sought to uncover the discourses that construct "ideals" within higher education and STEM. Broadly, ideals constitute the desirable characteristics of an individual within a specific context (Wong et al., 2021a). For example, Wong et al., (2021) identified eight dimensions of the ideal university student that reflected academic and personal skills. These domains included diligence and engagement, organization and discipline, reflection and innovation, positive and confident outlook, supportive of others, academic skills, employability skills, and intelligence and strategic approach. Within these domains, some of the characteristics of the ideal university student included a strong work ethic, prepared and punctual, thoughtful, positive, helpful to others, and someone clever, focused, and capable (Wong et al., 2021). Similarly, the ideal STEM student was described as someone independent, prioritized school, competent in their field, and was willing to take risks

and ask questions (Friedensen et al., 2020; Leathwood, 2006; Parson & Ozaki, 2018). The ideal scientist was someone who had a natural ability for STEM work and thought, was curious, and performed high-quality work (Friedensen et al., 2020; Parson et al., 2021). Similarly, other studies explored how gender and ideals are reproduced in faculty careers, such that the ideal academic publishes research in high-quality journals, is productive with research and secures external funding (Hart, 2016; Lund, 2012). These characteristics are framed as neutral and normal, but instead reflect gendered expectations as masculine traits are often associated with the characteristics of the ideal over feminine traits (Acker, 2012; Gonsalves, 2014; Parson et al., 2021).

In this study, I aimed to better understand how institutional discourses in STEM coordinated the work of women PhD students in biology by examining how those discourses characterized the ideal graduate student and how those characteristics were similar and different to the previously described ideal student and ideal scientist/academic. I then sought to understand how the characteristics of the ideal graduate student created challenges for women PhD students in biology and if and how the discourse of the ideal graduate student was gendered.

Theoretical Framework

This study was framed through Acker's (1990; 2012) theory of gendered organizations to examine how STEM institutional processes, practices, and discourses informed the experiences of women PhD students in biology. Organizations and their corresponding practices are inherently gendered and explicitly and/or implicitly favor one gender over the other (Acker, 1990, 2012; Britton & Logan, 2008; Lester, 2008; Mars & Hart, 2017). Three substructures produce and maintain gender in organizations: gendered subtexts, organizational logic, and the ideal worker (Hart, 2016; Mars & Hart, 2017; Parson et al., 2021). Gendered subtexts refer to the

texts and discourses within an organization that appear to be neutral, but upon further inspection, are gendered (Hart, 2016). These subtexts shape organizational practices and policies in a way that can favor men (Acker, 2012; Mars & Hart, 2017). Organizational logic is a part of the gendered subtext and refers to the common understandings of how an organization works and the way work is done (Acker, 2012; Hart, 2016). For example, centering university faculty work around research, teaching, and service would be considered organizational logic (Hart, 2016). Finally, in a gendered organization, the ideal worker presumes a gender-neutral, unencumbered worker with no outside obligations, but because men are more likely than women to meet the standards of the ideal worker, the ideal is not gender neutral (Acker, 2012).

Methods

Through the theoretical framework of gendered organizations (Acker, 1990; 2012), the purpose of this study was to examine the institutional discourses and the STEM educational norms and values of graduate STEM education from the standpoint of women PhD students in biological sciences at a Southern Research University (Smith, 2005).

This study used institutional ethnography to answer the following research questions:

1. What STEM institutional discourses and educational norms and values coordinated the experiences of women PhD students in biological sciences at SU?
2. What, if any, challenges did women PhD students experience because of these STEM institutional discourses? Where did these challenges emerge?

Participants

I used purposive and snowball sampling methods to recruit study participants. In fall 2020, I reached out to prospective participants via a graduate student listserv. Prospective participants included graduate students in master's thesis or doctoral programs in biological

sciences at a Southern Research University (pseudonym SU). Graduate students participated in three interviews throughout the fall 2020 and spring 2021 semesters to gain a comprehensive understanding of the daily work of graduate students and how those changed over time.

Additionally, I identified faculty participants through interviews with the graduate student participants. Faculty were included in this research due to their knowledge about the processes that inform graduate student education (Campbell & Gregor, 2004; DeVault & McCoy, 2014; Smith, 2005). Because this institutional ethnography focused on the experiences of women students as a point through which to view the institution, emphasis was placed on recruiting women students for participation. Participants included 6 women PhD students in biological sciences and 2 faculty members (see Table 1 and Table 2 for participant descriptions).

Table 2.1
Graduate Student Participants

Pseudonym	Degree Program	Year in Graduate School	Career Interests
Sophie	PhD	3	Government/ Industry Research
Junie	PhD	2	Faculty
Jordyn	PhD	3	Teaching Faculty
Charlotte	PhD	3	Industry Research
Amelia	PhD	1	Faculty
M	PhD	1	Faculty

Table 2.2
Faculty Participants

Pseudonym	Position	Concentration
Carol	Professor	Ecology
Victoria	Associate Professor	Ecology

Data Collection

I followed institutional ethnographic data collection procedures to examine the STEM institutional discourses, norms, and values through the standpoint of women graduate students in

biology. This involved the collection of two types of data: entry-level data and level-two data (Campbell & Gregor, 2004; Smith, 2005). Entry-level data included information about the local setting, the individuals, and their experiences whereas level-two data investigated how the setting works through organizational processes that may not be readily visible to participants (Campbell & Gregor, 2004). To collect entry-level data, I conducted 18 semi-structured interviews with graduate women in biological sciences and asked them to describe their everyday work and experiences as graduate students. The interview questions focused on what constituted their day-to-day activities and what they needed to know or do to be successful in graduate school. Data collection and analysis occurred simultaneously during the interview and transcription process to inform the collection of level-two data, which I used to understand how women's experiences within graduate school were organized (Campbell & Gregor, 2004). To collect level-two data, I conducted additional interviews with graduate student participants and faculty members and collected institutional texts including department handbooks, graduate-level course syllabi, and institutional requirements and policies from SU's website.

Data Analysis

Data analysis began immediately upon data collection and transcription of interviews with analytical memos (Campbell & Gregor, 2004; Hesse-Biber, 2014). During the interview process, I took notes on salient events and experiences. I transcribed interviews verbatim immediately after they were completed using the Otter.ai transcription software (Otter.ai, 2020). I performed quality checks for each transcription to ensure accuracy. I also took notes in the form of analytical memos to note any emergent themes or important information during the transcription process. Once an interview was fully transcribed and the first stage of data

collection and analysis was complete, I uploaded each interview into Atlas.ti, a qualitative data analysis software, for subsequent data analysis and coding.

Data analysis in institutional ethnography is an iterative process that involves uncovering an emergent problematic and following the thread (Campbell & Gregor, 2004). My analysis followed the analytical methods of critical ethnographic research outlined by Carspecken (1996) and I used Acker's (1990; 2012) theory of gendered organizations with a specific focus on the construct of the "ideal worker" as an analytical lens. This type of analysis began with low-level coding, which followed closely with the actual events described by the participants (Carspecken, 1996). Low-level codes included open, structural, and process coding as I first identified the actions and activities that constituted the day-to-day activities and experiences of women graduate students in biology (Saldaña, 2016). Low-level codes involved descriptions of graduate student work, such as lab and/or fieldwork, teaching and research responsibilities, coursework, meetings, and interactions with peers.

Low-level coding then led to high-level coding, which involved higher levels of abstraction to generalize findings and reconstruct meaning (Carspecken, 1996). The low-level codes informed future data analysis of the policies, processes, texts, norms, and expectations associated with the coordination of a graduate student's everyday work in biology. High-level codes involved identifying aspects of graduate students' everyday work that is coordinated by processes that are outside of their knowledge, such as discourses, policies, procedures, and institutional norms and values (Campbell & Gregor, 2004; Smith, 2005). High-level coding was guided by my research questions, namely what institutional discourses coordinated the everyday work of biology graduate students and what, if any, challenges did they experience. I reviewed the interview transcriptions and institutional texts and recoded passages that referred to the

actions, characteristics, norms, and values of a successful graduate student in biology. These high-level codes focused on the institutional discourses, norms, and values that characterized the ideal graduate student. For example, high-level codes included “Prioritizes Research,” “Adequate Scientific Background,” “Asks Good Scientific Questions,” “Self-Motivated,” “Imposter Syndrome,” “Fear of Failure,” and “Stress and Anxiety.”

The final stage of the data analysis process involved code reorganization (Carspecken, 1996). The low-level and high-level coding process resulted in redundant and intersecting raw codes that I reorganized into a hierarchical scheme (Carspecken, 1996). Code reorganization involved grouping codes together into a few large categories and was done via code mapping and code diagramming (Campbell & Gregor, 2004; Smith, 2005). Figure 2 (Appendix H) shows the code reorganization map for the Ideal Graduate Student. Finally, the categories were reorganized into two emerging themes: 1) the characteristics of the ideal graduate student, and 2) the challenges participants experienced meeting the characteristics of the ideal graduate student.

Trustworthiness and Validity

I used several data collection and analysis methods to ensure trustworthiness and validity of my study. First, by using multiple methods of data collection (3 interviews each with student participants, interviews with faculty members, textual analyses of policies, handbooks, syllabi, lab guidelines, etc.) I ensured that I had rich data and a holistic understanding of the daily activities of graduate students in biology and how their activities were organized (Onwuegbuzie & Leech, 2007). Furthermore, by interviewing participants from diverse backgrounds (race/ethnicity, age, gender, etc.), and including participants from different stages in the doctoral degree process with different academic backgrounds, I was able to assess student experiences and ensure thick description of the experiences and institutional processes, procedures, and

discourses that organize the everyday work of graduate students (Campbell & Gregor, 2004; Onwuegbuzie & Leech, 2007; Smith, 2005). I also triangulated the findings of my study with the current literature to make sure my findings were substantiated by the literature (Onwuegbuzie & Leech, 2007). Given that data collection and analysis is an iterative process that builds upon itself in institutional ethnography, I was able to follow up with participants and ask clarifying questions in subsequent interviews during the data collection process as a member-checking methodology to ensure my data is rich and accurate to the student's experiences (Campbell & Gregor, 2004). Finally, I created an audit trail throughout each step of the research process, which included raw data, a researcher journal, and analytical memos (Onwuegbuzie & Leech, 2007; Saldaña, 2016).

Considerations

Although I take on the perspective of women PhD students in biology, they are not the objects of my investigation. Instead, the focus of this chapter was on the institutional processes, practices, and discourses that informed the everyday lives of women PhD students. I used graduate women's experiences as the entry point for exploring the invisible social relations that organized their experiences. Therefore, the findings of this study cannot be generalized to the entire population of biological sciences and STEM graduate students since it is limited to the time of the study and this setting. However, it is anticipated that the findings of this study could be applied to similar situations within biological sciences or other STEM disciplines and that recommendations for equity and inclusion for STEM could be developed from this research. Furthermore, although the initial focus of this study was on gendered experiences within STEM graduate education, the intersectionality of social identities cannot be ignored (Crenshaw, 1991; Gaston Gayles & Smith, 2018). The intersection of race and gender was prevalent within some

participants' experiences, so it is imperative to embed intersectionality within the analysis and continue to decenter whiteness from feminist research.

Findings

Acker's (1990, 2012) theory of gendered organizations informed the exploration of institutional discourses that informed the everyday work of the women PhD students in this study. First, I define the characteristics of the ideal graduate student based on descriptions from graduate students and faculty participants, and institutional texts. Graduate student participants, faculty members, and institutional texts described the characteristics of the ideal graduate student as someone who has an adequate scientific background, prioritizes research, is good at managing their time and responsibilities, is willing to ask questions, and is self-motivated. Second, I describe how the expectations outlined by the discourse of the ideal graduate student created challenges for participants. Participants described challenges meeting the expectations of the ideal graduate student such as a fear of failure and imposter syndrome.

The Characteristics of the Ideal Graduate Student

Through conversations with graduate students and faculty about their everyday work and the characteristics of a successful graduate student, I learned about the standards graduate students are expected to meet and identified the characteristics of the ideal graduate student. Because the purpose of graduate school is to prepare students to become future professionals and further their scientific training (Austin, 2002; Fox, 2001), there was some overlap in the characteristics of the ideal graduate student and the ideal academic/scientist, and I discuss how those characteristics were similar or different in the findings and discussion (Table 2.3). The ideal graduate student was defined as someone who has an adequate scientific background,

prioritizes research, manages time and responsibilities well, was willing to ask questions, was independent, and was self-motivated.

Adequate Scientific Background

First, faculty members described the characteristics of the ideal graduate student as someone who had an adequate background in research and knowledge of biology. For example, Victoria, a faculty member in the department, explained how she liked students who had previous research experience because it showed that they understood the scientific process. Admissions requirements for the biology graduate program at SU also reinforced this expectation, as prospective graduate students were expected to write in their personal statements about their previous research experience. Victoria explained how prospective student's application materials were used to demonstrate their previous experience with research, "[we] would be looking for research experience and kind of how much and different things that they did... it really shows that you know that they acquired some skills and have a good understanding of the processes of science." Personal statements and letters of recommendation were used to determine if prospective students had previous research experience and an understanding of the scientific process. Carol, another faculty participant, also explained how she found students with previous research experience valuable because they may bring in new skills and ideas to her research lab.

Graduate students were also expected to have background knowledge of biology and science, as described by admissions requirements for the program. Incoming graduate students were required to take genetics, organic chemistry, physics, and calculus in their undergraduate degree to be accepted into the program. Furthermore, institutional documents stated that a graduate student was required to make up those courses in the first year of their program if they

were missing or did not have an equivalent course at their undergraduate institution. The institutional documents reviewed labeled these as “course deficiencies” although graduate students were able to take these courses during the first year of their program. One of the graduate student participants recognized how impactful the label of “course deficiencies” was on her graduate school experience. Jordyn, a third-year PhD student, explained how she spent the first year and a half of her PhD making up courses. She explained that because her undergraduate university was an HBCU, it did not have the same access to resources that SU had, and therefore did not have all the required classes she needed for grad school. She explained:

There was a lot of classes that I had to kind of substitute for applying to SU because we didn't have that. And I also had to sit in on some classes at SU because I didn't have that at my school as well.

Jordyn felt like she arrived at SU with an inadequate background compared to her peers because she did not have the same access to biology courses and was considered behind. This placed a lot of pressure on Jordyn to catch up to her peers. Jordyn further explained how her course deficiency contributed to her feelings of imposter syndrome:

I felt like I was coming from an undergrad, I didn't have as many resources as other grad students. So, I felt kind of like... imposter syndrome like when you know you capable of doing it but because you didn't have so and so, like background knowledge, you kind of feel not as capable.

Jordyn felt like she was behind her peers in building her scientific knowledge because she did not have the same background as other graduate students and had to make up a lot of undergraduate courses during the first year of her PhD.

Prioritizes Research

In addition to an adequate scientific background, the ideal graduate student was described by students, faculty, and institutional documents as someone who prioritized their research above all else. Graduate students were expected to spend most of their time working on their research. This meant that graduate students needed to match their research interests with their advisor and dissertation committee members so they could receive the support they needed to prioritize research. For example, Charlotte explained how she selected her advisor based on their shared research interests and needs:

My advisor wanted someone who had a genetics background and had this behavior project set up for a PhD student and I had a background in genomics, for my master's degree, and wanted to get back in behavior. So, it's just kind of a good fit.

Charlotte felt that her advisor was a good fit because their research interests matched up well. Similarly, Sophie, another PhD student, explained how research alignment was important for selecting committee members to get the most support for her dissertation. She explained:

Research is first. So, one aspect is you do want to make sure that your research is aligned and that they're able to help you with your research questions and coming up with your experiments and telling you this might go wrong, or when reviewers might not like this... you do want the research to align.

For Sophie, and the other graduate students, research alignment meant that graduate students were getting the most support from their advisors and committee members to make progress on their research. Additionally, the participants described how they selected their coursework to align with their research interests and needs for their dissertations. Courses were treated as

another way to support their research by providing the content knowledge they needed to conduct scientific research.

Graduate students were expected to prioritize their research over other work, such as coursework and teaching. For example, Junie explained how she prioritized her research because her graduation depended on completing research:

The research is more important because my research... one, pays my way but two, it also its what's going to hold me up from graduating, because I got my master's, so I have half of my PhD credits already transferred over. So that means I'm not super worried about class, but my money and my timeline are dependent on research.

Junie prioritized her research over her coursework because she was getting paid to do research, and she recognized that doing research was the one thing keeping her from graduating. The expectation to prioritize research was supported by lab expectations given to graduate students. The lab expectations reviewed stated that research should take priority over coursework, which meant that Junie scheduled her time to maximize her research progress but still do well in her courses. Similarly, Sophie was able to prioritize her research work during the fall semester because all her courses were online. She explained, "it's been really nice that I can save most of my daylight hours for research and class at a different time." Sophie was able to spend the day working on research in the lab because she could spend the evenings or weekends working on her coursework.

Finally, research was considered a priority based on how graduate students were evaluated on their annual progress. Faculty and graduate student participants and institutional documents described an annual review process that was used to assess students' progress in their research and degree completion requirements. According to the graduate student handbook,

graduate students were ranked from 1 to 5, with a 1 indicating the student was making insufficient progress and failing their courses, and a 5 meant that the student was exceptional and had major accomplishments regarding research. Jordyn explained how the ranking process prioritized research activities over all other activities a graduate student was expected to do, “With the committee ranking thing, like, you got to submit a grant, you got to be on a publication... they don't even care about teaching but hell, you need to teach to live.” The accomplishments that warranted a 4 or a 5 in the annual review revolved around research activities such as submitting a grant, presenting research at a conference, publishing a research article, or receiving an award for outstanding achievement. Teaching was not considered one of the criteria for significant progress even though one of the main responsibilities of most graduate students was teaching. Therefore, graduate students had to prioritize making progress on their research despite all other responsibilities.

Manages Time and Responsibilities Well

The ideal graduate student was also described as someone good at managing their time. Graduate student participants were expected to prioritize their work around research, teaching, and coursework, which meant they needed to be good at time and project management. Although research was the primary focus of the participants, they had other competing responsibilities that they had to be able to manage with limited time and resources.

The participant’s everyday work centered around research, teaching, and coursework, and with that came multiple responsibilities and projects that they had to manage. The ideal graduate student was described as someone who could manage multiple competing tasks and still be productive. Indeed, written expectations for PhD students explained “I expect students to manage their time efficiently and to think hard about priorities so that their multiple tasks are performed

well.” Graduate students’ multiple responsibilities competed for time, and so graduate students needed to be able to manage their time efficiently to meet deadlines and make progress on their research. Junie explained how she saw time and project management as an important skill for graduate students, “I would guess that if you’re not very good at managing your time or chunking huge projects down that you’d really struggle.” She recognized that time and project management were important skills for graduate students to develop and planned her schedule in a way that made her the most productive and able to complete all her tasks. Similarly, M and Charlotte explained how they used time blocking and a strict schedule to be able to stay on top of their work.

Willing to Ask Questions

Faculty and graduate student participants also described the ideal graduate student as someone who was willing to ask good questions. Asking questions to gather more information or initiate the scientific process was considered the hallmark of being a good graduate student and thus a good scientist. For example, M explained how she considered asking questions as a characteristic of a good scientist:

I think anyone that asks a question and formulates a way to answer it would be considered a scientist. I don’t think there’s any cookie-cutter person who can or can’t be a scientist. It’s like a runner, you know like if you run, you’re a runner... I think that’s how science is too. Like if you think about it and you want to do it, then you’re a scientist.

M considered someone a scientist as a person who follows the scientific method and asks questions, similar to how anyone who runs is considered a runner. Charlotte agreed that asking questions and applying the scientific method made someone a scientist:

Being a scientist is just someone who asks questions, which, again is kind of cheesy philosophy answer but like, if you ask questions, apply the scientific method, I think you can be considered a scientist. Whether you're a good one or not depends on how you go about answering that question and then I think how you communicate about it.

Charlotte added the caveat that although asking questions and applying the scientific method made someone a scientist, whether you were a good scientist depended upon *how* you answered scientific questions, suggesting that a good scientist asks questions and applies the scientific method in a certain way to be considered good.

Some of the participants struggled with the expectation to be willing to ask questions to be a good graduate student and a good scientist. For example, Amelia explained how she struggled with reading the literature and coming up with research questions for her doctoral work:

Ariel: What do you think a good graduate student should be?

Amelia: I mean, they tell us that we should be reading all of [the literature] for the first year, first semester... to try to come up with a question or with a topic for research. And it's like, you'll never find the time... I mean you find time for reading but myself I find that maybe I don't read that much or what I think is a lot is not actually a lot.

Amelia associated spending time reading scientific literature and coming up with research questions as a quality of a good graduate student, and she felt like she had a hard time keeping up with that expectation. Reading the research literature and asking questions was important for graduate students to develop their research interests which is a priority for graduate students to be successful in their degree.

The ideal of being willing to ask good questions was also demonstrated by participants in how they sought out information about their work from their peers, advisors, and committee members. The participants described how the primary way they gathered information and learned about how to be successful in graduate school was by frequently asking questions. For example, Junie explained how she would ask other graduate students or her committee members for advice if she did not know something or could not find the answer out on her own.

Self-motivated

The ideal graduate student was also described as someone who was self-motivated. Participants and institutional texts described the expectation that graduate students are self-motivated and can work independently. For example, a set of lab expectations explained “Graduate school is a self-directed experience and students must take responsibility for their education.” The ideal graduate student is expected to take charge of their education and become an independent thinker and scholar. This was emphasized in the PhD student expectations and participant experiences where they oversaw selecting their coursework, research ideas, and committee members with some guidance from their advisors.

Faculty member Victoria explained how she gives her graduate students a considerable amount of independence and expected them to be continually making progress on their work without much help from her. However, Victoria also recognized that her students needed different amounts of help based on their needs and previous experiences. She explained, “I try to adjust to each student based off of how much help they need... some of them need very little, right. And others need a lot.” Victoria was able to adjust her advising to focus on her student’s needs but also expected a level of independence in their work. Carol, another faculty member, also valued independence as a characteristic of her students because each of the graduate

students she advised worked in different systems and had different research interests, and thus needed to be independent enough to lead their own projects and make decisions.

Challenges Meeting the “Ideal” Graduate Student Standards

The ideal graduate student was described as someone who has an adequate scientific background, prioritizes research, can manage their time and responsibilities well, asks good questions, and is self-driven. However, participants reported challenges with meeting some of the characteristics of the ideal graduate student. Graduate women participants described the fears and pressure they experienced to keep up with expectations and how that impacted their sense of belonging at SU.

Fear of Failure

Despite the characteristics of the ideal graduate student, such as a willingness to ask questions, graduate participants expressed a fear of failure in their graduate education. Although the participants were considered high-achieving graduate students, they feared appearing unprofessional or incompetent. Failure was described as not knowing answers or sounding smart enough in written and verbal communication, failing graduate school, and not being prepared for a future career. Jordyn described how her fear of failure affected her desire to reach out for help with her research projects because she was worried that asking for help made it look like she was not smart enough to be there. Jordyn explained:

I do need to ask more help from the other professor. I think that's where I'm falling short, is asking him for help' ...cause when you go into a different lab, you kind of want to have your shit together... and the idea of not having it together when you come into somebody else's lab is intimidating.

Jordyn felt like she had to appear put together and like she knew everything before she asked for help. Fear of failure also manifested in a similar way for other participants. Junie was worried that asking her committee questions about the proposal and qualifying exam process was “unprofessional.” Junie was preparing for a meeting with her committee and reading over the graduate student handbook during one of our interviews when she brought up her concern about appearing unprofessional for asking questions. Junie was comfortable with asking her advisor questions about graduate school expectations and research but feared she would be viewed as unprofessional by her committee. She explained:

You’re just supposed to ask your committee what they expect from you... how formal is that supposed to be because I’m not just going to send three professors an email that’s like, “Yo, what do I need to do for this,” you know. [laughs] That’s some of the confusing stuff and a barrier between like should I send out an email demonstrating I don’t know this information, even though I’ve been trying to figure out this information. Is that unprofessional? Is that gonna make my committee think that I’m not prepared or is that what a committee is for?

Junie feared looking unprofessional in front of her committee because she did not want to appear unprepared for her graduate degree. This sentiment was supported by Jordyn, who feared failing her proposal seminar because she did not sound smart enough. Jordyn explained, “I was overprocessing my proposal... is this smart enough? Am I making my point valid? Is it clear? Are they going to be confused? I get anxiety, and I just close it out.” Writing a dissertation proposal and presenting it to an advisory committee is an important step to becoming a PhD candidate. Jordyn’s fear of failure stemmed from her assumption that she did not have an adequate background in research and thus wanted to prove she belonged.

Fear of failure also manifested in anxiety about failing graduate school. Participants described how they worried they would mess up and get kicked out of graduate school. For example, both Jordyn and Junie expressed their greatest fear was failing a major milestone, like their qualifying exams. Jordyn explained, "I am literally terrified of failing or being unsuccessful in my PhD program. It so happens that one of those fears consists of finishing my proposal for my preliminary exams." Junie's response to the fear of failure was to work harder. She assumed if she was productive, she would not fail out of graduate school, which was her greatest fear.

Finally, participants were worried that they would not be prepared for their future careers, which some constituted as a failure. Junie was worried about her future postdoc and faculty career because she did not have experience designing a research project from beginning to end. She explained, "if I were to go off after this for a postdoc or an assistant professor job, I wouldn't be prepared to do that. I'd have no experience doing that. Maybe I'd be prepared but I wouldn't have done it before." Junie found her lack of research design experience concerning because she did not want to appear unprofessional or incompetent, especially whenever she started a postdoc or faculty position.

Imposter Syndrome

Similar to fear of failure, participants expressed the imposter syndrome they experienced as they tried to meet the standards of the ideal graduate student and their PhD expectations. For some of the participants, their imposter syndrome corresponded with feeling good enough to do scientific work. For example, Amelia expressed concern for what she was capable of regarding her research. She said, "...it was very daunting, like what could I bring to this topic? Is it really new or is it... like it was really difficult for me to see how it can be turned into a point of view that could be new or useful." Amelia felt pressure from her graduate program to produce

scientific work that was new and useful, which aligned with the expectation that research was the priority. In our conversations, Amelia explained how she struggled with coming up with research ideas that she enjoyed that would also be useful, and that she felt like she was not able to do good research. Similarly, Jordyn explained how her background led to her imposter syndrome because she felt limited in what she was able to do. She explained, "I didn't have as many resources as other grad students. So, I felt imposter syndrome, like when you know you're capable of doing it because like you didn't have so and so background knowledge you kind of feel not as capable." Jordyn went to an HBCU with fewer resources and available courses compared to SU, so she had to make up a lot of courses when she started her PhD program at SU. This led Jordyn to feel like she was not as capable as the other graduate students to conduct research and led to her imposter syndrome.

Some participants compared their progress and accomplishments to other graduate students and visiting scientists, which contributed to their imposter syndrome. For example, M explained how it was hard not to compare herself to other people:

I think the biggest thing is remembering that I'm still learning. It's really hard because you see all of these great people doing great things because that's what they're showing you. But in reality, everyone is either struggling with something or they are only giving you the highlight reel. They're not giving you a whole store. So, it's like, imposter syndrome can be really daunting, especially like, I'm a perfectionist and I want to make sure that the tasks that I'm completing are to my best ability.

M was comparing herself to seminar speakers and other graduate students who have been in their positions for several years and had done a lot of scientific research she thought was cool. M even

admitted that she was aware she was only a year into her program and should not compare her progress and accomplishments to other scientists but felt it challenging to not make those comparisons. The pressure to be productive and meet the standards of an ideal graduate student that produces high-quality, interesting research, has an adequate scientific background, and is self-driven placed unnecessary stress on the participants.

Discussion

Using the theoretical framework of gendered organizations (Acker, 1990; 2012), I described the characteristics of the ideal graduate student that coordinated the work of biology graduate students and the challenges they experienced in meeting that ideal. By describing the ideal graduate student from the standpoint of those that are constituent of it, we can further untangle the STEM institutional discourses that reproduce inequalities in STEM and higher education. The findings of this study described an ideal graduate student as someone who has an adequate scientific background, prioritizes research, can manage their time well, asks good questions, and is self-driven. Participants reported challenges with meeting the standards of the ideal graduate student that contributed to a fear of failure and imposter syndrome. It is important to understand how ideals are produced and reproduced in STEM graduate programs because they provide a view into how graduate students internalize the norms and standards of their field as they progress into a professional career. Additionally, by understanding ideals in graduate education, we can further disentangle how women in STEM internalize norms and how those ideals can contribute to the chilly climate experienced by women in STEM.

The characteristics of the ideal graduate student set a standard that is not well defined but difficult to achieve. For example, although an adequate scientific background was described by participants, faculty, and institutional texts, each one had a different perception of what was

considered adequate. Participants and institutional texts focused on content knowledge and undergraduate coursework as an adequate background, while faculty viewed previous research experience as important when deciding to admit new students. Although specific undergraduate courses were required for admission, new graduate students were also allowed to make up those course deficiencies in their first year, which made defining what an adequate scientific background was difficult. However, how an adequate background was defined by participants and institutional texts assumed that incoming graduate students had access to research and appropriate coursework at their undergraduate institution. This was not always the case as evidenced by Jordyn's experience with making up coursework during the first year and a half of her PhD and not knowing how to do research on her own. Jordyn attended an HBCU for undergraduate and did not have the same access to resources as the other graduate students at SU. When it came time to start writing her proposal for her dissertation, Jordyn described feeling anxious about being perceived as smart enough to get a PhD. She explained how she felt her background was limiting her from being successful and viewed it as a deficit. Access to adequate undergraduate courses and research experience can be limited, especially for women and traditionally marginalized students in STEM, as they are more likely to attend community colleges and/or less prestigious undergraduate programs and thus may not have access to research experience (Jackson & Laanan, 2011).

The graduate student ideals described in this study also focused on research as a top priority for graduate students. Participants were expected to balance multiple responsibilities and manage their time well enough to prioritize research while still passing their classes, keeping up with teaching, and completing milestones for their PhD. Some of the participants found this challenging because they had a hard time balancing the different facets of their everyday work to

prioritize research and not sacrifice work-life balance. Managing time well to maximize research output is gendered because it assumes the individuals have no outside obligations and can dedicate all their extra time to research. This assumes an unencumbered, disembodied, abstract worker that can produce research publications and presentations as their primary work, but this is not always the case (Acker, 2012; Hart, 2016). Graduate students must balance other responsibilities such as teaching, coursework, and service work, which can often be time-consuming and can interfere with research time.

Most of the participants recognized that research was the only thing holding them back from graduating, and thus tried to prioritize any research work they had over other obligations, but it often came at the expense of work-life balance, social opportunities, and mental health. Time management was a major barrier for most of the participants, as they felt like they were being pulled in multiple directions to complete all their tasks. This made it difficult to meet the ideal because they were not always able to prioritize research. The expectation to prioritize research was a characteristic of the ideal graduate student and was also driven by the neoliberal discourse of productivity (Acker & Wagner, 2019; Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021; Museus & LePeau, 2019). This suggests that the characteristics of the ideal graduate student align with the neoliberal ideologies that guide higher education, which will be discussed in chapter 3 (Burke, 2021; Museus & LePeau, 2019; Olssen & Peters, 2007). Furthermore, while the participants in this study were full-time students and did not have outside family obligations or caretaking responsibilities, other studies on women in STEM show how outside obligations can impact time management and research productivity (Adamo, 2013; Blackburn, 2017; Blickenstaff, 2005; Hart, 2016; Liang & Lin, 2021). Women are often the primary caregivers of their families and dedicate time for care work in addition to their full-time work. This makes it

more challenging for women to meet the “ideal” of an unencumbered, disembodied worker that has unlimited time and resources to dedicate to their work and suggests that the “ideal” worker is masculine in nature (Acker, 2012).

The expectation to be self-motivated was a key characteristic of the ideal graduate student. Graduate students are training to become independent scholars and academics within their field of study, so they need to transition from a student to an independent researcher (Austin, 2002; Baker & Pifer, 2011; Fox, 2001). Written expectations for PhD students suggested that they exhaust all options and gather as much information on their own before asking for help, which made some participants reluctant to ask for help if they did not understand something. For example, Junie was nervous to ask her committee members to help her understand the qualifying exam and proposal process because she did not want to appear unprofessional or unprepared in front of her committee. The expectation to be self-motivated and self-driven appeared to contradict the expectation to ask questions, as participants were unsure of when it was appropriate to ask questions of their faculty advisor or committee members. The pressure to appear competent and prepared contradicted the expectations to ask questions and be curious. Indeed, it appeared that the expectation to ask good questions applied to asking good *scientific* questions, however, the participants interpreted that expectation to mean that all questions had to be good questions, and thus they were reluctant to ask questions when they did not understand something or wanted more guidance. The expectation to ask good questions was not worth the risk of appearing incompetent. Women in STEM experience higher pressure to appear competent in their area of expertise to be taken seriously, and experience imposter syndrome as a result (De Welde & Laursen, 2011; Griffin et al., 2015; Tao & Gloria, 2019). The participants in this study described the challenges they experienced with attempting to meet the

standards of the ideal graduate student, and that contributed to a fear of failure and imposter syndrome. They wanted to be seen and respected as scientists, and so went above and beyond to be considered competent and professional.

Fear of failure and imposter syndrome was enhanced in participants with intersecting identities. Both Jordyn and Amelia were women of color and expressed fears that they would be confirming stereotypes if they did not know everything. They experienced a greater pressure to appear competent and on top of their work compared to the other participants in the study. For example, Jordyn explained how her background put her at a disadvantage and made it feel like she was behind her peers. She also perceived she had to be extra prepared to answer questions and worried about if she was doing enough or sounded smart enough. Jordyn explained how she found herself changing the way she spoke or acted around others in the department to avoid being judged. This finding aligns with prior research on the experiences of Black graduate students who had to work twice as hard as their peers to be seen as successful (Mcgee et al., 2019; Ong et al., 2011). The characteristics of the ideal graduate student not only coordinated the work of graduate students in a gendered way but involved other identities as well, such as race. This highlights the need to further study how ideals in STEM education are intersectional and contribute to barriers for traditionally marginalized identities in STEM.

An Ideal Student or Ideal Academic?

The findings of this study support prior research that disentangled the institutional practices and discourses that described the ideal STEM student (Parson & Ozaki, 2018), the ideal scientist or engineer (Friedensen et al., 2020; Hart, 2016; Parson et al., 2021), and the ideal academic (Lund, 2012). Indeed, the expectations described for the ideal graduate student overlapped with similar expectations of the ideal STEM student, scientist, and academic (Table

3). For example, in this study, the ideal graduate student was described as someone who had an adequate scientific background, prioritized research, was willing to ask questions, could manage their time well, and was self-motivated. Some of the characteristics of the ideal graduate student aligned with the characteristics of the ideal STEM student (Parson & Ozaki, 2018). Parson and Ozaki (2018) described the ideal STEM student as someone who had an adequate background in mathematics, prioritized school, was not afraid to fail, was willing to ask questions, and demonstrated the ability for abstract thought. The ideal graduate student was expected to follow similar expectations such as having an adequate background and being independent. The expectation to have an adequate background was relatively unclear though, as the graduate student participants interpreted that to mean having appropriate coursework whereas the faculty participants interpreted it as having experience with scientific research. This created a disjuncture in the expectations, as the participants regarded their scientific content knowledge as adequate or lacking depending on what courses they previously took or needed to take. The discourse to be independent also created a disjuncture. STEM students are expected to work independently on their coursework and schoolwork; however, scientists work collaboratively in research groups or with colleagues instead of independently (Parson et al., 2021; Parson & Ozaki, 2018). The participants experienced a disjuncture between the expectation to be independent as a student but also needed to learn to be collaborative in their future role as a scientist.

Table 2.3

How the Characteristics of the Ideal Graduate Student align with the Ideal Student and the Ideal Academic

Characteristic	Ideal Student	Ideal Academic/ Scientist	Source
Adequate Scientific Background	X		(Friedensen et al., 2020; Parson & Ozaki, 2018) Faculty Participants and Institutional Texts
Prioritizes Research		X	(Hart, 2016; Liang & Lin, 2021; Lund, 2012) Institutional Texts; Graduate Student Participants
Willing to Ask Questions	X		(Parson & Ozaki, 2018) Faculty and Graduate Student Participants
Good at Time and Project Management	X	X	Graduate Student Participants (Liang & Lin, 2021; Wong et al., 2021b)
Self-Motivated	X	X	Institutional Texts; Graduate Student Participants (Parson & Ozaki, 2018; Wong et al., 2021b)
Independent	X	X	(Leathwood, 2006; Parson et al., 2021)

Alternatively, some of the characteristics of the ideal graduate student reflected the characteristics of the ideal academic or ideal scientist. For example, Parson et al. (2021) described the discourses that defined the ideal scientist as someone who is independent, has a fixed mindset about scientific ability, considers scientific knowledge is disconnected from the

real world, and has masculine characteristics. Similarly, the ideal academic was someone who published research in high-quality journals, which aligned with the expectation to prioritize research in academia as a metric of success (Lund, 2012; Liang & Lin, 2021). Graduate student participants described how they prioritized their research, worked on publishing articles, and sought external funding during their PhD program. This is similar to the expectations of the ideal scientist and academic, who prioritizes research, publishes articles, and applies for external funding as an expectation for success in academia (Acker & Wagner, 2019; Archer, 2008; Hart, 2016; Liang & Lin, 2021). However, the expectation to prioritize research conflicted with the ideal student aspect of the ideal graduate student, as the ideal student is expected to prioritize their schoolwork (Parson & Ozaki, 2018). Graduate students are in a unique position as they simultaneously fulfill the role of students while also learning to be future professionals (Austin, 2002). This places a unique set of pressures on graduate students to conform to different and often conflicting expectations to be successful. Future research should continue to examine the similarities and differences in expectations across STEM fields and institution types to describe how ideals are constructed and reinforced. Additionally, future research should work to develop an ideal graduate student concept or theory to understand how graduate students are expected to meet the expectations of a student and a future professional.

Conclusion

Beginning from the standpoint of women PhD students in biology, this study sought to uncover the institutional discourses that coordinated the everyday work of women PhD students in biological sciences. Through interviews with graduate students and faculty and the investigation of institutional texts, I identified and defined the characteristics of the ideal graduate student and described the challenges the participants experienced as they tried to meet

the standards of the ideal graduate student. This study is unique because it examines how ideals are constructed from the perspective of graduate students. The ideal graduate student is difficult to achieve and contributes to feelings of failure and imposter syndrome for women students. Understanding and revisiting the expectations of the ideal graduate student is critical for improving STEM education to be more inclusive to women and traditionally marginalized students.

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CHAPTER III

“TRIAL BY FIRE:” NEOLIBERAL DISCOURSES THAT COORDINATED THE EXPERIENCES OF WOMEN PHD STUDENTS IN BIOLOGY

Graduate students begin learning the norms and values of the neoliberal university early on as the expectations of skill development and career preparation in graduate school focus on research productivity, quantifiable outputs through publications, grants, and conference presentations, and competition (Austin, 2002; Caretta et al., 2018; Museus & LePeau, 2019). The positive and negative impacts of neoliberalism on higher education are well documented (Acker & Wagner, 2019; Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021; Lorenz, 2012; Museus & LePeau, 2019; Olssen & Peters, 2007; Parson, 2018). Undergraduate, graduate students, and faculty face similar pressures within the neoliberal higher education context, but these show up in different ways. For example, undergraduate students may experience pressure to complete their degrees within four years, which can create conflicts for majors that needed more than four years (e.g., engineering and physics; Parson, 2018). Similarly, faculty experience pressures to balance their work across research, teaching, and service in addition to publishing, applying for external funding, and presenting at conferences, which can create challenges with work-life balance, belonging, and sense of purpose (Acker & Wagner, 2019; Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021; Museus & LePeau, 2019). However, graduate students are in a unique position because they are simultaneously fulfilling their role as a student and as future professionals (Austin, 2002) and may experience neoliberal expectations differently. Therefore, this study expands on the current literature by examining how neoliberal discourses, practices, and procedures coordinated the everyday work and experiences of PhD students in biology, what

challenges they encountered due to those neoliberal discourses, practices, and procedures, and if those experiences are gendered.

Neoliberalism in Higher Education

Neoliberalism has been of significant interest to researchers since it became the management style of higher education in the 1980s (Lorenz, 2012). Neoliberalism is a meta-ideology or ideological discourse (Smith, 2005) that uses market-oriented logic, management practices in the form of auditing and measurement systems, businesslike competition, and intense accountability for productivity and performativity in higher education (Acker & Wagner, 2019; Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021; Lorenz, 2012; Lynch, 2015). Under neoliberalism, higher education is viewed as a private commodity, rather than a public good, and is subject to market demands and activities that generate revenue (Museus & LePeau, 2019; Olssen & Peters, 2007). The central tenets of neoliberalism emphasize consumerism, competitive individualism, surveillance, and the free market to shape the expectations and culture of higher education (Maiese, 2021; Museus & LePeau, 2019; Olssen & Peters, 2007). Indeed, academics face many obstacles in meeting the expectations of the neoliberal university such as intense accountability and measurement, production of high-quality research, the acquisition of external funding, presentations at national and international conferences, and teaching excellence (Acker & Wagner, 2019; Caretta et al., 2018). Women are in an especially unique position within the neoliberal university, as they experience greater demands compared to men in academia (Burke, 2021). For example, women as a group are paid less and hold fewer permanent and senior positions in academia, have greater domestic responsibilities, and are less successful with acquiring external funding for research (Burke, 2021). The expectations set by neoliberalism in higher education place a greater burden on women to succeed because they have other

responsibilities, such as family or greater teaching and service loads, that can take away time from research productivity and they can experience subtle and overt discrimination and microaggressions that contribute to the chilly climate within academia and impact their chances of success (Burke, 2021).

Positive consequences of neoliberalism in higher education include the focus on evidence-based teaching practice and centering the learner in education (Archer, 2008), however, students are expected to engage with higher education in an optimal way that leads them towards a high-wage job and becoming a productive member of society (Maiese, 2021). Therefore, the outcome of neoliberal education continues to focus on how individuals, rather than how public institutions, can contribute to society and market demands. While undergraduate students begin to internalize the neoliberal ideologies and market demands that drive higher education, the “indoctrination often accelerates in graduate education as future professionals in the academy become socialized to conform to neoliberal expectations” (Museus & LePeau, 2019, p. 217). These expectations lie in the discourses, practices, and procedures that coordinate graduate student work as they learn to become future faculty and professionals within their fields.

Neoliberal Discourses Persistent in Higher Education

Neoliberal ideologies, discourses, and practices shape the culture of higher education and how individuals within higher education behave and make decisions (Museus & LePeau, 2019). Researchers have sought to understand how neoliberal ideologies drive the heavy work demands of academics and how that impacts their personal lives and careers (Acker & Wagner, 2019; Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021). Academics play many roles as researcher, teacher, mentor, advisor, accountant, project manager, and fundraiser and must balance their time across multiple, often conflicting responsibilities (Archer, 2008; Austin,

2002). Expectations within higher education align with the central tenets of neoliberalism as academics are expected to conduct high-quality research, publish articles, present at national and international conferences, apply for external funding, teach, and manage, advise, and mentor undergraduate and graduate students (Austin, 2002; Caretta et al., 2018; Liang & Lin, 2021; Lund, 2012; Lynch, 2015). The emphasis is placed on quantifiable outputs that align with the neoliberal agenda and increase the revenue and prestige of the institution (Museus & LePeau, 2019). These expectations are time-consuming and can lead to stress and burnout as academics attempt to balance their heavy workload with their personal lives. The neoliberal expectations within higher education have left academics feeling exhausted and stressed as they attempt to keep up with the demands of academia and the auditing systems of their institution (Acker & Wagner, 2019; Archer, 2008; Lorenz, 2012; Lynch, 2015). Graduate students are in a unique position because they are simultaneously learning the norms and expectations of the neoliberal university while fulfilling their roles as students. Graduate students face increasing pressure to conform to neoliberal expectations within the academy to be successful, which pushes graduate students to focus more on pursuits that increase their productivity and publication output, especially as academic positions become more competitive. The pressure to conform to neoliberal expectations and productive pursuits can create challenges for graduate students, such as negative impacts to their mental health, decreased work-life balance, fear of failure, and imposter syndrome, which may also differentially impact women as they navigate the standards of the neoliberal university (Acker & Wagner, 2019; Archer, 2008; Burke, 2021; Liang & Lin, 2021; Lorenz, 2012; Lynch, 2015). Therefore, this study explores how women PhD students in biology experience neoliberal discourses in higher education and the gendered implications of working in the neoliberal university.

Theoretical Framework

This study explored the experiences of women graduate students in biological sciences through the framework of feminist standpoint theory (Harding, 2009; Hesse-Biber, 2014; Smith, 2005). Feminist standpoint theory positions women as the knower about their own experiences within power structures that can contribute to their marginalization. Scientific research has focused on objectivity and generalizability that privileged a white, middle-class, heterosexual, androcentric point of view that undervalued other ways of knowing (Hesse-Biber, 2014). Feminist standpoint theory challenges these dominant ways of knowing by considering women's ways of knowing as a valid form of scientific inquiry (Harding, 2009). Furthermore, feminist standpoint theory is an entry point for inquiry that makes the unknown or unseen visible to members of a social group that are traditionally oppressed (Smith, 2005). The embodied knower is an expert in their everyday activities and experiences but is not necessarily an expert in the relations and power structures that organize their everyday lives (Smith, 2005). Therefore, an inquiry that uses feminist standpoint theory seeks to bridge that gap and understand how women's everyday lives are socially organized by knowledge and power structures (Campbell & Gregor, 2004; Smith, 2005).

Methods

Beginning from the standpoint of women PhD students in biology, this institutional ethnography examined the institutional practices, processes, and discourses of graduate STEM education to understand how women's work was coordinated in graduate school. This study answered the following research questions:

1. What neoliberal discourses, processes, and practices coordinated the everyday work of women PhD students in biology?
2. What, if any, challenges emerged because of the neoliberal discourses, processes, and practices that coordinated their work?

Context

This study took place at a Southern Research University (pseudonym SU) in the Southeastern United States. SU is classified as an R1 institution, meaning it has the highest level of research output and has undergraduate, master's, and doctoral programs (The Carnegie Classification of Institutions of Higher Education, n.d.). SU is a large public land-grant university with over 30,000 students enrolled across undergraduate, graduate, and professional programs. SU's graduate school has over 115 graduate programs across thirteen colleges (SU Website). The biology department at SU has over 100 graduate students that specialize in organismal biology, cellular and molecular biology, evolutionary biology, ecology, evolution, and behavior.

Participants

Institutional ethnographic inquiry begins from the actuality of people's everyday lives to explicate the ruling relations that coordinate their everyday experience (Campbell & Gregor, 2004; Smith, 2005). Therefore, to investigate the STEM institutional practices, processes, policies, and discourses that coordinated graduate student work, I began my inquiry from the standpoint of women PhD students in biological sciences. I used purposeful and snowball sampling to identify and recruit graduate student and faculty participants. Participants included six women PhD students and two faculty members in biological sciences at SU. Graduate and faculty participants were selected based on their experience with and knowledge of the processes

of doctoral student education (DeVault & McCoy, 2014). Graduate students participated in three interviews throughout the fall 2020 and spring 2021 semesters to gain a comprehensive understanding of their day-to-day work and how that changed over time. Faculty participated in one interview each to supplement and provide clarity on some of the topics discussed with the graduate student participants.

Data Collection

I collected two types of data for this study: entry-level data and level-two data. Entry-level data involved collecting information about the local setting, individuals, and their experiences whereas level-two data investigated how the setting worked through organizing processes (Campbell & Gregor, 2004). I used three forms of data collection methods to gather data about the everyday work of women PhD students and the challenges they faced. First, I conducted semi-structured interviews with graduate student participants over Zoom to collect level-one data. These interviews focused on the daily activities that characterized the work of women PhD students in biology. For example, I asked questions about graduate participant's activities that centered around research, teaching, and coursework. I focused on these three aspects of graduate education based on my own experience as a graduate student and the literature on graduate education (Austin, 2002). The first and second interviews informed the collection of level-two data through the third set of interviews with graduate participants, interviews with faculty participants, and the collection of institutional texts. I also used graduate student journals modeled after the critical incident journals used by Cabay et al., (2018) that asked graduate student participants to describe a specific event that happened, an action they took, and their reaction and/or reflection of that event. The final data corpus used in this study was extracted from 20 total interviews with graduate student and faculty participants, graduate

student journal entries, and 14 institutional texts, including course syllabi, the graduate student handbook, written lab expectations, and SU's website.

Data Analysis

Data collection and analysis occurred simultaneously as the collection and analysis of level-one data informed the collection of level-two data (Campbell & Gregor, 2004). To answer my research questions, I used Carspecken's (1996) critical ethnographic analysis process. My analysis began with low-level coding, which followed closely with the primary record and involved the use of structural, process, and open coding (Carspecken, 1996; Saldaña, 2016). Low-level codes involved descriptions of graduate student work centered around research, teaching, coursework, meetings, and service/volunteer work.

Low-level coding led to high-level coding which required greater levels of abstraction to generalize findings and reconstruct meaning (Carspecken, 1996). I used high-level codes to identify institutional practices, policies, procedures, and discourses that coordinated the participant's everyday work. For example, when participants described the publication process, I gave it a low-level code of "publishing research." On subsequent re-reads of the interviews, I noted that some of the participants emphasized publishing research as their primary focus to be successful in graduate school because their publication record would be used as a metric in the future as they applied to jobs. I then re-coded these instances with the high-level code "publish or perish discourse" to distinguish the abstract idea that publications are an important metric for success in academic work.

Finally, data analysis involved code reorganization via code mapping and code diagramming (Campbell & Gregor, 2004; Carspecken, 1996; Smith, 2005). The coding process produced redundant and intersecting raw codes that I collapsed and reorganized into a few large

categories. The categories of low- and high-level codes were then organized into themes. The themes that I identified in this study centered around the three types of graduate student work, the challenges that emerged from each, and the processes, practices, and discourses that coordinated that work. The three types of work included: 1) research work, 2) teaching work, and 3) course work. Graduate student work was coordinated by three neoliberal discourses: 1) productivity, 2) competitiveness, and 3) pressure to “do it all.”

Trustworthiness

To ensure trustworthiness and credibility of this study, I used several data collection and analysis methods. First, by using multiple methods of data collection (3 interviews each with graduate students, interviews with faculty members, textual analyses of policies, handbooks, and texts), I ensured that I had a rich sample of data and a holistic understanding of the day-to-day activities of graduate students in biology at SU. Next, by using a critical ethnographic analysis process (Carspecken, 1996), I was able to explore how the daily activities of the participants were coordinated at the department, discipline, and institutional level through several readings of the data (Onwuegbuzie & Leech, 2007). Furthermore, I regularly engaged in peer debriefing throughout the data collection and analysis process to challenge my emerging assumptions. I also triangulated the findings of this study with the current literature to make sure the findings are substantiated by the literature (Onwuegbuzie & Leech, 2007). Given that institutional ethnographic inquiry is an iterative process that informs the collection and analysis of additional data, I was able to follow up with participants and ask clarifying questions in subsequent interviews as a member-checking process to ensure my data was rich and accurate to the participant’s experiences (Campbell & Gregor, 2004).

Considerations

Although this study began from the standpoint of six women doctoral students in biological sciences, they are not the unit of analysis. This study sought to understand the translocal social relations that coordinated the experiences of graduate women in biology, therefore, the unit of analysis became the ideological discourses (i.e., neoliberalism) that emerged as a coordinating process. The purpose of institutional ethnography is to examine the ruling relations that coordinate the everyday actualities of people's lives, and thus may be invisible or viewed as neutral and normal to the people living and working within these institutional contexts. From there, institutional ethnographic inquiry makes these invisible or normalized processes visible and provides a map of how they coordinate people's lives. It also allows us to identify where challenges emerge to provide recommendations and empower individuals to be informed about how their everyday activities are coordinated.

Understanding how the everyday world is coordinated brings awareness to issues within the specific contexts we study and provides a foundation to provide recommendations that support the people who work within it. Therefore, in this study, I began from the standpoint of women doctoral students in biological sciences to identify the institutional and ideological discourses that coordinated their experiences, identified the challenges that are associated with those discourses, and provided recommendations that can be applied to the institutional context. Because this study was limited by the context it takes place, the findings cannot always be generalized to other contexts. However, I show how the findings of this study fit within prior literature and the larger contexts of STEM graduate education and higher education in general. The findings and recommendations of this study may be applied to similar contexts.

Findings

Through the standpoint of women PhD students in biological sciences at SU, I identified how graduate student work was coordinated by STEM institutional processes, practices, policies, and discourses. In institutional ethnography, “everyday work” consists of the daily activities and happenings of people that take time and effort, is done under definite conditions, and is not always compensated labor (Smith, 2005). This broad definition of work was used to identify the everyday work of graduate student participants and how that work was coordinated by institutional practices, processes, and discourses. Graduate student work was organized around the domains of research, teaching, and coursework and was driven by the neoliberal discourses of productivity and competitiveness. First, I describe the everyday activities of the participants centered around research, course work, and teaching. Embedded within these domains are the skills graduate students are expected to develop and how these three domains coordinate that skill development. I also identified the challenges that emerged for participants through their everyday work. Next, I explore how the participant’s everyday work is coordinated by neoliberal discourses of productivity, competitiveness, and pressure to be busy. Finally, I explore how these neoliberal discourses created challenges for the participants as they completed their graduate work.

Defining Graduate Student Work

Graduate student work as described by the graduate student and faculty participants and institutional texts revolved around three domains: research, coursework, and teaching. While intentional or not, the organization of graduate student work formed a hierarchy, with research work taking precedence over course work and teaching work, despite all types of work being an important part of skill development, content knowledge development, and the educational goals

of the department and university. Graduate student participants recognized that their research work took priority and thus structured their workday to maximize research productivity and selected courses that supported their research interests and filled knowledge gaps. The participants ran into challenges with their teaching assistantships and coursework that were time-consuming and took away time from their research. Although they understood that their research and graduate work was important, the participants were mindful about structuring in social time and time away from work. Below, I summarize the three domains of graduate student work and how the participants structured their work to meet institutional requirements and workload demands.

Research Work

Research work was considered any activities that supported the participants' paid research assistantships and dissertation research. Based on descriptions by the participants, research activities included animal care, coming up with research ideas, designing and conducting experiments, collecting data, analyzing data, fieldwork, lab-based work (e.g., DNA extractions, calibrating equipment), computational work, managing/mentoring undergraduates, conducting literature reviews, writing research articles, applying for grants, submitting papers for publication, and presenting at conferences. Participants scheduled their days around completing these tasks to support their research, and some of the tasks were time-consuming (e.g., animal care) but were necessary for the participants to complete their work. Some participants did not consider some of these activities as research work or scientific work, although these activities took time and supported larger research goals. For example, Charlotte, a third-year PhD student, explained how she did not consider computational work as scientific work:

I have one computational project, but... it just doesn't feel like real data. It's not like I went out in the field or had a lab experiment and have like a data book, it was stuff on a computer. Having flies and having a treatment that I manipulated and then seeing how those treatments are affecting nutrition or mating systems or affecting different stress physiology components is more 'science-y'.

Charlotte viewed her lab work as scientific work because she was physically manipulating variables and collecting data in the lab rather than working on the computer. Similarly, M considered lab work and solving problems to be scientific work and saw those as important for moving her research forward rather than the animal care work or data collection work that supported the lab work. The busy work associated with research was normalized as a part of the daily actions of graduate students and not recognized as "work" because it was not rewarded in the same way that publications and conference presentations were.

An annual review system for graduate students was established by the SU biology department to keep graduate students on track with their degree progress. The review criteria resemble the expectations of a successful faculty member: coursework, GPA, research activities, and degree progress. According to the department's graduate student handbook, graduate students are given a rank of 1 to 5, with 1 being poor progress, 2 as below expectations, 3 as meeting expectations, 4 as exceeding expectations, and 5 as exemplary. Graduate students who made progress on their work, maintained a 3.0 GPA, and met the requirements of their PhD within a timely manner are given a 3. A rank of 4 or 5 is awarded to students who meet expectations and provide evidence of two or more of the following accomplishments: presented at a national or international conference, submitted a proposal for external funding, awarded a grant for external funding, received an honor for outstanding achievement, published a junior or

senior authored paper, or was invited to speak at a symposium or conference. The criteria for receiving a 4 or a 5 emphasized research productivity as the accomplishments worthy of a reward.

While designed to keep graduate students on track and give them a record of their accomplishments, the annual evaluation also sets the standard of prioritizing research for the participants and deprioritizing other types of work. For example, Jordyn stated, “With the committee ranking, you got to submit a grant, you got to be on a publication... they don't even care about teaching but hell, you need to teach to live. So, it's just kind of like, okay I'm doing all these things, but I still got to do this too.” Jordyn recognized that non-research-related work was not rewarded but was required for her to support her academic and personal life. She was also motivated to do the work to be ranked a 4 or a 5 but was aware that this was considered extra work on top of her already busy schedule. The standard of success placed additional stress on participants to go above and beyond what was expected of them to be considered exemplary graduate students.

Selecting Course Work

According to the graduate student handbook, graduate students in the biology PhD program were required to complete 30 hours of graded coursework and 30 hours of ungraded research credits, for a total of 60 credit hours. Carol and Victoria, both professors in the department, explained that the department did not have a core curriculum; course selection was primarily up to the graduate student and their faculty advisor. Graduate student participants explained that they selected coursework based on their interests and knowledge gaps, input from other graduate students, and input from their advisors and committee members. For example, Charlotte explained, “it was kind of 50/50... some of them were advisor encouraged or

suggested, and then the other half were like, ‘this is in line with my research, I really want to take it.’ Graduate students were given considerable freedom to select courses based on their own interests, but it also required them to be aware of deficits in their own knowledge or understanding and predict course availability throughout their program. Some graduate students had a hard time selecting courses without a set curriculum and felt that a core curriculum for the graduate students would be useful. For example, Jordyn stated:

I feel like SU’s downfall is to not have a set curriculum. I do not like it whatsoever. I don’t like picking classes. It’s cool, its freedom, but I’m kind of guessing what classes... that can help support you and your dissertation.

Jordyn found the freedom to choose her own classes challenging because she was not sure what would help support her dissertation research. She thought a list of classes that were relevant to her research would have been helpful to have.

Participants often found the coursework to be useful for filling in content gaps for their research, but sometimes their coursework was time-consuming, was not useful, or served a different purpose. For example, Junie explained that she strategically selected her coursework to support her future career as a faculty member in biology. Because Junie specializes in biology education research, she wanted to take courses that were relevant to her research questions but instead had to take courses that proved she had biology content knowledge so she could prove to future employers that she was capable of teaching biology courses. June explained

I’m specifically taking biology content courses for no reason other than to prove to biology people that I have taken a lot of bio courses when that’s not even what I study. It doesn’t help me do my dissertation or develop me as a researcher at all.

In Junie's case, she was unable to prioritize her research when considering her coursework because she needed to prioritize her future career as a faculty member in biology. Junie lamented that the courses she was taking did not help her develop skills as a researcher or future faculty member and that she would prefer to take courses that would help her. Graduate participants had to think ahead to what coursework would support their research and future careers to be competitive for the job market.

Teaching Work

Most of the participants were supported by a graduate teaching assistantship (GTA) that paid a stipend and provided a tuition waiver to cover most of the costs of graduate school. GTA responsibilities and time commitments varied among the participants depending on if they were considered 1/3-time (13.3 hours per week) or 1/2-time (20 hours per week) and what course they taught. The participants described their teaching workloads, explaining that they were expected to lead or assist lab courses, grade assignments, and present lecture materials. There were considerable differences between the workloads of GTAs who taught undergraduate introductory labs versus upper-division labs. For example, Charlotte, Amelia, and Jordyn all taught introductory biology labs; most of their work consisted of giving a short presentation on the lab content, assisting students with activities, grading occasional assignments, and proctoring exams for the faculty instructors.

In contrast, the participants that taught upper-division courses, such as Sophie and M, had a heavier teaching workload. M and Sophie both explained that they had to develop their lecture materials, write the quizzes and tests, set up materials and activities, and grade large assignments. M was a half-time GTA but ended up doing an additional 5 hours of work on top of her GTA responsibilities to prepare. Sophie explained that she spent a significant amount of her

time doing prep work. This meant that at least half of their week was spent on work related to their teaching assistantship. This highlights the clear differences between the preparation required for introductory and upper-division courses. Introductory courses teach a larger number of students and cover broader topics, whereas upper-division courses have fewer students and are more specific, which accounted for the differences in teaching preparation and responsibilities. The differences in teaching preparation and responsibilities between the introductory courses and upper-division courses also meant that the participants had different amounts of time each week to dedicate to their coursework and research. The participants that taught the introductory lab sections explained that they had extra time during the week and could work on their research projects or coursework during their office hours, whereas the participants who taught upper-division courses had to dedicate all the allotted teaching time to activities related to teaching, and thus had less time to focus on research or coursework overall.

“Trial by Fire”

A disjuncture exists between the GTA expectations set by the university and the participants’ actual experience with being a GTA. Institutional texts state that graduate students were encouraged to participate as GTAs “to broaden and enhance their academic experience and training and to assist the department in the central mission of undergraduate education” (DBS Website). GTAs are considered an integral part of the department’s teaching program as they provide expertise in laboratory courses and act as a key link between undergraduate students and faculty members. However, the participants noted that the expected purpose of a GTA was not reflected in the behaviors and attitudes towards teaching and the reward systems of the department. Outside of the graduate student orientation and their previous experiences, the participants did not receive any formal training for teaching through the department. Instead,

when I asked the participants how they learned how to teach, many of them said “trial by fire,” meaning they had to figure it out on their own. M explained, “We literally just kind of get thrown into it and you’ll figure it out. You just kind of have to learn how to adapt and if you don’t have your materials, then you’ll wing it.” The expectation that the graduate students would figure it out made teaching challenging at first. Most of the time, they had to learn how to teach from other graduate students, who also learned from senior graduate students that trained them. However, Charlotte mentioned that the department recently created a required course for all new GTAs to learn how to teach, but that course was not retroactive for the more senior graduate students.

Additionally, some of the participants noted that teaching was not as valued as research. For example, as Jordyn remarked about the annual graduate student evaluation, teaching excellence was not a criterion for being ranked at 4 or 5. Similarly, Charlotte explained that teaching was not valued, “good teaching is not rewarded... unless you teach for your advisor, you’re not going to get the teaching awards or anything like that so it’s like why put time into this, except if you care.” Teaching awards were available for GTAs, however, Charlotte noted that only the GTAs who taught upper-division courses for their advisors were the ones who received those awards. Furthermore, the participants often did extra work for their teaching assignments because they cared about providing a high-quality learning environment for their students, despite not being paid extra or rewarded to care. The expectations around graduate student teaching highlighted a conflict between the institutional discourse of “teaching is important for development” and the neoliberal discourse of “prioritizing research and productive work,” which created challenges for participants.

Neoliberal Discourses

In the above section, I described the three domains of women PhD students' work in graduate school and the challenges they experienced because of their work. In this next section, I describe the discourses of productivity, competitiveness, and pressure to "do it all" that coordinated their everyday work and the subsequent challenges that emerged because of these neoliberal discourses.

Productivity

The participant's everyday work was driven by the neoliberal discourse of productivity, specifically research productivity. This was reflected in the annual graduate student evaluation that rewarded research outputs, such as publications, conference presentations, and external grants, and in other institutional texts such as lab expectations. The participants prioritized their research because research productivity was what was going to make them competitive for their future careers. For example, Junie explained how she prioritized her research over coursework,

I'm trying to do my best work in my courses in the shortest amount of time so I can maximize my research time so that I can get out the maximum research so that I can hopefully get more pubs.

Junie recognized that she needed to maximize the number of publications she produced to be successful in academia. Indeed, she received advice from her advisor that 10 publications would make her competitive enough for an assistant professor position, so Junie strived to publish 10 papers before she finished her PhD. Similarly, Jordyn explained how she observed one of her lab mates work to produce a lot of publications and grant applications before she graduated, "one of them is about to graduate so I assume that she's just trying to like go go go go go so she can get some good stuff for her resume before she leaves." Jordyn took note of how her lab mates were

enacting neoliberal expectations in their own work, which led her to consider what she needed to do to be productive with her research.

Graduate students were also encouraged to apply for external funding. Most of the participants applied for grants or planned to apply for grants throughout this study. Acquiring external funding was considered an important skill for graduate students to develop and was listed as a learning outcome in the syllabi for graduate-level courses and an expectation in the lab expectations shared with me. Junie explained that she co-wrote a grant with her advisor so she could learn about the grant writing process:

The reason we did write a grant together that we're still waiting to hear about is because I've heard that's a good thing to practice while you're in grad school so then when you become a professor, people think you'll be able to do it.

Participants understood that acquiring external funding was important for their future success as faculty members and sought to practice applying for grants early on in their PhDs. Grant writing was an important enough skill for graduate students that Carol, a professor in the department, suggested graduate students get in touch with the grant writers through the associate dean's office to get help with writing grants.

One challenge that emerged from the expectation to be productive is that a lot of the participants felt like the expectations for what they were supposed to be doing were unclear. For example, Junie explained her biggest challenge was the clarity of expectations:

The biggest challenge is feeling like you are doing what you're supposed to be doing and doing it enough. So, basically, you could boil that down to like placing yourself correctly, I guess. Like you're trying to figure out your surroundings and understand how to survive there but it's really hard because there's not like clear stuff.

Junie was referencing her expectations for being productive. She referred to the written lab expectations she later shared with me and pointed out that there was no clear direction on what exactly she should be producing or how much in terms of research projects and publications. Junie found the lack of explicit instructions anxiety-inducing because she was not sure how much work was considered enough.

“Publish or Perish” Discourse

Relatedly, some participants described the “publish or perish” discourse as a challenge they experienced related to the expectation to be productive with their research. Each of the participants discussed preparing their research for publication and celebrated when a publication was submitted or accepted. However, they also recognized the immense pressure they felt to publish. For example, Jordyn wrote in her journal entry “the urgency (or pressure) to publish during your PhD is so tough. It makes me very anxious to know my whole career depends on the amount of publications that I push out.” Jordyn had just received news that a paper she submitted was accepted for publication and she was relieved to finally have a publication. She later told me that she was ranked a 4.5 on her annual evaluation because of this first-author publication. Jordyn explained that she did not believe in the “publish or perish” discourse at first and did not understand the anxiety around it. But then she realized that research could be unpublishable and that contributed to her anxiety around research and publishing. Especially knowing that publications are used as a metric for success in academia. Jordyn also recognized the positives of the “publish or perish” discourse because it encouraged her to submit papers, especially since it felt good to get a paper accepted.

Competitiveness

Competition is another discourse that is pervasive in neoliberalism. Although most of the participants reported that their experiences were generally positive in their PhD program and the department and individual labs were collaborative and supportive, there was an underlying notion of competition and comparison in the participant's experiences. For example, Charlotte explained how she compared her current progress to what she expected, "I think it's partially just self-comparison, where it's like, oh you've already been in grad school [for] two years, you should be able to get this done earlier." Charlotte was in her third year and placed an expectation on herself that she should be further along with her dissertation research. This expectation to be further along was reinforced by Junie, who was confused by when she was supposed to be completing certain milestones according to the graduate student handbook and the proposed degree timeline for PhD students. According to one, she was behind while according to her advisor she was making great progress. Similarly, Jordyn noted an "unannounced" competition between graduate students where she compared her accomplishments to the accomplishments of other graduate students. She said, "you feel like you should be doing more even though you're doing great." The pressure to publish and aim for a high rank on the annual evaluation placed a lot of pressure on students to continuously work and set high expectations for themselves. Jordyn also noted the subtle competitive climate of the department:

I see the competition within the department, like "oh, this graduate student published six papers..." and even in your lab you have one student who does fucking everything, and they're like on top of everything, and you're like damn, I need to get on top of mine.

For Jordyn, professors in the department sharing the accomplishments of their students created a sense of urgency and competition to be productive and publish papers.

While the competitiveness was more subtle within the department, the participants reported that the department climate was overall collaborative and supportive. Faculty were more than willing to share lab equipment and help the participants out with issues regarding their research, which contrasted with the participant's previous experiences. For example, M, who did her master's at a different university, explained that her previous department was "cutthroat," and the faculty would steal ideas and undermine each other. However, her experience at SU was very different, with faculty willing to share lab spaces and equipment without a second thought. The faculty and students at SU worked to create a collaborative culture within the department, which helped improve the participant's experiences and reduce competitiveness between graduate students and labs.

Pressure to "Do it All"

Participants also reported experiencing pressure to "do it all" and continuously work to meet all the expectations of their program and fulfill the high demands of research output. For example, Junie explained, "I like to be busy, but I don't think anyone does this to me except for myself. Actually, [my advisor] has been specifically redirecting other projects to other people because I am too busy." Likewise, Jordyn struggled with the pressure of trying to accomplish multiple things in one day:

The challenge is time management. [laughs] Man, trust me I cannot stress this enough. I don't do well with it when I'm under pressure and it's my fault. [laughs] But it's so hard.

I'm trying to do multiple things in one day to feel accomplished.

Jordyn felt that if she was busy and completed multiple tasks in one day, she would feel accomplished as opposed to not completing any tasks. Junie, M, and Charlotte all explained how they felt like they were more productive if they were busy, but sometimes would be pulled back

if they were doing too much. M described how her advisor told her she needed to just focus on one thing a day instead of trying to do multiple things at once:

I have a really hard time because I want to do everything all the time, so, I've been pulled back. My advisor is like "you got to try one thing at a time like I know you really want to do all of it, but you can't, you have to do one thing a day."

While some of the participants explained that they liked being busy because they felt more productive, others explained how the pressure to be busy came from observing others who appeared to be good at managing multiple things at once. For example, Jordyn explained how she watched other graduate students and her advisor appear to 'do it all,' "I look at my advisor and see that she does a million things at one time and I just, I always ask myself how? How do you advise four different grad students and 10 undergrads?" Jordyn's advisor modeled someone who could manage multiple projects and people at once, which created pressure for Jordyn to do the same, even though she struggled with working on multiple things at once. Jordyn's pressure to be busy not only emerged from her interactions with her advisor but observations with her peers and the educational climate of her department. Jordyn explained how she felt like she had to do more than her peers to be seen as an equal in the department:

It just seems like you have to do a little bit more. I don't know how to explain in what aspect, but you have to be on top of your shit just to feel like you're equal. And I don't know what drives that, but it just feels like that. I never experienced it until I got here. But it's just like it naturally came it's just like "I gotta do this. *I gotta do this. I gotta do this* [different emphasis on each one]" I don't want people to think that I'm less of because I am Black.

Jordyn explained how she did not want to be thought of as less than her peers because of her racial identity, but she noticed that her race had an impact on how she was perceived in the department. She reported that she did not understand where that feeling of urgency and need to prove herself came from, only that it had started when she started her PhD at SU. Jordyn described feeling like she had to go above and beyond what her peers were doing to be considered an equal PhD student, which meant pushing herself to complete as many projects as possible to feel accomplished and fit in with the other PhD students.

Time Management

Consequently, participants described struggling with time management in their day-to-day work due to the shifting priorities and heavy workload of graduate school. Graduate students were expected to be self-directed, which meant they oversaw setting their own schedules and getting things done. Sophie explained, “I don't have anything really telling me what I have to do every day, so I have to be organized enough that I get everything done.” The participants explained how most of their time and responsibilities were self-directed, and this created challenges for them to complete all their work. Similarly, Jordyn had mixed feelings about setting her own schedule for graduate school: “I love that you can make your own hours in grad school, but I hate it at the same time. Like you have to make a set schedule to get shit done or you won't get shit done.” The freedom to create their own schedules gave the participants a lot of flexibility in their day-to-day work, however, it also meant they could work whenever or for however many hours they wanted/needed, which sometimes cut into their personal life.

Creating a structured schedule worked well for some of the participants, who described using time-blocking or maintaining a calendar to keep up with tasks. For example, Junie explained how she dedicated a certain number of hours to her coursework and research each

week: “I give 20 hours a week to research, and then the other 20 I try to allocate to class.” This method worked best for Junie to prioritize her research, which she felt was important for her PhD, while still passing her classes. Other participants, such as Charlotte and M, used scheduling to help stay on top of their work. Charlotte explained her system, “It’s just something I’ve always done. Because like even in high school, it was like multiple extracurriculars so like I feel like I’ve just always balanced multiple things and I feel like I do better if I’m busy.” Charlotte perceived she was more productive if she stayed busy and scheduled everything in her calendar, as opposed to having an unstructured day. Failure to manage their time meant the possibility of falling behind on their work or falling behind on the recommended timeline for PhD students.

Fear of Falling Behind

Participants described a fear of falling behind on their work if they were not able to manage their time well. This led some participants to feel like they had to work continuously or else risk falling behind. For example, Junie explained how she felt like she needed to make up her time if she took a break during the day: “If I take breaks during the day that I need to like make up for it later because it’s during the workday and I wasn’t working the whole time.” Similarly, Amelia described how she continued to struggle with time management throughout the semester. She set high expectations for herself and her work, which put an immense amount of pressure on herself and caused her to fall behind on everything because she wanted to produce high-quality work:

[The] expectations of myself... I should have done this by this date or like [pause] the work that you did should have been to this level... accepting like maybe I only had time for only this quality of work.

Amelia struggled with not being able to dedicate enough time to produce high-quality work when she had several competing priorities, which ultimately caused her to fall behind. Participants' fear of falling behind and their struggle with time management were the consequences of an academic culture that valued research productivity and output, subtle competition, and the appearance of "doing it all." The challenges reported by participants as a consequence of neoliberal discourses led to participants feeling anxious and pressure to produce to keep up with the demands of graduate school and future academic careers.

Discussion

This institutional ethnography explored the institutional processes, practices, and discourses that coordinated the everyday work of women PhD students in biological sciences within a neoliberal context. Through participant descriptions of their day-to-day work, I was able to identify the neoliberal discourses that coordinated their work and how those neoliberal discourses created challenges for participants. The findings of this study followed an iterative data analysis process where I defined graduate participant work within the contexts of research, coursework, and teaching and identified how the neoliberal discourses of productivity, competitiveness, and pressure to "do it all" coordinated their work and created challenges for participants including challenges with time management and contributed to a fear of falling behind. In the following sections, I examined how these neoliberal discourses may or may not be gendered and how they impact women's experiences in graduate school. The examination of how neoliberal discourses, practices, and procedures may be gendered provided a unique insight into how the academic environment can support or hinder women's persistence in STEM.

Prioritization of Output

The neoliberal university prioritizes measurable outputs through research publications, conference presentations, and the acquisition of external funding (Acker & Wagner, 2019; Caretta et al., 2018; Lorenz, 2012; Museus & LePeau, 2019). The production of high-quality research in high-impact journals leads to a publish or perish culture within academia and places undue pressure on graduate students, postdocs, and faculty to meet these high demands. Additionally, the demanding, fast-paced publication expectations of academic science promote an ideal academic who can spend an undetermined amount of time conducting research, writing, and submitting publications, and has access to funding to support their research and any graduate students or research staff they may need (Lund, 2012; Parson, 2018; Parson et al., 2021). The participants in this study reported how their work centered on research productivity and output; participants selected coursework that best supported their research work and emphasized maximizing their research time to produce publications. The expectation to conduct research and publish articles while simultaneously balancing their other graduate work increased the pressure participants experienced to be highly successful.

The audit culture of neoliberal higher education emphasizes measuring productivity and holding academics accountable. This was enacted in the annual evaluation graduate students were required to complete with their committees every year. While the annual evaluation was used as an audit system to keep students on track with the PhD program, it increased the pressure for some students to produce publications or other research products to receive a high score from their committee. This audit system was also used by the department and graduate school to keep track of students and make sure the department was maintaining standards and that graduate students were successful. Auditing systems can be beneficial to assess performance and keep students and faculty on track with expectations, it can also increase stress and anxiety as students

and faculty try to keep up with assessment demands (Liang & Lin, 2021). Furthermore, assessments can lead to unintended competition, such as was the case with the participants in this study (Caretta et al., 2018; Liang & Lin, 2021). Some of the participants used the annual evaluation scores as a metric of success and compared their progress and publication records with other students in the department. This can have unintended consequences for women and marginalized students in STEM, such as increased imposter syndrome (Chakraverty, 2020a, 2020b; Stone et al., 2018) and experience with microaggressions and overt sexism, racism, etc. (O'Meara et al., 2017, Powless, et al., 2022; Ong et al., 2011) as they already have unequal expectations for work to be considered competent and respected in their field (Griffin et al., 2015; Mcgee et al., 2019; Wofford et al., 2021).

The expectations set by neoliberal discourses within graduate education increased the pressure women experienced to perform and be productive. The participants explained how they experienced increased pressure to produce publications and meet the high demands of graduate school, and this experience was more salient for the participants who held multiple, intersecting identities. Indeed, women and students who belong to traditionally marginalized groups in STEM are more likely to experience increased pressure to be productive and prove themselves to be considered successful in science (Mcgee et al., 2019; Pifer & Baker, 2014; Smith & Gaston Gayles, 2018). The neoliberal discourse of productivity expects that individuals can dedicate an indeterminate amount of time towards research and publishing articles, which ignores the other types of work women do in addition to their graduate or academic work (Acker & Wagner, 2019; Archer, 2008; Burke, 2021; Liang & Lin, 2021; Lund, 2012; Parson, 2018). Expectations that center on research productivity reinforces the masculine expectation of an unencumbered worker

who can produce research and has no other outside obligations that could interfere with their work.

Teaching is Undervalued

The findings of this study pointed to how teaching work was deprioritized over the highly rewarded research work. The participants were expected to prioritize their research work over all other forms of work, regardless of if they were getting paid to do research or not. For most, if not all the participants, teaching was a means to an end, and a job that they did to support their graduate studies through a graduate teaching assistantship. While teaching is a part of the academic career, it was not treated as important or valued, to the point where it was not measured on the Annual Review criteria to assess graduate students' progress. The participants also highlighted the lack of specific training they received for teaching, explaining that most of the time they had to figure it out on their own or by watching senior graduate students they taught with. However, one participant did explain that the department added a teaching-focused course that was required for all new GTAs, although this course was not retroactive for senior GTAs.

One PhD student, Charlotte, mentioned how she valued teaching and cared about her students even if the department or other graduate students did not seem to care as much. M, another PhD student, described how she spent more time on her teaching assignment, typically taking over the work of other GTAs because they did not enjoy the work as much as she did. One participant also mentioned that it was difficult to receive teaching awards and that graduate students who taught for their advisors tended to receive those awards. There was also a discrepancy in the training that graduate students receive regarding teaching. Sophie and Junie, who both taught with their advisor, received more in-depth training and one-on-one mentoring

from their advisors, whereas the other graduate students, Charlotte, Jordyn, M, and Amelia, had to learn from other graduate students teaching the lab with them or rely on previous experiences teaching during their master's degrees.

The lack of value in teaching is reflected in academic and neoliberal discourse, as research output tends to be valued more than teaching and service (Acker & Wagner, 2019). The lack of value placed on teaching and service work reinforces the masculine expectations of the neoliberal university, since teaching and service work are considered 'feminine' work and is placed more onto women than men (Burke, 2021; Liang & Lin, 2021). Participants' progress on their degree and research was measured by the Annual Review criteria, which valued research output (publications, grant applications/awards, presentations at conferences) over other measures of progress or success. These findings aligned with other studies on the relationship between academic measures of success and neoliberalism (Acker & Wagner, 2019).

Additionally, there is often a tension between prioritizing teaching and research. In a study exploring how life sciences PhD students navigate this tension, authors found that graduate students received conflicting messages about the value of teaching and research depending on the context and who the information came from (Reid & Gardner, 2020). How graduate students perceived those messages depended upon the student's identity as a researcher and/or teacher and their future career goals, although the authors highlight a need for more research in this area (Reid & Gardner, 2020). Despite the conflicting messages about the importance of teaching and research, another study suggests teaching improves graduate students' methodological research skills (Feldon et al., 2011). This study highlights the importance of adding value to teaching in graduate education, however, it is still maintaining the hierarchy that research is more valuable

than teaching and teaching experience *adds* value because it improves doctoral students' research skills.

Recommendations

Understanding how graduate STEM education was coordinated by neoliberal discourses and neoliberal policies is not necessarily a bad thing for understanding gender disparities in STEM. Organizing graduate education with clear expectations for success helps prepare women to be successful for a career in academia because they are given a clear roadmap for the milestones they need to complete (Archer, 2008; Burke, 2021). The neoliberal university and the evaluation and measurement of tangible products in higher education and research is the reality that we live in, so higher education should focus on developing structures that help women and traditionally marginalized individuals be successful in their fields. Because success in academia and science is driven by neoliberal practices, policies, and discourses, making those expectations clear and establishing structures that aim to help women be successful can be beneficial in the short-term, however, long-term solutions should focus on addressing systemic issues with how success is defined in academia and science. Other studies show that women are creative with meeting the standards and expectations within the neoliberal university in a way that is still true to their values and identities (Acker & Wagner, 2019). Providing clear expectations and means for promotion and success is also a way to empower traditionally marginalized groups in STEM because it gives them agency and the power to make decisions that align with their needs and values instead of based on the expectations of the neoliberal university.

Conclusion

Beginning from the standpoint of six graduate women in biological sciences, this institutional ethnography sought to examine the neoliberal discourses that coordinated the

everyday work of graduate students in STEM. Through interviews with graduate students and faculty and the analysis of institutional texts, I described the everyday work of women PhD students within the context of research, course work, and teaching and identified how the neoliberal discourses of productivity and competition coordinated their experiences. The participants prioritized work that supported their research output, which was in line with the expectations of the neoliberal university. This increased the pressure for women to produce and perform in ways that led them to be successful but also increased their fear of falling behind their peers and pressure to be busy all the time to keep up with the demands of graduate school and academic work. As graduate students are learning the expectations of the neoliberal university and their future careers through the structures, processes, policies, and discourses that coordinate graduate education, it is imperative to understand how neoliberal discourses support or hinder women's persistence in STEM. Neoliberal discourses contribute to the gendered nature of graduate STEM education by creating an environment that prioritizes research productivity, the acquisition of external funding, and competition and deprioritizes work that is considered "feminine" such as teaching and service work. The findings of this study suggest the biology graduate education environment reinforces these neoliberal discourses by placing an emphasis on research productivity as the primary form of academic work and neglects to address other aspects of academic work such as teaching and service. Although biology graduate education appears gender-neutral, these neoliberal discourses contribute to a gendered environment because it is based on a culture that promotes an ideal graduate student and/or academic that is attributed to the characteristics of White, Western, heteronormative, able-bodied, middle-class men. By exploring the impact of the neoliberal university on women's experiences in a field that is

considered gender-balanced, we can determine how STEM education can make progress in improving the experiences of women and traditionally marginalized students in STEM.

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CHAPTER IV

THE IMPACT OF THE COVID-19 PANDEMIC ON GRADUATE STUDENT WORK

In March 2020, the COVID-19 pandemic caused schools and businesses to close and shift to remote learning and work. This shift disrupted university teaching and research; non-essential work was to be done remotely. As a result, laboratories were closed, research was put on pause, and students, faculty, and staff had to adjust to remote learning and work (Servick et al., 2020). Scientists and researchers across the world had to make quick decisions to shut down their labs while institutions determined which facilities and research projects were essential to keep running (Servick et al., 2020).

As university facilities, lab and field research, and classrooms shut down or converted to remote across the nation, graduate students were left to wonder how they would adjust their research to finish their degrees. Since the beginning of the pandemic, researchers have examined the impacts of the pandemic on research disruption (Servick et al., 2020; Suart, Suart, et al., 2021), transition to remote work and instruction (Bal et al., 2020; Börgeson et al., 2021; Parker et al., 2021; Ray & Shklarski, 2021; Varadarajan et al., 2021; Wyne et al., 2021), well-being and mental health (Ashton & Pintor-Escobar, 2020; Chirikov et al., 2020; Patias et al., 2021; Varadarajan et al., 2021; Wasil et al., 2021; Wieczorek et al., 2021; Woolston, 2020), and productivity (Bal et al., 2020; de Caux, 2021; Haven et al., 2019; Suart, Neuman, et al., 2021; Viglione, 2020) in graduate students, postdocs, and faculty. Graduate students reported greater mental health and time management issues as paused research, remote work, and the resulting isolation continued (Ray & Shklarski, 2021; Suart, Suart, et al., 2021; Varadarajan et al., 2021). First-year and senior biomedical PhD students reported positive and negative experiences due to the university closure (Varadarajan et al., 2021). Positive impacts included spending more time

with family and on mental and physical well-being while the negative impacts included high stress, lack of interactions with peers, and decreases in their psychosocial health (Varadarajan et al., 2021). Similarly, another study surveyed graduate students and found that student's experiences with lab shutdowns were chaotic and frustrating due to a lack of clear communication, and they experienced increased anxiety and depression and decreased motivation because of the pandemic closures (Suart, Suart, et al., 2021).

Closures, disruptions to research, and changes to remote learning and work increased mental health issues in graduate students, with students reporting increased depression and anxiety (Chirikov et al., 2020; Woolston, 2020). Uncertainty about the pandemic and life afterward decreased motivation, and isolation contributed to the increased depression and anxiety in graduate students (Chirikov et al., 2020; Varadarajan et al., 2021; Woolston, 2020). Doctoral student research and writing productivity were also negatively impacted by the pandemic (de Caux, 2021; Suart, Neuman, et al., 2021; Viglione, 2020). Half of the doctoral candidates surveyed reported delays to their dissertation submission deadlines and changes to their writing productivity due to the pandemic (de Caux, 2021). The pandemic highlighted disparities in publication output between men and women, especially as women's childcare and teaching responsibilities increased (Viglione, 2020). These studies demonstrate how impactful the COVID-19 pandemic was on graduate student well-being, productivity, and motivation.

While exploring the impact of the COVID-19 pandemic was not the original intent of this dissertation study, this institutional ethnography sought to understand how institutional discourses, processes, and procedures coordinated the everyday experiences of graduate women in biology and the COVID-19 pandemic emerged as a major translocal factor that shed light on how those discourses, processes, and procedures worked within the higher education context.

Therefore, this study examined how the discourses, processes, practices, and procedures associated with the COVID-19 pandemic and institutional response to the pandemic changed graduate student work at SU. I began my inquiry from the standpoint of six women PhD students in biological sciences at SU and explicated how the COVID-19 pandemic changed their everyday work and what positive and negative experiences the participants had as a result. Due to the emergent nature of the pandemic, there was a limited amount of literature that this study could draw on. Therefore, this study contributes to the literature by addressing the need to understand how the COVID-19 pandemic and subsequent shutdown of research activities impacted graduate students (Ahmed et al., 2020; Börgeson et al., 2021; Servick et al., 2020; Suart, Suart, et al., 2021).

Theoretical Framework

This study uses feminist standpoint theory as the theoretical framework to examine how the COVID-19 pandemic changed the everyday work of women PhD students in STEM. Feminist standpoint theory views women's lived experiences as a point of discovery to make the unknown or unseen visible (Harding, 2009; Hesse-Biber, 2014). Research framed through feminist standpoint theory begins from the perspective of women working in and around institutions and organizations to see how their lives are organized by social relations and power structures (Smith, 2005). By framing my research through feminist standpoint theory, I was able to center the data collection and analysis process on the participant's voices and experiences. Therefore, the findings of this study reflect the lived experiences of women PhD students in biological sciences at SU as they navigated their PhD during the COVID-19 pandemic.

Methods

Due to the novelty of the COVID-19 pandemic and the emergence of the pandemic as a major factor that impacted the lives of the participants in the larger institutional ethnography, I sought to understand how the COVID-19 pandemic coordinated the everyday work of women graduate students in biological sciences at SU. I used a subset of data from the larger institutional ethnography to answer the following research questions:

1. How did the COVID-19 pandemic change graduate participant's everyday work?
2. What, if any, challenges emerged from the changes due to the COVID-19 pandemic?
3. What discourses, practices, and procedures coordinated those challenges?

Participants and Sample

Participants for this study included six graduate women pursuing their PhDs in biological sciences at SU. Graduate student participants were from a variety of research concentrations and were in their first, second, or third years of their PhDs which provided a unique perspective on the impacts of the COVID-19 pandemic across educational experiences and timeframes (Table 4.1). During the fall 2020 and spring 2021 semesters, they participated in three semi-structured interviews over Zoom that asked about their daily activities and how those changed over time. Because of the semi-structured nature of the interviews, I asked follow-up questions on topics participants discussed as they described their day-to-day experience in graduate school. Given the time and setting of this study, the COVID-19 pandemic emerged as a topic of discussion across all the participant's experiences, so I asked specific questions to understand their experiences with pursuing a PhD during a pandemic and how the pandemic changed their

everyday work. The participant’s responses about the COVID-19 pandemic made up the data sample used for this study.

Table 4.1
Graduate Student Participant Descriptives

Pseudonym	Degree Program	Year in Graduate School	Career Interests
Sophie	PhD	3	Government/ Industry Research
Junie	PhD	2	Faculty
Jordyn	PhD	3	Teaching Faculty
Charlotte	PhD	3	Industry Research
Amelia	PhD	1	Faculty
M	PhD	1	Faculty

Data Analysis

Data analysis of the sample followed Carspecken’s (1996) critical ethnography methodology. I used low- and high-level coding to understand the daily activities of the participants’ lives as graduate students, how the COVID-19 pandemic changed their daily activities, what challenges emerged because of the pandemic, and what discourses, processes, and practices coordinated those challenges. Low-level codes included structural and process codes to describe the everyday work of the participants in the context of the COVID-19 pandemic and how their work changed over time (Saldaña, 2016). Low-level coding led to high-level coding, which involved greater levels of abstraction to generalize findings and reconstruct meaning (Carspecken, 1996). I used high-level codes to reconstruct how the COVID-19 pandemic organized and informed the everyday work and challenges the participants experienced. Finally, I used code mapping and code diagramming to organize the codes into broad categories and themes (Campbell & Gregor, 2004; Carspecken, 1996; Smith, 2005). The themes that I identified in this study included positive and negative changes related to 1) the

transition to remote work, 2) the disruption of research work, and 3) interactions with others and isolation.

Researcher Positionality

Examining my positionality as a researcher is an important part of conducting feminist research (Hesse-Biber, 2014). How I collected, analyzed, and interpreted the data I received for this study was influenced by my own experiences and perspectives. I am a doctoral candidate who started the dissertation process during the beginning of a global pandemic and had to navigate setbacks and challenges associated with the changing landscape that resulted from the national and local response to the pandemic. In many ways, the experiences of the graduate students that participated in this study mirrored my own experiences as a graduate student trying to finish a research study during a global pandemic. When I started collecting data and reaching out to interview participants, I could not have anticipated how much the pandemic would have impacted our lives, or how long it would last. I sympathized with the participants as they explained how their research changed or was canceled, which resulted in pushed-back timelines and frustration. I understood the isolation the participants described because I too, felt the effects of a reduced community during the hardest point in my graduate career. I felt the same exhaustion and pandemic fatigue that the participants described nearly a year after the pandemic started. I looked forward to our conversations during this study because it was a time of learning and sharing in the frustrations of being a graduate student during a global pandemic, and I found the interviewing process enlightening because it was an opportunity for the participants and I to co-create our stories through a shared experience.

Being a graduate student helped me connect with the participants in my dissertation study because we shared a similar experience and the participants felt comfortable sharing their stories

with me. I recognize this also biased how I interpreted the data collected because my own experiences guided the follow-up questions I asked, the discussions I had with the participants, and what stories stood out to me as I was analyzing the data. This also impacted how I perceived the data and made it challenging to identify the processes, practices, and discourses that coordinated the challenges the participants experienced because the COVID-19 pandemic was so new. It was difficult at first to untangle how the participants' challenges were coordinated outside of the global pandemic because the pandemic was so new and impacted everything. However, similar themes began to emerge through the writing and analysis stages of the research. My own experiences with the pandemic hid the translocal processes that coordinate why the participants experienced their challenges during the pandemic because I thought the pandemic itself was the coordinating process.

Limitations

This research is limited to the time and context of this study, which limits the generalizability of this study on a broader scale. The COVID-19 pandemic impacted the data collection processes involved in this study. I was limited to collecting data in an online format – Zoom interviews – which limited the type of data I could collect to ensure the safety of myself and the participants. Although not the original intention of this dissertation, the COVID-19 pandemic impacted the lives and everyday experiences of the participants and emerged as a common theme across the participant's experiences. While the findings of this study may not be considered a "typical" graduate student experience before the pandemic, it is the reality of many graduate students who are pursuing a graduate degree during this time. Therefore, while the experiences may not be considered typical, this research highlights new and existing challenges associated with completing a PhD, especially during a global pandemic.

Findings

The findings of this study show that the COVID-19 pandemic changed how the participants experienced graduate school. These changes included changing expectations for teaching due to the shift to remote work, disruptions to research and graduation timelines, and isolation and interactions with faculty and peers. The participants described how the COVID-19 pandemic changed their PhD timelines and the positive and negative impacts they experienced because of those changes. They also described how remote work and learning changed how they interacted with peers and faculty and how the pandemic contributed to feeling isolated, a decreased sense of community within the department, and disrupted work-life balance.

The Shift to Remote Work

The COVID-19 pandemic had an impact on the participants' everyday work when I interviewed participants over the fall 2020 and spring 2021 semesters. During fall 2020, SU was using hybrid instruction, with some courses and lab sections either remote or limited in-person attendance. The participants discussed how their work changed because of the pandemic during the fall semester after the initial shutdowns.

Changes to Teaching Assistantships

Most of the participants had graduate teaching assistantships during the fall 2020 semester and spring 2021 semester. Fall 2020 was hybrid with some lab sections online and some with a limited in-person option. The participants explained how their teaching responsibilities and expectations changed over the pandemic. In addition to adjusting to teaching online, they also had an increase in grading responsibilities, and communication with students changed to email and Zoom office hours. This caused a change in time commitment and format for communicating with students. The participants who taught introductory level labs explained

that they received more emails during the pandemic than they had received pre-pandemic, which changed how they worked with students. They also experienced a change in time commitment to their teaching, as most of the materials were made available to students online and the GTAs were expected to hold online office hours for their lab sections instead of being present in the lab in-person. The amount of work increased for participants teaching upper-division undergraduate labs. For example, Sophie explained that she had to adjust her lab section to be online by recreating all the lab activities to work in an online setting. Sophie taught a lab that required the use of natural history museum specimens, so she had to convert the in-lab activities to online activities. The work of converting courses from in-person to online was time-consuming, but Sophie said she appreciated the work because it meant the course was ready for subsequent semesters. Similarly, M had an increase in her work for a microbiology lab she taught. During the fall semester, microbiology students came to class on a rotating weekly schedule, with half of the students attending on week A and the other half attending on week B. However, if students were sick with COVID-19, M had to make up labs with those students, even if the lab week was already over, so she added additional office hours to her week to help her students despite that not being a requirement of her teaching assistantship.

While the participants teaching upper-division courses ended up with more time-consuming work as they converted to online and hybrid courses, the participants teaching introductory biology labs reported that their teaching workload decreased. Introductory labs were taught completely online during the fall 2020 semester; the participants teaching those courses were responsible for holding online Zoom office hours, answering student emails, and grading. Although their workload decreased during the pandemic, the participants teaching the introductory courses expressed that they missed teaching in person because they could better

connect with students. Charlotte explained how students in introductory labs were not required to come to office hours, which was the only student contact time the participants had with their students. Charlotte expressed feeling frustrated and anxious with not being able to connect with students in-person or online:

I feel like it's more anxiety, even though it's less time... I don't feel like the students are learning, and I don't know what like my teacher evaluations are gonna look like, and it's just frustrating because we don't get paid more to care, but I care. I at least want them to feel like they did okay, or they came away with something, and the fact that I can't control that because I can't get to know them, and they can't get to know me is really frustrating.

Charlotte was frustrated that she was unable to connect with students and contribute to their learning. She was also worried that she would receive poor teaching evaluations from her students because she did not know how well they were learning during the fall semester.

One positive that the participants described was that due to the decreased contact time and expected teaching times for the introductory labs, they were able to dedicate more time to research and other lab work. This was a positive for the participants because they were expected to prioritize research to complete the requirements for their PhDs, and the decrease in teaching workload increased the amount of time available during the week for research-related work.

Disruption of Research and Timeline

The COVID-19 pandemic also disrupted some of the participants' research and changed their graduation timeline by pushing back their ability to complete PhD requirements such as their qualifying exams and dissertation proposals. For some of the participants, the pandemic

disrupted their dissertation research plans. For example, in our first interview Charlotte explained how the project she was hired to do for her dissertation was put on hold:

It's just kind of indefinitely on hold. I talked to my advisor about possibly if I couldn't finish it during my PhD, that being part of my postdoc experiences, coming back and doing that collaboration. Because it's a funded project. So, that was the other thing that was frustrating as it was a fully funded project to go and do this, and it's just pitfall after pitfall.

Charlotte was frustrated that she was unable to work on the fully funded project she was hired to do because of COVID. She further explained how she and her advisor had to jump through a lot of logistical hoops to get approval from the university's Institutional Animal Care and Use Committee (IACUC) to do her research. IACUC is an ethics committee that is "charged with the responsibility of ensuring the proper care, use, and humane treatment of animals used in research, teaching, outreach, production, and demonstration at SU" (SU's Website). Essentially, IACUC approval is required to conduct animal research to ensure animals are being treated ethically and humanely. In addition to the COVID-19 pandemic impacting research by shutting down labs, Charlotte encountered additional challenges with starting her dissertation research:

It ended up taking us 14 months to get an IACUC approved to videotape monkeys, and then our collaborator that we were working with was just really unreliable. He was bad at responding to any form of communication. And when he did, he wasn't always forthright with a lot of information or very clear about things, and then he ended up quitting.

Charlotte explained that the veterinarian on her research team quit without telling them, which created logistical issues for IACUC approval since she needed to have a veterinarian to work with monkeys. In later interviews, Charlotte explained that the project was canceled because

there were too many logistical issues with COVID and the loss of her collaborator, so she had to design an entirely new project to complete her dissertation. She said, “I just had to bounce back and find other projects that I can do because there's no point in me quitting my PhD.” Charlotte was in her third year and preparing to propose her dissertation when the pandemic shut everything down. However, she was determined to not let the pandemic slow her down and affect her PhD more than it already had.

Charlotte was not the only participant whom the pandemic affected. Sophie also experienced major setbacks due to the pandemic. When the university closed in spring 2020, Sophie explained that her lab had to shut down all research activities and reduce their animal colony. In addition, they had to stop a collaborative project with another university that shut down before SU did, which pushed back experiments that Sophie and her lab group were working on. Sophie explained how that affected her graduation timeline:

It's definitely pushed my completion back a lot. My PI was like “well I hope you didn't have any plans for afterward,” for a hard deadline because I'm looking at... I mean, granted PhDs usually are like four and a half, five years, so I'm looking at probably a solid five, maybe five and a half years depending on how quickly we can get our research back up and running. Because right now we're still on pause for a lot of things... our collaborators at [university] has been the big roadblock in that case, because they're completely shut down and we rely a lot on them so that's been pushed back six months now.

Sophie's research was placed on pause for almost a full year before she was able to start working on her dissertation projects. Sophie was also in the third year of her PhD, which is when most PhD students in the biology department at SU start preparing for their qualifying exams and

proposing their dissertation. Sophie explained that the pause affected her timeline to graduating, pushing her back nearly a year to make up for the time lost due to the pandemic. In addition to the pandemic, Sophie also explained that she would not be able to start the other two projects of her dissertation for a year because it depended upon the reproductive season of the animal species she worked with. Sophie's research was constrained by things outside of her control, such as the pandemic and animal reproductive seasons. However, Sophie accepted that she would be at SU longer than she expected and was in no rush to finish; the pandemic limitations gave her extra time to plan out and pilot her projects before starting them for her dissertation.

Decreased Motivation

The pandemic also affected the participants' motivation. Some of the participants reported decreased motivation at the beginning of the pandemic when they realized it was going to last longer than expected. Charlotte explained, "I had a lack of motivation because I thought it was gonna be a short-term thing and it just felt like a vacation, and right about that time was when bits of my project started going to hell." As described above, Charlotte's dissertation project was completely shut down over the pandemic, and the long-term realization that it would not be re-started? decreased her motivation. In a later interview, she explained that she was not going to let the pandemic ruin her PhD and was motivated again to start working on a new project.

Similarly, other participants described how the pandemic affected their motivation to work. Junie explained that the pandemic stifled her creativity for research projects. Junie does education research in biology and the shift to remote learning impacted her ability to conduct studies in classrooms. She said,

It's just really stunted my creativity for research questions because... It's really hard to form any sort of research question and then set up an experiment when the administration can't figure out, is it going to be face to face [or] it's going to be online.

Junie's research options were also limited because of the pandemic and the university's response to the pandemic because her work depended upon courses being taught in person. Therefore, her ability to conduct certain studies was limited by administrative decisions that were outside of her control.

Interactions with Others and Isolation

The COVID-19 pandemic also changed how the participants interacted with their peers and the faculty members in the department and increased feelings of isolation when everything moved to remote work. Access to faculty advisors and school facilities changed when the university shifted to remote work. Participants reported challenges with communicating with their advisors and lab mates when they switched to Zoom communication instead of in-person meetings. Jordyn explained that she had a harder time communicating and getting her point across in Zoom meetings, "...sometimes you can't get your point across Zoom. A lot of times, it's easier to explain yourself when you have a whiteboard, and you could kind of feed off each other's ideas." Jordyn felt that it was harder to communicate when she did not have access to tools in her lab space to help communicate her ideas and missed collaborative conversations with her advisor and lab mates. Similarly, Junie and Charlotte explained that access to their advisors changed with the pandemic. Junie explained that she used to walk down the hall to her advisor's office any time she had a question, but now had to wait until their weekly meetings. Charlotte's advisor recently had a baby and was susceptible to COVID, so her advisor's time for meetings was limited to accommodate.

Department socials were also either canceled altogether or moved to Zoom, which made it challenging for the participants to socialize with peers and faculty members. Charlotte explained that the Graduate Student Association held a department social every fall and spring to celebrate the semester and get everyone together and help introduce new students to the department. Those socials were moved online and were not as impactful as previous years when they were held in person. Charlotte explained that it was challenging to get people to attend the online socials because everyone was burnt out from Zoom. M also noted the lack of social events because of limitations to online events, “all of the seminars are online so you’re on Zoom. And normally the graduate students would have a bunch of events at this point, but we haven’t had anything in person.” M was in her first year at SU and did not have any previous experiences with social events to compare. For her, the lack of social events was normal because of the pandemic, but it created a sense that there was no graduate student community because she was unable to meet other graduate students in the department outside of her lab.

Isolation

Participants also reported feeling isolated and fatigued since the beginning of the pandemic. The requirements to work from home and socially distance meant that the participants were missing out on socializing with friends, communicating with their peers, and visiting with family. For example, Sophie expressed that she felt lonely during the pandemic, “it’s a little bit lonely. I’m keeping my circle really small and only seeing very few people. But overall, it’s still... we’re still communicating and luckily video conferencing is great.” Although Sophie had to reduce her social activities, she was still able to interact with friends over video conferencing. Charlotte also found the lack of social interactions challenging, as she valued interacting with

people and saw social activities as networking opportunities to learn or make new connections with people.

Participants also reported fatigue from working from home, especially since it impacted their work-life balance. Amelia explained, “there’s no distinction between your home and your workplace... working hours are really hard to distinguish too. Like the day seems longer in a way.” Amelia had a hard time separating her home time from her work time, which led to fatigue. Other participants expressed similar sentiments about being at home. Jordyn explained that working from home all the time negatively impacted her productivity. Junie spent all her time at home working because she did not have anything else to do, which burnt her out on work. Charlotte’s motivation to work decreased the longer she was at home. By spring 2021, the participants were able to start going back to campus part-time to work on experiments or work in the lab, which helped separate home time and work time.

Discussion

In this study, I explored how the COVID-19 pandemic changed aspects of graduate students’ everyday work in biological sciences at a Southern Research University. Participants discussed how the pandemic impacted their research and teaching work after the university shut down labs and converted courses to remote or hybrid instruction. While the pandemic did not have as large of an impact on their teaching assistantships, most of the participants experienced major setbacks to their dissertation research as labs were closed and research plans were canceled or postponed. This pushed some of the participants’ graduation timelines back as they had to make changes to their dissertation projects, push back experiments and qualifying exams for candidacy, and adjust their expectations for graduation. The disruption of research decreased motivation for many of the participants as they were unsure at the time how long the pandemic

was going to last or how much they would need to change their research. However, they were able to adapt and make changes to their dissertation research to move forward with their degree requirements. Participants also discussed how the pandemic impacted how they interacted with peers and faculty members by changing social opportunities and meetings to online. The participants reported feeling isolated from their peers, friends, and families during the pandemic and fatigue of being at home for extended periods for work, leading to a decreased sense of community and disruptions to work-life balance.

The pandemic and subsequent response by SU was outside of the participants' control, however, they had to adjust their expectations and daily work activities to stay safe and comply with institutional and national policies. The uncertainty and novelty of the pandemic led to participants feeling anxious about their future. They were unsure how the pandemic would impact their research, graduation, and future career prospects. Additionally, the pandemic limited networking and socialization opportunities, which are important for the professional development of graduate students (Austin, 2002; Weidman et al., 2001). Overall, the pandemic seemed to negatively impact the everyday work activities of the participants. There were some positives, such as more time to focus on research and the development of new skills with remote teaching. However, the pandemic contributed to issues with work-life balance and burnout that are already prevalent in graduate school without the pandemic (Bettencourt et al., 2021; De Welde & Laursen, 2011; Suart, Neuman, et al., 2021).

Although not immediately obvious, the challenges experienced by the participants during the pandemic were coordinated by similar translocal processes, practices, and discourses that are consistent with the findings of the other chapters within this dissertation. The novel context created by the COVID-19 pandemic exacerbated issues within higher education, and that was

evident within the challenges experienced by the participants of this study. For example, participants explained how the pandemic led to lab shutdowns and the cancellation of research projects that were important for their dissertation research and future careers. Participants described challenges with decreased motivation due to their inability to continue their research. This experience is coordinated by the expectation to prioritize research and be productive, which fall under the neoliberal ideologies that drive higher education today (Burke, 2021; Liang & Lin, 2021; Museus & LePeau, 2019; Olssen & Peters, 2007).

Expectations set by neoliberal ideologies within higher education place immense pressure on academics to produce high-quality research, publish in academic journals, and present at conferences as metrics for success (Archer, 2008; Caretta et al., 2018; Liang & Lin, 2021; Museus & LePeau, 2019). Setbacks in research productivity caused by the COVID-19 pandemic could have led to stress and anxiety as participants were unable to meet these neoliberal expectations for success in academia. Indeed, Jordyn explained that she was not sure how her committee was going to take the pandemic into account during her annual evaluation – were they going to still expect research productivity as evidence of success to give her a high score or would they change that expectation to account for how the pandemic impacted research for graduate students? Furthermore, some participants explained that their graduation was pushed back by a year because of changes to their dissertation research and ability to complete PhD requirements, such as qualifying exams, the proposal defense, and data collection for their dissertation research. Although graduate school is more flexible with how long a PhD is expected to take, graduate student participants were still under pressure to complete their degrees within a certain timeframe due to limitations in funding or the availability of assistantships. Some of the participants were okay with the delayed graduation timeline because it gave them

more time to focus on their research. Additionally, the delayed graduation could have been perceived as positive because the academic job market was negatively impacted by the COVID-19 pandemic in 2020-2021 and the limited security of graduate school could be better than possible unemployment due to a competitive job market.

Table 4.2

Institutional discourses, processes, policies, or procedures that coordinated the challenges related to the COVID-19 pandemic

Challenge	Discourse, Process, Policy, or Procedure	Gendered Implications
Cancelled research projects	Neoliberalism; productivity	Fewer publications and opportunities for external funding; can impact future job prospects which delays women's ability to earn higher pay
Disrupted timeline	Neoliberalism; productivity	Delays graduation and the job search; delays family-planning; may decrease opportunities for better pay and future access to leadership positions
Decreased motivation	Expectation to be productive; prioritize research	Fewer publications, which can impact future job prospects; increased depression and anxiety
Lack of community	Neoliberalism; focus on educational outputs, research productivity, and getting people back to work	Decreased sense of community; women are less likely to persist in STEM when they do not have access to peers and mentors
Isolation	Prioritizing work and revenue instead of mental health, community, and social support	Places burden on prioritizing work over social relationships and community; increased depression and anxiety

Community is important for graduate student well-being and the presence of a supportive community has been shown to impact the persistence of women in STEM (Börgeson et al., 2021; Bostwick & Weinberg, 2018; Horner-Devine et al., 2016; Macoun & Miller, 2014; O'Meara et al., 2017). The isolation and lack of socialization or networking opportunities experienced by the participants may reflect the priorities of the institution. While social activities were limited

because of the pandemic, institutions focused on getting students back into the classroom and graduate students and faculty back to work instead of social support for individuals involved with the university. This also reflects the neoliberal agenda of higher education to focus on outputs and revenue (Museus & LePeau, 2019; Olssen & Peters, 2007). During the pandemic, researchers reported increased mental health challenges experienced by graduate students related to isolation, uncertainty about the future, and their own health and safety (Chirikov et al., 2020; Patias et al., 2021; Wieczorek et al., 2021; Woolston, 2020). The lack of prioritization of social support and community highlighted what graduate students had access to, were willing and able to participate in, and may reflect the priorities of the institution.

The findings of this study are consistent with the findings of other studies that examined the impact of the COVID-19 pandemic on graduate student experiences. The participants in this study experienced disruptions to their research because of institutional shutdowns, which changed their dissertation research progress and delayed their graduations (de Caux, 2021; Servick et al., 2020; Suart, Suart, et al., 2021). Some participants were concerned about their future careers, as the pandemic changed their ability to design and conduct research or limited their options for gaining experience in alternative career paths. This is reflected in other studies, where doctoral candidates were concerned with the availability of future faculty and postdoc positions (Suart, Suart, et al., 2021). Developing a research agenda and having a strong publication record is necessary for being competitive in the faculty job market, and the pandemic impacted the motivation, productivity, and research output of graduate students across the world (de Caux, 2021; Suart, Neuman, et al., 2021). Further research to understand the long-term impacts of the COVID-19 pandemic is needed.

Future Research

The long-term implications of the COVID-19 pandemic on graduate student well-being, productivity, and job prospects are yet to be known. Therefore, future research should follow graduate students as they transition into the job market and begin their job search during the pandemic and after the pandemic. Future studies can examine how the disruptions to research and writing caused by the pandemic will be regarded during doctoral candidates' job searches. Several studies have reported increased depression and anxiety in graduate students; therefore, research should also examine the long-term impacts of the pandemic on mental health and how graduate students have coped with the challenges of their graduate degree and the pandemic. Additionally, understanding how expectations for doctoral students have changed during the COVID-19 pandemic and if those changes stay intact moving forward will be important questions to consider as we transition into a post-pandemic world. Although the impacts of the COVID-19 pandemic were not the initial purpose of this institutional ethnography, this study highlights the need to understand how the discourses, practices, policies, and procedures associated with the COVID-19 pandemic have a differential impact on women in graduate school. Future research should look at the gendered implications of the COVID-19 pandemic on women's experiences in graduate school and how the changes to work and research impacted women. Finally, graduate students were in different stages of their doctoral education when the pandemic started. Future research could explore the perceptions and experiences of graduate students who started their first year during the pandemic and of graduate students who are in more advanced stages of their graduate career. This would provide unique insights into how graduate students coped with the pandemic as they transitioned into a new environment.

Recommendations

As the COVID-19 pandemic continues to impact our everyday world and higher education spaces, we need to consider how we can support graduate students during this difficult time. The experiences of the participants in this study highlighted a need for greater transparency in communication between faculty, administrators, and graduate students about expectations and changes to research, teaching, and coursework. The procedures for lab closures were unclear and had long-term impacts on participants' research, so in the future, lab closure expectations, protocols, and decisions should be clearly communicated (Suart, Suart, et al., 2021). The findings suggest that participants were not prepared for the disruption to their research and either had to completely change their dissertation projects or wait an extended period to start their research. Although this was an unprecedented experience, additional support for graduate students whose projects did not go as planned is necessary moving forward as they cope with the depression and anxiety that resulted from the loss of research productivity and the pressure to catch up (Suart, Suart, et al., 2021). Expectations for productivity during and after the pandemic should be made explicitly clear, and faculty advisors should be in communication with their students about what they expect as students come back to the lab and start their research again. Clear expectations can also help graduate students establish work-life balance as they work from home. Faculty and administrators can also be empathetic, and patient as graduate students adjust to working in the lab, taking classes, and teaching in-person again when universities begin transitioning to in-person operations full time.

In line with productivity and job searches, as universities are conducting job searches, search committees should consider how they are making hiring decisions with graduate students and early career researchers. Gaps in publications and research output could greatly affect the job

prospects of many early career researchers, and this is especially true for women and people of color, who faced additional barriers to their productivity with increased childcare, family, and teaching responsibilities (Viglione, 2020). Finally, the mental health implications of the pandemic were enhanced, with graduate students reporting higher levels of depression, anxiety, and distress during the pandemic (Chirikov et al., 2020; Patias et al., 2021; Suart, Suart, et al., 2021; Varadarajan et al., 2021; Wieczorek et al., 2021; Woolston, 2020). This highlights the need for increased resources for mental health, wellness, social, and emotional support.

Conclusion

The COVID-19 pandemic changed the state of higher education worldwide; students, faculty, and staff transitioned to remote courses and work, research was halted, and facilities were closed. In spring 2020, the pandemic brought with it uncertainty about the future as we did not know how long it would last or what the long-term economical, societal, psychological, and health impacts would be. We did not imagine that it would continue, nearly three years later, as the world attempted to return to normalcy while the pandemic raged on. This study documented the experiences of six women doctoral students in biological sciences at a Southern Research University as they navigated an uncertain, novel environment, overcame obstacles, and continued with their studies despite the pandemic. Participants reported changes to their everyday work as teaching expectations changed with the shift to remote work, research was disrupted to the point where some of the participants had to change their dissertation research or delay their graduation by a year. The way the participants interacted with their advisors and peers changed as well, moving to remote department social and seminars or forgone altogether. This led to participants feeling isolated from the broader graduate student community at SU and the department, as well as fatigue from working from home for extended periods. Based on the

findings of this study, I provided avenues for future research and recommendations for higher education professionals to support graduate students as they complete their PhDs during this challenging time.

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CHAPTER V

DISCUSSION AND CONCLUSION

The purpose of this institutional ethnography was to examine the institutional practices of graduate Science, Technology, Engineering, and Mathematics (STEM) education from the standpoint of women graduate students in biological sciences. More specifically, I sought to understand how processes, policies, practices, and discourses coordinated the experiences of women graduate students in biology. Additionally, this dissertation examined how discourses coordinate the expected attitudes, norms, and values of the biological sciences discipline and explored how those discourses created challenges for women pursuing a PhD in biology. This dissertation provides a better understanding of the institutional processes, procedures, practices, and discourses that coordinate graduate student work and provided insight into how women PhD students are socialized into their field to make recommendations to improve the graduate STEM education environment.

I collected qualitative data by conducting semi-structured interviews with women PhD students and faculty, participant journals in the form of modified critical incident questionnaires, and document analysis. Participants in the study included six PhD students in biology and two faculty members in biology. Through the framework of feminist standpoint theory, data collection and analysis began with the descriptions of women PhD students' day-to-day work at SU. Descriptions of participants' day-to-day work informed subsequent data collection process where I examined how their day-to-day work was organized through interviews and institutional documents. I coded, analyzed, and organized data by the sub-research questions, which allowed me to identify three problematics that became the major findings of this dissertation. This

dissertation was organized into three articles that explicated the ruling relations of graduate STEM education through the standpoint of women PhD students in biology.

This study was based on the following overarching research question: How do the STEM education institutional processes, policies, practices, and discourses organize and inform the experiences of women graduate students into the discipline of biological sciences at SU?

Data collection and analysis were guided by three sub-research questions:

1. What is the everyday work of women PhD students in biological sciences?
2. What challenges emerge from the coordination of women PhD students' everyday work?
What processes, practices, and discourses coordinated those challenges?
3. How is gender associated with the coordination of the everyday work of women PhD students in biological sciences?

I begin this chapter by synthesizing the findings in response to the research questions and how those findings connect to the existing research on graduate STEM education and socialization. Second, I address the implications of this study for the field of STEM education. I also identified the limitations and considerations of my study that limit the applicability of the findings and provide a nuanced view of these women's experiences. Third, I discuss recommendations for the field of graduate STEM education. Fourth, I discuss my own researcher's reflection and positionality after conducting this study. Finally, I discuss areas for future research to extend the findings of this dissertation.

Through the analysis of interview and document data, I identified the processes, practices, policies, and discourses that coordinated the experiences of women PhD students in biology at SU. The three key findings are as follows:

1. Graduate student and faculty participants and institutional texts described the characteristics of the “ideal” graduate student as someone who has an adequate scientific background, prioritizes research, manages time well, is willing to ask questions, and is independent and self-driven. Participants reported challenges with meeting the standards of the ideal graduate student such as fear of failure and imposter syndrome, which impacted their mental health in their graduate program. The ideal graduate student overlapped with the characteristics of the ideal STEM student and the ideal academic, which created a disjuncture for women PhD students to fulfil as they needed to conform to both. Additionally, although packaged as gender-neutral, the characteristics of the ideal graduate student are more likely to be met by men than women.
2. Graduate student work was organized around the three domains of research, teaching, and coursework. Neoliberal discourses such as productivity and competitiveness coordinated how the participant’s work was structured and created challenges for students. The challenges included pressure to be productive, the “publish or perish” discourse, comparing progress with other students, fear of falling behind, and trouble managing their time as graduate students tried to keep up with multiple conflicting aspects of their work. The neoliberal discourses identified in this chapter contributed to the gendered educational environment of graduate biology education by reinforcing the ideal graduate student as an unencumbered, abstract worker that has no outside obligations and can meet the demands of the neoliberal higher education environment.
3. The COVID-19 pandemic impacted graduate student work by making changes to their daily work structure, isolation and reduced socialization opportunities with faculty and peers, and a disruption of their research plans and PhD timeline. Participants described

both the positive and negative implications of the COVID-19 pandemic and how it changed their graduate work. For example, the participants experienced delays to their research and thus graduation timeline, which could impact women's research productivity, opportunities for external funding, and delay their future careers and family-planning. Additionally, the participants experienced isolation and a lack of community, which reinforced the priorities of the neoliberal university to focus on productive work instead of graduate student well-being and support. This can differentially impact women graduate students as research shows women are more likely to persist when they have a supportive community of peers and mentors.

The previous chapters presented the findings by organizing data from various sources into categories and themes. In this chapter, I discuss the conclusions that follow from these three major findings, situated in the literature on graduate STEM education, gendered institutions, and neoliberalism. The conclusions are intended to extend the literature on women's experiences in STEM graduate education and illustrate how gendered structures persist in a field that is considered gender balanced.

Commonalities and Distinctions Across Key Findings

The conclusions from this dissertation follow the key findings and research questions to provide an understanding of the social organization of STEM graduate education and the translocal processes that coordinated graduate student work. I use a selection of key findings to discuss how similar discourses contribute to different challenges for graduate students and reinforce the chilly climate. By concentrating on these conclusions, the findings and implications of this dissertation may shape how we understand the persistence of gendered experiences in STEM fields as women's representation increases.

Similar Discourses – Different Mechanisms

How ideological codes, institutional discourses, and ideological discourses coordinated the work of graduate students in a STEM field were the central focus of this dissertation.

Discourse in institutional ethnography refers to “translocal relations coordinating the practices of definite individuals talking, writing, reading, watching, and so forth, in particular local places at particular times” (Smith, 2005, p. 224). Essentially, discourses are social relations that organize how, where, and when people act within specific locations. These discourses appear as ideological codes, which are a “discursive framework that organizes people’s talk and text and to which people hold themselves accountable” (Luken & Vaughan, 2021, p. 366). Institutional discourses are essentially larger ideological codes that are integral to the production of the institution (Smith, 2005). Ideological discourses are “generalized and generalizing discourses operating at a metalevel to control other discourses” (Smith, 2005, p. 224). These three types of discourses coordinate the everyday work of people within institutions by providing a framework for how to behave, speak, and work within an institution. Therefore, similar discourses can act in different ways depending on how they are being enacted, and how the individual is socially situated within the institution.

Across the chapters of this dissertation, similar discourses were working in different ways on the everyday work and experiences of graduate student participants. In chapter 2, I described the ideological codes that constructed the “ideal” graduate student in STEM. Specifically, the ideal graduate student was someone with an adequate scientific background, prioritizes research, manages time and multiple responsibilities well are willing to ask good questions, and is independent and self-driven. Participants experienced challenges with meeting the characteristics of the ideal graduate student, namely imposter syndrome and fear of failure. I also examined how

the ideal graduate student was compared to the ideal student (Parson & Ozaki, 2018; Wong et al., 2021) and the ideal scientist/academic (Lund, 2012; Parson et al., 2021). I found that the ideal graduate student shared characteristics of the ideal student and the ideal academic, but often, these characteristics conflicted with one another, creating a disjuncture for graduate students to meet these standards.

In chapter 3, I described how neoliberalism (an ideological discourse) coordinated the work of graduate participants through the discourses of productivity, competition, and pressure to “do it all.” These discourses created expectations for participants to prioritize research in their graduate training and aim to produce research products through publications, grants, and conference presentations. Participants experienced subtle competition within their graduate program as they compared their progress and publication output to other graduate students within the department and viewed themselves as unsuccessful if they were unable to conduct publishable research. These neoliberal discourses contributed to a fear of falling behind and pressure to be busy to keep up with the high demands of graduate school and academic work. They also contributed to the chilly climate by suggesting that an ideal academic would be someone that could fulfill the expectations of the neoliberal university and by placing extra pressure on women and marginalized students to produce more research outputs to be respected in science.

In chapter 4, I explored how the COVID-19 pandemic changed how graduate student work was conducted, the challenges that emerged from the pandemic, and the institutional discourses that coordinated those challenges. I found that participants experienced disruptions to their dissertation research, which led to disruptions toward their graduation timeline and decreased their motivation to continue their work. The participants also described the decreased

sense of community and isolation they experienced because of the pandemic. The findings of this chapter highlight how the neoliberal expectations of higher education further coordinate the challenges experienced as a result of the pandemic. The issues with higher education were exacerbated by the pandemic because participants were not able to complete research tasks and were expected to focus on work instead of community support during the pandemic, which led to feelings of anxiety for the future and isolation. These findings highlight how the gendered educational environment of STEM education can impact women. Women are more likely to persist when they have access to community through mentors and peers, especially if those mentors and peers share the same gender identity as them (Bostwick & Weinberg, 2018). Because the institution deprioritized community building and addressing graduate student isolation and instead focused on returning to the activities that were profitable and productive, the institution is signaling to women that their needs are not as important or valued compared to the profit needs of the university.

Across chapter 2, chapter 3, and chapter 4, I noticed similar discourses were coordinating the work of graduate students but in slightly different ways. First, the prioritization of research was a discourse that aligned with neoliberalism. Graduate students were expected to and rewarded for prioritizing research output in their graduate work. This expectation to prioritize research then constructed the ideal graduate student, as the characteristics of a good graduate student were someone who was able to prioritize research. The COVID-19 pandemic emphasized the problems with this expectation, as participants were unable to complete research at the level they believed was expected of them and were less motivated. This could impact the annual evaluation criterion that graduate students were expected to complete, as it was unclear how graduate students would be evaluated regarding the disruptions to research that the COVID-

19 pandemic caused. Other expectations, such as the pressure to publish a lot of papers in high-impact journals, acquire external funding, and present at national and international conferences were markers of prestige and success for academics, and it promotes an ideal that can only be obtained by certain people. Specifically, the neoliberal discourses and ideological codes constructed the ideal graduate student as a disembodied, unencumbered worker that had unlimited time and resources to conduct and produce research. Men are more likely than women to ascribe to that ideal, and so the discourses discussed in chapter 2 and chapter 3 contributed to the chilly climate and gendered institution through different ways but produced a similar result. Neoliberalism in higher education creates a high-pressure, competitive, chilly environment and reinforces the ideal academic as someone willing to conform to the demands of the academic workload. Furthermore, the neoliberal demands of higher education were exacerbated by the institutional response to the COVID-19 pandemic as research productivity was prioritized over community building and addressing isolation, suggesting that profit and productivity are more important above all else in higher education.

While the primary focus of this dissertation was on the gendered experiences of women PhD students in biological sciences and how the STEM institutional discourses, processes, practices, and procedures coordinated challenges in a way that was gendered, it also coordinated challenges for participants in a way that was racialized. An individual's identities and social positioning do not exist in isolation; they are multiple and can overlap and be impacted by multiple forms of systematic oppression (Collins & Bilge, 2016; Crenshaw, 1991; Gaston Gayles & Smith, 2018). Feminist research that reduces women's experiences into one whole experience without considering the intersecting ways systematic oppression can impact the lives of women with multiple, minoritized identities contributes to centering whiteness in women's experiences.

Of the six women that participated in this study, three identified as women of color; however, only two mentioned their racial identities as a salient part of their experiences. Not discussing race or considering white as a racial identity comes from a place of privilege, as whiteness is considered the norm and dominant identity, especially within STEM fields and higher education. For the two participants whose racial identities were salient, they experienced additional challenges that were coordinated by the ideological codes, institutional, and ideological discourse that organized and informed their work. They worried about confirming racial stereotypes and were more aware that they were a minority within the department. They were also more aware of the lack of experience and resources they had compared to the other graduate students in the department. For one participant, she did not consider her gender as a major influence for the challenges she experienced because she was surrounded by women in her work and educational environment; however, she was one of the only Black women in her lab and her racial identity was more salient for her than her gender identity. The discourses, processes, procedures, and policies that coordinated a gendered experience also coordinated a racialized experience for the participants who held marginalized identities as they worked to meet the expectations of the ideal graduate student and the neoliberal university. These expectations contributed to a challenging environment where one had to work harder to be seen as an equal and contributed to enhanced feelings of imposter syndrome, fear of failure, and fear of falling behind just to keep up. These reflect the experiences of Black graduate students in STEM (Chakraverty, 2020; Mcgee et al., 2019; Stone et al., 2018) and highlight the need to use intersectionality as an analytical tool within STEM graduate education research to understand how multiple identities and forms of systematic oppression can impact the lives of women of color.

Researcher Reflection

I entered this dissertation research from the perspective of someone who “left” science and entered a new (to me) field that gave me the tools to understand my own experience. I dealt with shame and guilt as I embarked on this new journey, and that shame and guilt resurfaced as I conducted my dissertation research. As my research moved forward with every interview conducted and analyzed, every text collected, and every interaction with the participants of this study, I found the threads that led me to the major findings of this dissertation. And with those findings came the guilt and shame that I “failed” because I was not able to conform or meet the standards of graduate STEM education. But I also learned that I was not the only one who felt that way. As I talked with each of the participants in this dissertation, I learned about the complexities of graduate education, the visible and invisible expectations and standards graduate students are held to, and the institutional structures that are beyond the everyday world of graduate education that contribute to those feelings of guilt, shame, and imposter syndrome. I found myself being “called out” a lot during the research process because I was experiencing a lot of the same feelings as the participants, such as fear of failure, imposter syndrome, and trying to meet academic standards that reflected a masculine “ideal.”

I empathized with the participants when they talked about their struggles in graduate school, as I was also going through similar struggles. I often caught myself participating in institutional capture while I was interviewing participants or analyzing the data. Institutional capture refers to the shared knowledge that I have with the participants and how that can sometimes bias how I understand their lived experiences (Smith, 2005). I have insider knowledge about graduate school both as a graduate student, a higher education scholar and as someone who graduated with a STEM master’s degree. So, I had to be aware of how I was

constructing meaning with the participants as we related our experiences. I felt like my status as a graduate student and former biology graduate student influenced the rapport and power dynamics between researcher and participant. Often, we co-constructed experiences because I had similar experiences as the participants, and so we were able to use our knowledge as women in STEM and graduate students to construct meaning. I also found it challenging to not finish the thoughts of my participants or forget to ask probing questions because, at the time of the interview, I understood what they meant as they told me about their daily work and the challenges they experienced.

I found that as I analyzed my data, I had previous assumptions about how things worked or understood them from a graduate student perspective – such as qualifying exams and graduate teaching assistantships. I also had a hard time with my assumptions around gender inequity and how gender would emerge in my research. I was surprised when the participants were either unaware of gender in their experiences or were reluctant to attribute gender to their experiences. This made it hard for me to talk about gender within my analysis, as I did not want to misrepresent the participant's descriptions of their experiences, but I also recognized that gendered experiences still exist and may be invisible or normalized as neutral instead of gendered.

Overall, this dissertation was a challenging and rewarding process. I enjoyed the growth that arose from the challenges of conducting a dissertation (even if I sometimes did not actually enjoy it in the moment). I also enjoyed talking to the participants and learned a lot from their experiences. I empathized with their struggles and saw myself in their determination. I valued the conversations we had as they shared with me their experiences with graduate education. I hope that the findings and conclusions from this dissertation provide a foundation for improving

graduate education and empowering graduate women to share their stories and perspectives. Research that hopes to improve the agency and power of people should begin from the standpoint of those people, and that is what I had hoped my research could do.

Future Research

Future research that builds from this study could follow three paths. First, future research can expand upon this study to examine institutional practices, processes, and discourses across other institutions and biology programs to include a wider variety of experiences. Biology is a broad field with a variety of programs spanning cellular and molecular biology programs, ecology and evolution programs, zoology, computational biology and genomics programs, and organismal-based programs. The graduate student experiences with graduate school and socialization have been widely studied in cellular and molecular and biomedical sciences programs, however other sub-fields of biology such as ecology/evolutionary biology, organismal and field-based programs, and computational biology programs remain understudied. Therefore, expanding the exploration of the STEM institutional structures to these other programs will provide a comprehensive exploration into the practices, processes, and discourses that organize and inform the academic field of biological sciences.

Second, future research can follow graduate students along their graduate school experience from their first to last year to examine how institutional structures and discourses may change across the different stages of a graduate student's experience. This could also further explore how their perceptions change throughout their graduate career and examine how long-term relationships with women faculty and peers affect the outcomes of graduate women in STEM. Third future studies can and should explore how graduate students from underrepresented identities, such as students of color and first-generation college students,

experience socialization in graduate school to extend the literature on graduate student socialization to include intersectionality. Furthermore, graduate students who previously attended community colleges are an understudied student population that would provide a unique perspective on the institutional structures that inform graduate STEM education and maintain inequities in STEM.

Fourth, future research can further disentangle the expectations of graduate students and how those expectations may be different across institutions, departments, and labs. Graduate programs are diverse, and as mentioned above, biology is a broad field with different norms and expectations depending on the subfield. For example, expectations for lab-based sciences that use lab rotations as the primary pedagogy may be different from field-based sciences or major-professor-centric subfields. By understanding how expectations are constructed and enacted within different subfields of biology, we can further understand how marginalized identities (e.g., gender, sexuality, race, ethnicity, class, dis/ability, etc.) experience and are constituent of the expectations for success within biology specifically and STEM broadly.

Conclusion

Efforts to increase the number of women in STEM have previously focused on recruitment and retention, however, exploring women's experiences as they navigate institutional processes, policies, practices, and discourses provided a unique perspective into how women experience graduate STEM education and the masculine norms and values that persist in those spaces. This dissertation examined how the everyday work of women PhD students in biological sciences was organized and informed by STEM institutional policies, processes, practices, and discourses. The findings of this study suggest that women's work in biology graduate education was coordinated by neoliberal discourses of productivity and competitiveness, as well as the

discourse of the “ideal” graduate student. Graduate women were expected to prioritize research and publication output, manage their time well, ask good scientific questions, have an adequate scientific background, and be independent and self-driven in their work. These expectations contributed to the chilly climate experienced by women by increasing feelings of anxiety, imposter syndrome, and fear of failure. Additionally, the impacts of the neoliberal university were evident in the findings of this study, as women students experienced increased pressure to perform and produce research in line with the audit culture of higher education. Finally, while not the initial intention of this study, the COVID-19 pandemic had a profound impact on graduate student work as it changed how the participants conducted their research, teaching, and coursework. The COVID-19 pandemic created challenges for students by changing their research productivity, which could have long-term implications for participants as they may have a gap in their publication output.

Implications for this research point to a critical examination of the policies, practices, and procedures of graduate STEM education to improve the experiences of diverse students in STEM. The impacts of the COVID-19 pandemic are also important to consider, as graduate students were greatly impacted by the pandemic. Future research should explore how expectations for graduate students change to accommodate the impacts of the pandemic and ensure equitable considerations for graduate students and early career researchers who were impacted. It is hoped that this research provides a unique perspective on the experiences of women in a STEM field that is considered gender-balanced and can provide the foundation for recommendations to improve graduate STEM education.

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APPENDICES

Appendix A: Participant Demographics

Graduate Student Demographics

Pseudonym	Degree (M.S/PhD)	Year in Program	Program Concentration/ Discipline	Career Goals	Gender (Self-Identified)	Number of Interviews
Sophie	PhD	3 rd Year	Physiological Ecology	Government Research/ Industry	Woman	3
Junie	PhD	2 nd Year	DBER	Faculty	Woman	3
M	PhD	1 st Year	Physiology, Genomics	Faculty	Woman	3
Amelia	PhD	1 st Year	DBER	N/A	Woman	3
Jordyn	PhD	3 rd Year	Genomics	Teaching Faculty	Woman	3
Charlotte	PhD	2 nd Year	Genomics, Animal Behavior	Industry	Woman	3

Faculty Demographics

Pseudonym	Position	Research Concentration	Gender (Self-Identified)	Number of Interviews
Victoria	Associate Professor	Physiological Ecology	Woman	1
Carol	Professor	Physiological Ecology	Woman	1

Appendix B: Interview Protocol

Interview code: _____

Consent form signed: yes/no (circle one)

Review purpose of the interview:

The purpose of this interview is to explore biological science graduate student experiences and perceptions of socialization. It is estimated that interviews will last 45-60 minutes. If you are willing, this interview will be recorded using the AudioNote app on my iPad for the purpose of review and transcription. Your name and identifying information will not be recorded.

Do I have your permission to record our conversation? yes/no (circle one)

Date/Time of interview:

Location of interview:

M.S. or PhD student/candidate (circle one)

Year in school:

Stage of graduate education (circle one): First Second Third

Interview number (first, second, third):

Pseudonym:

First interview questions: (asking additional questions to clarify unclear information or to re-focus responses to be pertinent to the study):

1. Why did you choose to pursue a graduate degree in biological sciences?
2. How did you identify a graduate school/lab to join?
3. Why did you choose to come to SU?
4. What steps did you take to apply to graduate school?
5. Do you have a GTA/RA?
 - a. How did you find out about that funding option?
 - b. What are your expectations/responsibilities as a GTA/RA?
 - c. Where do you find that information?
6. Starting when you began your graduate biology coursework, tell me about how you have progressed through your program. Guiding questions (if necessary):
 - a. What classes have you taken?
 - b. What has been your hardest class? Why?
 - c. What has been your easiest class? Why?
7. Overall, what have been your biggest challenges? (Tell me more...)
8. Tell me about a typical day. Guiding questions (if necessary):
 - a. What do you do when you wake up?
 - b. When do you get to campus/the lab/class? How do you get to campus/the lab/class and how long does it take?
 - c. What do you do at class/in the lab?
 - d. What happens after class/lab work on a typical day?
 - e. Describe the work you do for school/research on a typical day.

- f. How does that change during preparation for an exam/experiment/field work?
 - g. What else happens during the week?
9. Tell me about a biology class you are taking/teaching right now. Guiding questions (if necessary):
- a. What happens on the first day of class? What is on the syllabus?
 - b. How do you find out about assignments/expectations?
 - c. What does a typical class session look like?
 - d. What do quizzes/exams look like? How do you prepare?
 - e. Where would you go if you needed help?
 - f. Tell me about the people in the class (leaving out names or other identifying information)
10. How do you find out the information you need to be successful as a graduate student in biological sciences?
11. Who do you go to for support?
12. What professional development courses/activities do you have to take (if any)?
13. What other information do I need to know to understand the steps/processes you take as a biological sciences graduate student?

Close of the first interview:

This is all the questions I have for you today – thank you for your time. About halfway through the semester, I would like to meet with you for a follow-up interview, intended to last 30-45 minutes. Would you be willing to talk again? Yes/no (circle one).

Second interview questions (follow consent process above):

1. How is the semester going so far?
2. Remind me of what classes you are taking (if applicable)?
3. Remind me of what classes you are teaching (if applicable)?
4. Remind me of what research you are working on?
5. Tell me about _____ (fill in with current class).
 - a. What assignments are you working on? How do you find out about them?
 - b. How does the professor structure each class session?
 - c. How does the professor structure the work required for the course?
 - d. Where do you go if you need help?
 - e. What does a typical class session look like?
6. Tell me about _____ (fill in with class they are teaching)
 - a. What responsibilities do you have as a GTA?
 - b. How is being a GTA going?
 - c. How do you structure each class session? Or how is each class session structured?
Where do you learn that information?
 - d. Where do you go if you need help?
 - e. What does a typical lab/course session look like?
7. Tell me about _____ (fill in with lab/research)
 - a. How is the research process going?
 - b. How do you structure time in the lab/research?
 - c. Where do you go if you need help?
 - d. What does a typical day in the lab/field/doing research look like?

8. Thinking ahead to graduation:
 - a. When do you anticipate you will graduate?
 - b. What do you need to do to graduate with a degree in biological sciences? How do you know?
 - c. What are your plans for after graduation? Career aspirations?
9. Are you still planning to graduate with a degree in biological sciences? If not, tell me why.
10. How does a typical day look for you? Has that changed? Do you anticipate it will change? Why or why not?
11. Tell me about your interactions with your peers/your advisor?
 - a. How often do you interact with your peers/advisor?
 - b. What do those interactions look like?

Close of second interview:

This is all of the questions I have for you today – thank you for your time. After the conclusion of the semester, I would like to meet with you for a follow-up interview, intended to last 30-45 minutes. Would you be willing to talk again? yes/no (circle one).

Third interview questions (follow consent process above):

1. How did the previous semester go?
2. Overall, what was your experience in each class (go class by class).
3. Overall, what was your experience as a GTA?
4. Overall, what was your experience with research/lab work?
5. Thinking back, what stands out to you positively about the last semester?
6. What stands out to you negatively about the last semester?
7. Tell me about finals for your biology courses (if applicable).
 - a. Were the tests/projects comprehensive?
 - b. How did you prepare for the finals?
 - c. What would have helped you to prepare better?
 - d. Do you feel like you were prepared?
8. Thinking about your biology classes:
 - a. Tell me about the composition of your classes (men/women, year in school, etc.)
 - b. Who participated the most? Least?
 - c. Was there support inside of the classroom? Outside of the classroom? Tell me about it.
 - d. How often would you talk to your professor outside of class?
9. Thinking about the biology graduate administration and faculty, tell me about your interactions with them?
 - a. Who would you interact with the most? Why?
10. What is expected of you as a graduate student in biological sciences? How do you know?

- a. Where do you find the information you need to be a graduate student in biological sciences?
11. Thinking about your experience this past semester, what additional information would you like to tell me about to understand your experiences?

Conclusion of interview:

Thank you for your participation in these interviews with me. As you know, these interviews are confidential, and no identifying information was recorded. Over the next few months, I will be continuing to gather and record information. As a part of that process, I would like to confirm that the information I have gathered from you is in accordance with your perceptions and intentions. Would it be okay if I emailed you portions of our transcribed interviews for you to read through and clarify any information as you see necessary? yes/no (circle one).

Faculty Interview Questions:

Obtain consent and review purpose of the interview (above).

I have some specific questions for you about how the day-to-day activities of graduate students are coordinated as well as about specific documents used in the classroom/lab to coordinate those activities.

1. Tell me about your course syllabus. How do you decide what information should go into the syllabus? How does the syllabus function in your classroom?
 - a. How do you structure assignments? Is there a guideline for what should be assigned in each course? How do you know?
 - b. How do you structure course assessments? Is there a guideline for what should be included in an exam? How do you know?
 - c. What else do you expect from graduate students in your classes? How do you communicate those expectations to students?
 - d. Do you see differences in the work and/or effort from different students? What are those differences? What motivates those differences?
2. What do you expect from graduate students who do research in your lab/that you advise? How do you communicate those expectations to students?
 - a. Do you see differences in the work and/or effort from different students? What are those differences? What motivates those differences?
 - b. How do you support students in your lab/that you advise?
3. Additional questions about specific texts that have emerged in the interview/observation process?

4. Final question: What additional information do I need to know to understand how the day-to-day activities of graduate students are coordinated?

Conclusion of interview:

Thank you for your participation in these interviews with me. As you know, these interviews are confidential, and no identifying information was recorded. Over the next few months, I will be continuing to gather and record information. As a part of that process, I would like to confirm that the information I have gathered from you is in accordance with your perceptions and intentions. Would it be okay if I emailed you portions of our transcribed interviews for you to read through and clarify any information as you see necessary? yes/no (circle one).

Appendix C: Critical Incident Questionnaire

Consent form (yes/no)

Overview of the Purpose of the CIQ:

The purpose of this critical incidence questionnaire is to explore the everyday experiences and activities of women graduate students in biological sciences. Here, you will write an entry about an event, or critical incident, that happened to you over the last 2-3 weeks. These incidents can be positive or negative events or interactions. You can write multiple entries and are encouraged to submit an entry after the event has occurred. You may also be contacted for follow-up questions about your CIQ.

Date/Time of incident:

Location of incident:

M.S. or PhD student/candidate (select which best fits)

Year in school: (fill in the blank)

Stage of graduate education (choose one): First Second Third

Pseudonym:

Guiding Information for CIQ Entry:

Using the space below, please write an entry about an event/incident that occurred within the last 2-3 weeks. Events can include but are not limited to lab meetings, course meetings, meetings with advisors/professors, interactions with peers, conducting research, teaching, or any other daily activities associated with graduate student life. Please be as descriptive as possible and use the following questions as a guide:

1. Describe the setting of the event.
2. Who was present?
3. What happened immediately before, during, and after the event?
4. How did you or others react to the incident?
5. At what moment during the incident did you feel most engaged and or least engaged?
6. What aspects (action, reaction if any) of the incident were most affirming or helpful?
7. What aspects (action, reaction if any) of the incident were most puzzling or confusing?
8. What was the most important information you learned from the incident?

Thank you for your entry.

Appendix D: Data Collection Matrix for Institutional Texts

Text/Documents	Source (interview, website, etc.)	Type (policy, syllabus, handbook, etc.)	Availability (public/private)	Informant
Biology Graduate Student Handbook	SU Biology Website	Handbook	Public	
SU Course Bulletin	SU Website	Course Policy	Public	
PhD Course Requirements	SU Biology Website	Course Policy	Public	
PhD Plan of Study Checklist	SU Biology Website	Course Policy	Public	
Timeline – PhD Program	SU Biology Website	Program Information	Public	
PhD Requirements	SU Biology Website	Program Information	Public	
Admission Requirements	SU Biology Website	Program Information	Public	
Lab Expectations	Interview	Policy	Private	Junie – participant
Physiological Ecology of Reproduction	Interview	Syllabus	Private	Victoria – faculty participant
Professional Aspects of Biology	Interview	Syllabus	Private	Carol – faculty participant
Evolutionary Epigenetics	Interview	Syllabus	Private	Jordyn – participant
Graduate Student Expectations	Interview; Carol’s website	Policy/Text	Public	Carol – faculty participant

Appendix E: Color-coding Scheme

I developed a color-coding scheme that I used to code the organizing processes, practices, policies, procedures, and discourses that coordinated the everyday work of PhD students in biology at SU.

Policy, Documents, & Texts: Pink

Work of Informants & Others: Light Green

 Research related work: Light Blue

 Course related work: Dark Green

 Teaching related work: Turquoise

 Service/Volunteer related work: Orange

Institutions, People, Organizations, & Committees: Red

Ideological codes, Institutional discourses, Ideological discourses: Purple

COVID-19: Yellow

Appendix F: Low-Level Codes

Not feeling accepted as a scientist in undergrad

Challenge: bachelor's degrees not intellectually stimulating

Challenge: being the first doctoral student in the lab

Challenge: unable to connect with students - teaching

Perception that PhD students with master's degrees don't seem to struggle as much

Going to professor for help with coursework

Faculty can write a petition letter to admit a student

Challenge: interview environment is high pressure

Getting a PhD feels monumental when you're Black

Not interested in the course

Successful faculty member: writes a lot

Discussing research interests with advisor

challenge: hard to pay attention on Zoom

Pandemic changed how people interact with each other

Text: Printed Lab Protocols

Challenge: adjusting research project to fit expertise

Challenge: not familiar with advisor's content area of expertise

Successful graduate student: attention to detail

Challenge: qualifying exams are a "big scary thing"

Preparing updates for meetings

Increased responsibilities to teaching due to COVID

Transferring credits from previous institution

Policy: Maintain a 3.0 GPA

Text: course catalog

Challenge: feeling rushed to complete a course research project

Challenge: don't know what doing a PhD is like outside of COVID

Challenge: Work well under pressure

Text: professional development document in lab

Learned an appreciation for the work involved in teaching

Challenge: different perceptions of who a scientist is

Successful faculty member: networking and communicating

Institutional discourse: teaching broadens academic experience

Challenge: negative connotation of being "inexperienced"

Selecting students based off of limited information

Advice from undergrad about grad school

Unable to use campus facilities

Entering data

Challenge: not enough time to gain experience with academic work

Don't overwork it

Department seminars

Challenge: homesick

Touring campus

Meeting deadlines

Challenge: master's department was cutthroat and competitive

COVID-19: adding extra office hours to accommodate students

Coordinates Graduate Student Work

COVID-19: increase in emails from students

Expectation of animal handling experience

Checking into hotel

Getting advice

COVID-19: teaching the same lecture two weeks in a row

Learning how to reach out to professors for graduate school

Hosting a conference

Challenge: lack of creativity for research

Challenge: there aren't other labs that do similar research

Challenge: how advisor handled a struggling student

Challenge: unpredictability and pressure

Expectation of content knowledge

Building aquariums

Challenge: no training in supporting graduate students emotionally

COVID-19: social events held on Zoom

Family in a STEM field

successful graduate student: strong interpersonal skills

Undergraduate mentees not careful or don't see grad students as people

COVID-19: having extra time to work

COVID-19: have to do extra work to make-up labs for students

successful graduate student: good at presentations

Liking lab mates/PI

Other GTAs don't enjoy teaching

Formalization of an informal process

challenge: virtual conferences not the same

Waiting for admission decision

Challenge: feeling like being weeded out

Challenge: lack of career options

Communication via email

Challenge: burnt out on research

faculty is disorganized

Publishing feels good

Challenge: including graduate students in support and developmental opportunities

good scientist: supporting other people

Getting information from administration

Shifting to online

Getting to know other graduate students

successful faculty member: competent in their field

successful faculty member: gets tenure

Lab work

Piloting research projects

Not interested in teaching

Refers to Course Catalog

Racial Identity

Challenge: new lab in the department - advisors don't know requirements

Challenge: master's program not transparent about financial support

Challenge: lack of community

Institutional discourse: mission of undergraduate education

Learning about life at SU

Creating own schedule

Work at Office

Learning by reading

Changing your attitude

COVID-19: changed access to advisor

Challenge: limit on number of special topics courses one can take

Talking with prospective graduate students

Other Black graduate student as a role model

Representation in the department

Holding office hours

Constantly thinking about science

Learning how to be successful from seminars

Challenge: unable to attend conferences

getting into grad school is about who you know

Challenge: advisor is not as accessible/more busy

Challenge: Adjusting to life at SU

Graduate courses are discussion based

Doing graduate school online

Non-lab Work Day

Differences between masters and PhD

Challenge: teaching in person

Going to friends for help with coursework

Course did not meet expectations

Challenge: setting boundaries

Absentminded

Hiring undergraduates to help with animal care

Parent has institutional knowledge

Pandemic Fatigue

Skill development: preparing for oral exams

successful faculty member: has a lot of funding

Advertisement for graduate position

Challenge: faculty undermining each other

Managing students in class

Not interested in research question

Academic expectations

Challenge: advisor doesn't know the answer to everything about the grad school process

Meeting with professors

successful graduate student: does amazing research

Working more often

Challenge: freedom

Learning lab techniques/methods

Setting up equipment

Professor inconsistent in course

Challenge: given extra assignments to fulfil teaching hours

Needing space to share with other graduate students about struggles

challenge: not wanting to sound dumb in front of faculty members

Challenge: stopping collaborations

Being added to a research grant

Challenge: expectation to enjoy coursework

Training for new GTAs

Identifying graduate schools

No formal training on how to teach

Challenge: don't have senior graduate students to ask questions

Friends at different stages of graduate education

Skill development: novel research ideas

Skill development: experimental design

Graduate student friends understand challenges of grad school

Preparation for a Faculty Position

Attending workshops

Challenge: conflicts with colleagues

Learning about job applications/job search process

Graduate degree as next step in career

Developing skills from courses

Meeting with graduate program officer

Adjusting advising based on student need

Perception of increased productivity when busy
successful graduate student: has a lot of funding

Refers to Women in STEM

Disconnect between expectations in handbook and reality

Employment outside of PhD

Successful graduate student: works hard

Refers to Tuition waivers

challenge: variation in advice from others

Contribute to knowledge creation

Challenge: GTA was not guaranteed

Racialized Experience

teaching not rewarded

Good grades /= good scientist

Know what you're getting into

Completing tasks

Everything moved to online

Financial needs

treated differently based on gender

Skill Development: critical thinking

"The factor keeping you in grad school is research"

Challenge: setting high expectations for oneself

Checking emails

Socializing with other graduate students

Alternative career options not prioritized

Proposal seminar

No core curriculum

Extracting DNA

Skill Development: Building content knowledge

Building relationships with professors

Challenge: not knowing how to do research

Challenge: didn't know grad school was an option

successful faculty member: gets the job they want

Skill development: peer review

Becoming competitive for a PhD

Not taking breaks

Going to counseling

Evaluation of Graduate School Applicants

Exams are hard

Emailing students

Family doesn't understand graduate school

Interviewing for graduate programs

Deciding to come to SU

Going over research projects

Analyzing data

Graduate student association

Power dynamics

Certain kind of work is considered "doing science"

Working at your own pace

Confirming Stereotypes

challenge: students not showing up

Confidence

Choosing a woman as an advisor

Skill Development

Research Assistantship

Struggling with course material

Studying for classes

Heavy workload

Graduate program is major professor centric

Asking for help

Skill development: presentations

Differences between faculty and student knowledge/expectations

GTA expectations

Admissions requirements

Refers to graduate student handbook

Doing homework

Roadblocks with research

"I'm still learning"

Requires Approval from Committee Members

Challenge: proving your worth

Expectation: always making progress

Recommendations for coursework

Easiest class

Wanting to feel accepted and validated as a scientist

Policy: must make up course deficiencies

Positive: feel safe around other women

Reaching out for support

Challenge: changing timeline

Applying to SU

Text: lab expectations

Treated differently because of race

Refers to DBS Website

Challenge: fitting in

High number of women in the department

Hardest class

Application Materials

Want to feel like an equal

Motivation

Field work

Skill development: Scientific writing

Unable to interact with peers

Attending conferences

Writing for Coursework

Time spent on research

Communicating with colleagues

Writing for research

Fatigue of being at home

Solving problems

Aligning research interests

Gaining teaching experience

Importance of relationships in grad school

Communicating with prospective advisor

Learning from other faculty members

Presenting Research

Transitioning from master's to PhD

Professional Development

Weekly meetings with advisor/lab group

Feeling overwhelmed

Recruitment event

Time spent on coursework

Teaching online

Lab meetings

Applying for Grants

Interest in science

Animal care

Coming up with research ideas

Preparing for teaching
Time to graduation
Changing research plans
Mentorship
PhD timeline
Time spent teaching
Mentoring Undergraduates
Communicating with advisor
Refers to Career Interest
Receiving Feedback
Unclear expectations
Grading
Reading research papers
Publishing research
Asking questions
Learning from advisor
Time-consuming
Designing a research project
Department Culture
Requirements for PhD
Refers to Committee
Graduate Teaching Assistantship
Learning from other graduate students

Support Network/Systems

COVID-19

Course Work

Research Work

Selecting Courses that are related to research interests

Challenge: am I doing enough?

Appendix G: High-Level Codes

"Publish or Perish" Discourse

Elitism in science

Leaving graduate school

Science contributes to society

Ability is fixed

Risk Taking

Refers to Plan of Study

Kindness

chilly climate

Research should be novel or useful

Paid Work

Code Switching

First-generation college student

Flexibility of Expectations

Cares about students

Isolation

Time & Project Management

Department Culture

Requirements for PhD

Refers to Committee

Graduate Teaching Assistantship

Refers to Dissertation

Refers to Qualifying Exams

Stress and Anxiety

Prioritizing Research

Pressure to be Productive

Finding a good fit

Fear of Failure

Imposter syndrome

Unclear expectations

Refers to Career Interest

COVID-19

Course Work

Research Work

Support Network/Systems

Unpaid Work

Ideal graduate student

Selecting Courses that are related to research interests

Prioritizing multiple responsibilities

gender "blindness"

Perfectionism

Collaboration

Adequate Scientific Background

Language barrier

Willing to ask good questions

Comparison

Diversity in STEM

Sense of belonging

Fear of Falling Behind

"Trial by fire"

Enjoyment

Passionate about Science

"Grad school is really really freaking hard"

Enjoys teaching

Annual Graduate Student Evaluation

Difficulty

Meaning unclear

PhD expectations

Work-Life balance

Professional Development

Independent

Refers to Policy

Previous Research Experience

Mental health

Self-Driven

Networking

Challenge: am I doing enough?

Competition

Neoliberal discourse

Communicate Science Effectively

Resilience

Procrastination

Learning to understand

"Boys Club"

