

Literature Exploration of Graduate Student Well-Being as Related to Advising

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1 Introduction

A significant gap exists in knowing what specific factors play into graduate student mental well-being, especially as it relates to their relationship with their advisor. The goal of this review is to identify potential factors that impact graduate student mental health and provide concrete examples of next steps for improving their well-being. In doing so, this literature review also explores how faculty advisors understand and support the needs of their graduate students. This review will detail the elements of (a) graduate student mental health factors, (b) current stress-mitigation techniques, and (c) the role of the faculty advisor in graduate student success. There are several interventions aimed toward mitigating graduate student stress, but there are few programs that aim to support advisor mentorship as well as management styles to enhance graduate student experiences as well as their advisors. Accordingly, the literature detailed in here are important as they have significant implications for developing better methods to help provide students with solutions to their needs, which in turn may help to improve graduate student mental health and aid in faculty advisor mentoring and management responsibilities.

2 Current State of Graduate Student Mental Well-Being

Mental health needs among graduate students are likely 10% higher than the rest of the population, potentially causing a mental health crisis within academia (Hyun et al. 2006, p. 256). Graduate students are also not as studied as their undergraduate counterparts in terms of mental well-being (Cranford, Eisenberg, and Serras 2009; Levecque et al. 2017; Liu et al. 2019; Nature Editorials 2019; Paglis, Green, and Bauer 2006; Schlosser et al. 2011; Sverdlik et al. 2018; Waldeck et al. 1997). University counselors have reported an increase in the complexity of problems students are facing, which they believe to be due to an increase in mental distress in the student population and an increasingly more stressful university environment (Hyun et al. 2006, p. 248). Additionally, the

increasing ability to treat mental illness and provide coping mechanisms means that more students with mental illness have the opportunity to go to college, which causes an increase in college students with mental illness (Hunt and Eisenberg 2010, p. 6). In a study of nearly 6000 random undergraduate and graduate students across several institutions, just under half of them were rated as having flourishing mental health (Keyes et al. 2012, p. 127-128). This means that more than half of the participants were experiencing some degree of mental distress. The screening undergone in this study was used to predict student's likelihood to have suicidal behaviors and to predict academic impairment (Keyes et al. 2012). Students who had a mental illness and languishing mental health were 50 times more likely than a flourishing mental health student with no mental illness to report academic impairment, which refers to some negative impact upon grades, motivation, class success, etc. (Keyes et al. 2012, p. 130). Another study of 2,279 graduate students across 234 institutions showed that graduate students are at least six times more likely to experience depression and/or anxiety than the general population (Evans et al. 2018). Many of these students will not reach out to mental health services, despite indications that they may want to go. As many as 67% of students may want to attend mental health services, with only 38% of students actually going (Cranford, Eisenberg, and Serras 2009).

The stress experienced by graduate students is also different depending on demographic. Women, for example, continue to take the majority of the burden of household duties and child-rearing responsibilities while also dealing with the stress and responsibilities of graduate studies (Hyun et al. 2006). Some studies have noted that women are more likely to have depression and anxiety, but men are more likely to be high risk for suicide (Hunt and Eisenberg 2010, p. 4). A study performed at a large western university explored student's need for access to mental health care and their utilization of it (Hyun et al. 2006). The researchers looked at several measures of graduate student stress: mental health needs, functional relationships with advisors, financial status, family burden, academic discipline, program competitiveness, social support, race/ethnicity and international status, and utilization of mental health services (Hyun et al. 2006, p. 249). The study showed that there was a statistically significant difference between men and women reporting that they or a colleague had experienced a stressful event within the last year, with more women stating 'yes' (Hyun et al. 2006, p. 255). This represents the dichotomy of stress experienced by the different genders in graduate studies. It is also representative of the gender gap in academic careers, especially STEM (science, technology, engineering, and math) (Patrick, Riegle-Crumb, and Borrego 2021; López-Iñesta et al. 2020; Wang and Degol 2016). Women, often, are more likely to give up or not start an academic career due to the stress involved and the perceived lack of support from both academia and society. Women were also more likely to seek support for mental health needs, seek out information about support services, and generally admit to having mental health needs (Hyun et al. 2006, p. 255, 257). This also means that men who may be experiencing mental distress are not as likely to seek out support and could continue to suffer, despite

the resources available to them. This may help to perpetuate societal standards of men being ‘strong’ or being able to contain their emotions, which is, long-term, an unhealthy coping mechanism. The dichotomy in how men and women approach mental health also serves to further separate the inherent differences in how they seek help and who receives help/succeeds in academia. Women, seeing men not ‘needing’ to seek out help for mental illness, may feel that if they seek out help or have mental illness that they are weak or less deserving of their position than their male colleagues. This feeling of being less deserving of their position because of their mental illness may continue to feed the same mental illness. Additionally, men only seeing women seeking out help for mental illness may see seeking out help as ‘weak’ and continue to suffer alone out of fear of being seen as “less of a man.” This can also feed into a cycle of self-doubt that may perpetuate these misconceptions into future generations. Studies regarding transgender and non-binary individuals in this context were not found. Considering that non-cis-gendered and non-binary people generally have poorer quality of mental health than their cis-gendered counterparts, it is likely that transgender and non-binary graduate students also have poor mental health in part related to social response to their gender identity (Jones et al. 2019).

Additionally, of all the students surveyed in Hyun’s (2006) study, 46% reported feeling overwhelmed and 40% reported feeling consistently exhausted, which could be representative of the heavy work load carried by graduate students (Hyun et al. 2006, p. 255).

While current education institutions are concerned with the well-being and success of their students, much of the existing research and interventions focus primarily on undergraduates rather than the rising population of doctoral students in Canada and the United States (Sverdlik et al. 2018, p. 362). Given the personal factors critical in exploring mental health, many of which are unique for graduate students, this is especially concerning. Seven of the key factors in categorizing mental health are self-actualization, hardiness, maturity, self-reported happiness, personal growth, subjective well-being and stress-resistant personality (Compton et al. 1996). Of particular importance in identifying the mental well-being of any particular person are subjective well-being and personal growth (Compton et al. 1996). Research that has been focused on graduate students primarily looks at their success in terms of time to degree, dissertations, completion rates, and supervisory roles held, rarely is student well-being and success outside of graduate school milestones studied (Sverdlik et al. 2018). This pressure to succeed academically can cause further distress on the student and further turns their focus away from all other objectives than their academic success. Rather than solving issues in their home and personal life, graduate students may be pressured to ignore them, potentially exasperating the problem. The perceived lack of caring about these home and personal issues from their academic institution can also serve to make the graduate students feel dehumanized, potentially leading to further mental crisis (Van der Linden et al. 2018). Through analysis of 163 empirical studies exploring graduate students,

it was found that there are several issues from which graduate students suffer as a result of their role (Sverdlik et al. 2018). These concerns are: high stress, depression, upper respiratory infections, difficulties maintain relationships, trouble engaging in social activities, negative impacts on psychological and physical well being, poor motivation, and interference with long-term and short-term goals. Causing these concerns, the meta-analysis found, was a series of internal and external factors affecting the students (Sverdlik et al. 2018, p. 362-363), which will be discussed in the following sections.

2.1 External Factors

Some external factors to graduate student well-being include supervision/management (discussed in section 4), personal/social lives, departmental structures and socialization, and financial opportunities (Sverdlik et al. 2018, p. 364-376). Graduate students tend to be more likely to have to balance social and familial responsibilities with academia than undergraduate students (Sverdlik et al. 2018; Hyun et al. 2006). Graduate students, therefore, can find it more difficult to achieve a work-life balance that allows them success in both aspects of their lives, which can lead to stress and other detrimental effects. Being unable to find an appropriate work-life balance can also lead to depression, anxiety, poor motivation, and a higher chance of dropping out of their program (Sverdlik et al. 2018, p. 373). On a related note, graduate students in departments more aligned with their own values or structures are more likely to stay in their program, be motivated to work, and feel supported (Sverdlik et al. 2018, p. 373). Departments that push students to be at work more, when the students may need time with family, for example are more likely to lose those students or have an increase in mental health decline among their students (Sverdlik et al. 2018, p. 373-374). Student access to funding, particularly departmental funding, also has an effect on student well-being (Sverdlik et al. 2018, p. 374-375). Students who have research assistantships not only have the financial support they need from their department, but often have more departmental support and mentoring to assist them in meeting their research goals (Sverdlik et al. 2018, p. 375). Graduate students are often at a place in their lives where they need to be financially independent. Students who may have had familial financial support during their undergraduate degree often no longer have that support through their graduate studies, especially pertaining to financial necessities like insurance, which can only be provided to children through the age of 26 in the United States. Graduate students often have their own expenses, and may begin to have their own families that rely on them for financial support. Students who are not financially supported by their department or program may be forced to leave their degree program to find financially stable work. Additionally, students who do not leave their degree program may be consistently burdened by their financial stress due to the limited pay (Levecque et al. 2017).

2.2 Internal Factors

Internal factors affecting students include: motivation, writing skills, and academic identity (Sverdlik et al. 2018, p. 376-380). Students who have more internal motivation are more likely to succeed in doctoral degree programs, which tend to require individual work ethic and self-driven goals and research (Sverdlik et al. 2018, p. 376-377). Internal motivators, such as a desire to succeed in academia or the desire to better research skills, help graduate students succeed within a graduate school environment (Sverdlik et al. 2018, p. 377). Additionally, students who already have a strong set of writing skills are likely to be more successful in graduate school than those without (Sverdlik et al. 2018, p. 377-378). Beyond having strong technical writing, students who are able to plan, write, and revise in an organized manner are less anxious and more confident in their studies than students who procrastinate or have no planning and revision stage for their writing (Sverdlik et al. 2018, p. 377-378). Finally, student success is tied to their academic identity (Sverdlik et al. 2018, p. 378-380). Students who show self-efficacy, that is confidence in their work, leads to positive outcomes in career trajectory and more competence in core abilities (Sverdlik et al. 2018, p. 379-380). This is also tied to student's self-worth. Student's who feel success as a result of their accomplishments as a graduate student are more likely to have continued motivation (Sverdlik et al. 2018, p. 379-380). This can also, however, cause major detriment to some students. Students whose identity is tied to academic success and then find themselves in a position of rejection or failure can spiral into an identity crisis and potentially depression. Academia is a field that is inherently filled with rejections, from grant review boards, journal review boards, study committees, and other various leaders in the field. It is, then, inevitable that everyone in academia will experience some form of rejection, yet graduate students are oftentimes unprepared to accept and face these rejections. Ultimately, this can lead to more stress and feelings of failure among highly motivated students.

The concept of student's self-worth and internal factors being tied to their success and mental health is also explored as it related to medical students (Dunn, Iglewicz, and Moutier 2008). Though medical school presents different challenges from doctoral studies, the age-range of students, stress levels, and work demand is similar enough to make a comparison between the two groups. It is noted that medical students are often used to being the top of their class in undergraduate studies (Dunn, Iglewicz, and Moutier 2008, p. 45). Medical schools then admit the top-tier of students from across the globe to attend their school, so students that are used to being the best now may only be considered average in their new environment (Dunn, Iglewicz, and Moutier 2008, p. 45-46). This can lead students toward stress and depression as much of their self-worth was inherently tied to their performance as compared to their peers (Dunn, Iglewicz, and Moutier 2008, p. 46). Additionally, because of this stress and change in self-perception, students could begin to feel that they have not made the right choice for their career path (Dunn, Iglewicz, and Moutier 2008, p. 46).

This can lead to students experiencing a cycle of cognitive dissonance, in which they continually feel that they are not successful and, therefore, do not belong, leading to more feelings of being unsuccessful (Dunn, Iglewicz, and Moutier 2008, p. 46). Additionally, students entering medical school begin to have less time to dedicate to self-care and their well-being (Dunn, Iglewicz, and Moutier 2008, p. 46-47). This is similar to the time-stress that graduate students may feel. Activities that could help to decrease stress, such as exercise or socializing with friends, are often forgotten in favor of more time to study or work on classes (Dunn, Iglewicz, and Moutier 2008, p. 47-48). This leads to a cycle in which stress continues to build with no outlet for the students to release it (Dunn, Iglewicz, and Moutier 2008, p. 47-46).

3 Current Stress-Mitigation Methods

One reason why graduate mental health is a major concern among universities is that untreated mental illness is a significant contributor to the drop-out rate of graduate students at all universities (Hyun et al. 2006; Eisenberg, Hunt, and Speer 2013, p. 248). Universities continue to try different tactics to help students cope with mental illnesses, with differing degrees of success. There is an increasing demand for long-term mental wellness care, with sometimes limited increases in the resources available for students (Hunt and Eisenberg 2010, p. 7). Some universities have attempted to help decrease the burden on their mental wellness center by unveiling a new phone app (*CAPS launches new wellness application - News - Purdue University* 2018). The current effectiveness of these apps is not yet known. Help from a medical professional, however, is hard to replicate and, handled inappropriately, could potentially cause more harm than good. A lack of resources means increased waiting times for students to receive help, which can increase any distress and potentially worsen any symptoms students are experiencing. Medical schools have attempted interventions to help their students cope, but these efforts are sometimes unsuccessful due to low attendance (Dunn, Iglewicz, and Moutier 2008, p. 49). For example, a medical school might offer an elective course on stress-reduction. However, if this course is not necessary toward the student's graduation or career goals, then they may not take it as they feel the time dedicated to that course could be better used prepping for exams (Dunn, Iglewicz, and Moutier 2008, p. 49). Graduate students may feel guilty for taking time off from doing work directly related to their classes or research, taking time off to do something solely for their mental-health then often becomes a low priority. Universities can continue to provide free yoga classes, therapy dog visits, guided meditations, and similar events, but these one-time, free events may not entice students who already feel they do not have time to take care of basic care for themselves.

The culture and environment of an institution can also have an impact on the student's well-being and success. Within higher education, there has been a stigma around asking for help (Dunn, Iglewicz, and Moutier 2008; Wrench and

Punyanunt 2004). While an institution may offer and advertise mental health services to assist students, many may unlikely pursue them due to feeling that it will negatively affect their career goals and the perceptions of them by peers and faculty (Dunn, Iglewicz, and Moutier 2008, p. 49-52). Additionally, students who see faculty falling into the same patterns of stress and poor work-life balance as themselves may see these behaviors as normal and think the stress they are experiencing is the cultural that surrounds being an academic (Dunn, Iglewicz, and Moutier 2008, p. 47). Similarly, graduate students can sometimes experience the same stigma against seeking help within their research program. They are expected to be independent thinkers and researchers, which may discourage asking for help at the risk of looking like they do not belong in the program. Many graduate faculty also experience these same concerns and then partake in unhealthy life-styles, such as staying up late to complete tasks or spending too much time dedicated to a task without a break. This can generate a culture of overwork that students feel they need to fit into in order to be an accepted part of the community. However, these lifestyles may only serve to increase the stress, anxiety, and mental unwellness within the academic community as students attempt to emulate the behaviors of their superiors. This culture could lead to an endless cycle of academic giving in to overwork as a result of peer pressure (Evans et al. 2018; Nature Editorials 2019).

3.1 Providing Support to At-Risk Groups

Mitigation techniques may already be in place at many universities, but may not be easily accessible to all at-risk groups such as graduate students. Some universities may try to provide mental health services in residence halls or student centers, however, these types of initiatives may not work with graduate students since they do not tend to congregate in those areas (Hyun et al. 2006, p. 261). In addition, while universities may have the tools to help students cope with these stresses, cultural differences may prevent students from seeking them out. White students are more likely to use mental health services than the rest of the population, creating an effective lack of services targeted to multicultural students (Hyun et al. 2006, p. 249). Further research needs to be performed to find ways to reach out specifically to graduate students.

Social support systems for student mental health can be a source of stress mitigation, however there is significant variation in the level of support traditional social systems provide and if they are reliable to graduate students (Hefner and Eisenberg 2009). Researchers have found that participants who rated themselves as having lower quality social report also had a higher incidence of depression and other mental health disorders (Hefner and Eisenberg 2009, p. 496). They also discovered that more frequent contact with family could cause a higher incidence of self-harm and eating disorders, while more frequent contact with close friends had the opposite effect (Hefner and Eisenberg 2009, p. 497). Additionally, students that were part of under-represented minority

groups (racial minorities, LGBTQ+ students, women, etc.) were more at risk for mental illness than students not in these groups (Hefner and Eisenberg 2009, p. 497).

4 Role of the Faculty Advisor/Mentor

One factor within graduate student mental health can be mentoring and their supervision/management within assistantship roles. The transition to graduate school is often met with lowered self-esteem and one way universities have attempted to combat the stress brought on by this transition is through the use of peer-mentoring programs (Grant-Vallone and Ensher 2000, p. 637). There is some research on how mentoring programs in graduate schools assist students, but more research, like that of Grant-Vallone, *et al.*, is needed into how mentors and the mentoring relationship assists students (Grant-Vallone and Ensher 2000, p. 637). Grant-Vallone's study showed that the stronger the student-mentor relationship and the more often the pair were able to meet, the more supported the student felt (Grant-Vallone and Ensher 2000, p. 639). However, more support from a mentor did not necessarily lower the stress levels of the student (Grant-Vallone and Ensher 2000, p.637). One potential reason for this is that higher stressed students may have asked for more assistance from their mentors. Secondly, mentors may have provided too much information too quickly to students, adding to their overall stress levels (Grant-Vallone and Ensher 2000, p. 642). Peers are not, however, the only source of mentorship for graduate students.

Mentoring of graduate students falls, largely, to the student's faculty advisor who oftentimes serve as their supervisor/manager for assistantship roles. The retention and success of graduate students has been shown to rely heavily on the mentorship/guidance provided to them by their faculty advisors (Fedynich and Bain 2016, p. 1). A communicative, productive, and supportive faculty advisor-advisee relationships are correlated with better student mental health (Tammy D. Allen and Eby 2010; Evans et al. 2018; Fedynich and Bain 2016; Lee 2018; Levecque et al. 2017; Paglis, Green, and Bauer 2006; Rice et al. 2009; Schlosser et al. 2011; Tenenbaum, Crosby, and Gliner 2001; Van der Linden et al. 2018; Waldeck et al. 1997; Wrench and Punyanunt 2004). To create a positive environment for their students, faculty advisors can align their mentoring and management styles to prospective students. (Fedynich and Bain 2016, p. 2). Students are already experiencing several changes when they enter graduate school and therefore this alignment can be important. Creating a climate of trust through connecting and working to understand their students, advisors can provide students with a professional network that will help them to as well as the research program to succeed (Fedynich and Bain 2016, p. 2). So important is the mentoring relationship between graduate student and advisor that, the exploration of graduate mentoring has been met with what has been

described as “maniacal cheeriness” and rarely are the negatives of mentoring discussed (Johnson and Huwe 2002, p. 45). The effects of poor mentorship or a mismatched relationship can negatively effect a graduate student more than the faculty advisor, leading to a power disadvantage for students within the relationship (Johnson and Huwe 2002, p. 46). Ultimately there are several factors that can lead to a poor mentorship and/or management relationship between academic advisors and their students, including: personality, communication style, relationship preference, career stage, and career interest (Johnson and Huwe 2002, p. 46). Personality, communication, and relationship preference can all have mitigating effects with the adaption of empathy by both parties. The more understanding both the mentee and mentor have of each other, the more their relationship can flourish. Those factors can also be mitigated with open communication and through the assistance of a senior faculty member serving as a third party to provide assistance navigating the mentorship/management relationship (Johnson and Huwe 2002, p. 46). However, mentor inexperience, neglect, exploitation, abandonment, unethical behavior, and mentor-held stereotypes can all cause negative mentor relationships that are not easily fixed or salvaged (Johnson and Huwe 2002, p. 46-50). It appears that faculty advisors could be provided training on how to be effective and professional mentors, and supervisors/managers, for their students (Johnson and Huwe 2002, p. 50-53). While mentorship is said to be highly valued in academic faculty, administration rarely lays out guidelines for what they expect from their faculty in terms of mentorship, including management of graduate student assistanceships, nor are there sufficient programs to assist them in the mentoring and management processes (Johnson and Huwe 2002, p. 51). While faculty Advisors are focused on becoming effective scientists, this can sometimes limit their abilities to connect with others. This human connection can potentially impact their mentorship skills in advising as well as their management style in supervisory roles. This idea can lead to mentorship issues that may cause undue stress on the students and contribute to mental health issues and long-lasting career effects (Johnson and Huwe 2002, p. 51).

Having a mentor who is committed to and involved in the success of the student helps to produce a healthy and productive mentoring relationship that leads to better student outcomes (Sverdlik et al. 2018, p. 369). Similarly, the style of mentoring that a mentor has must be suitable for all students under that mentor’s direction (Sverdlik et al. 2018, p. 369-371). If a mentor changes their style to assist one student in particular, the lab as a whole could suffer, which may lead to a academic negative environment (Sverdlik et al. 2018, p. 370-371). It has been shown that most emotional events that students experience are due to an interaction with their graduate mentor, often caused by the mentor viewing students as ‘cheap labor’ or a lack of assistance in lab or career development (Sverdlik et al. 2018, p. 371). A positive mentor relationship can be most critical during times of change, such as entering the program, beginning the dissertation process, and leaving the program (Sverdlik et al. 2018, p. 371). Of course, as with any relationship, there is also responsibility on the side of

the mentee. Mentees who are more mature are more likely to meet mentor requirements and deadlines, showing respect toward the mentor and causing the mentor to have a more positive outlook towards their student (Sverdlik et al. 2018, p. 371). However, sometimes mentors may think they are providing the support and structure that their students need, when in reality they may be causing the students more stress in how they interact with them (Dunn, Iglewicz, and Moutier 2008, p. 46). For example, medical school faculty who give unorganized lectures or do not have guided notes may think that their class is successfully teaching students the concepts they need to learn. However, the students often require very structured and organized lectures to feel like there is not undue burden to teach themselves the material (Dunn, Iglewicz, and Moutier 2008, p. 46). Where the students see the faculty as ineffective and cruel, the faculty may see their students as lazy or unintelligent for not understanding them (Dunn, Iglewicz, and Moutier 2008, p. 46). Therefore, it seems that communication between mentors and students is critical in understanding and setting expectations on both side of the relationship so that it is beneficial to both parties.

It has been documented that a positive mentoring experience can lead to graduate students having increased publications, better professorial skills, ideal future placement, and increased visibility in their field (Waldeck et al. 1997, p. 94). Students who report a positive mentor experience said that their mentor provided psychosocial support more than career support, meaning their mentor helped them achieve a sense of self and self-efficacy within their role (Waldeck et al. 1997, p. 95). One of the reasons, however, that it is difficult to perform studies on positive mentoring experiences in graduate school is because many graduate students are unable to find a mentor or do not consider their advisor a mentor (Waldeck et al. 1997, p. 94-95). Students see preoccupation with other tasks and responsibilities as an inability to provide mentorship (Waldeck et al. 1997, p. 103-104). A faculty advisor going through the tenure process, for example, may not have as much time to devote to their graduate students and, therefore, their graduate students may not feel that they are able or willing to provide mentorship. Additionally, Waldeck's (1997) study had an overwhelming majority of white participants (Waldeck et al. 1997, p. 98) which was linked to the potential that students that are part of various minority groups may have a more difficult time finding a mentor for various reasons (Waldeck et al. 1997, p. 103). Therefore, more research into how graduate students find mentors, and their obstacles to obtaining effective mentors/advisors, must be done in order to provide resources to support graduate students as well as faculty advisors.

When researching graduate mentorship, it is critical to understand the foundations of mentoring as a concept. Several theoretical frameworks of mentorship exist, especially as it relates to adult education (Dominguez and Hager 2013). Looking through these frameworks, several themes of positive mentoring relationships can be identified. Firstly, Kegan's theory of mentorship notes that mentees in different developmental stages need different types of mentorship and guidance (Dominguez and Hager 2013, p. 172). Mentees early in their career may need more guidance in exploring their field and developing their views,

whereas more advanced mentees may need someone to challenge them to think more deeply about their views and perspectives (Dominguez and Hager 2013, p. 173). This can be an important concept to consider when thinking though how graduate student needs evolve over the time within their research program. Additionally, it is noted that many mentor relationships are sometimes unbalanced. That is, mentors, as the senior of the group, often view themselves as above the mentee (Dominguez and Hager 2013, p. 173). This is considered the norm by both parties in the relationship, but it can be detrimental to the learning of the mentee and the mentor (Dominguez and Hager 2013, p. 175). It seems then that it can be more beneficial if the relationship is viewed as a mutual learning experience, where each partner can gain wisdom from the other (Dominguez and Hager 2013, p. 175). This allows the mentor to act more as a facilitator rather than an authoritarian, which can generate a more positive mentoring experience, potentially having more positive outcomes for the mentee (Dominguez and Hager 2013, p. 176). This also draws on a traditional 'master-apprentice' relationship, where good habits in the mentee are formed through watching and learning from the mentor, but the mentor still cares about the well-being and learning of the mentee (Dominguez and Hager 2013, p. 176).

There are two additional frameworks that are helpful in identifying the types of mentorship that students could benefit from: the managerial grid and the student-advisor involvement matrix (Single 2009; Blake and Mouton 1978). The Managerial Grid is a 9 by 9 grid where managers can assess their style based on their concern for production and their concern for people. In STEM fields in particular, advisors act as managers for the work done in their labs, which adds complexity to the advising relationship with students. Advisors, then, can self-identify their advising style on the managerial grid as well. The x-axis is concern for production, with 1 being no concern for production and 9 being high concern for production. The y-axis is concern for people, with 1 being no concern for people and 9 being high concern for people. A 1-1 manager creates an "impoverished" management style. A 9-9 manager creates a "team" management style. A 1-9 is "country club" management, a manager who is unconcerned about the amount of work done, but who cares deeply about the workers. A 9-1 is "authority-obedience" management, a manager who does not care about the people who work for them, but who is very concerned about the amount of work produced. The Managerial Grid can be seen in Figure 1.

The Student-Advisor Involvement Matrix is a 2-by-2 matrix where each quadrant describes the type of relationship based on how involved both parties are. The four styles are: mentoring model, coaching model, apprenticeship model, and unadvisable option. All of these options, aside from the last, are viable options for an advising relationship. Ultimately, a style that matches what an advisor is willing to provide and what a student thrives under will generate the most success. The Student-Advisor Involvement Matrix can be seen in Figure 2.

Students could thrive under several forms of management and with a variety of advising styles. Similarly, advisors could be great advisors, and work under a variety of management or advising styles. The key is finding a management

style and advising style that works for both parties. Mismatching styles can result in frustration for both individuals. For example, if an advisor works best in a coaching model, but a student thrives in a mentoring model, the student will likely become frustrated with the lack of involvement from their advisor. Meanwhile, the advisor will likely become frustrated with the lack of independence of their student.

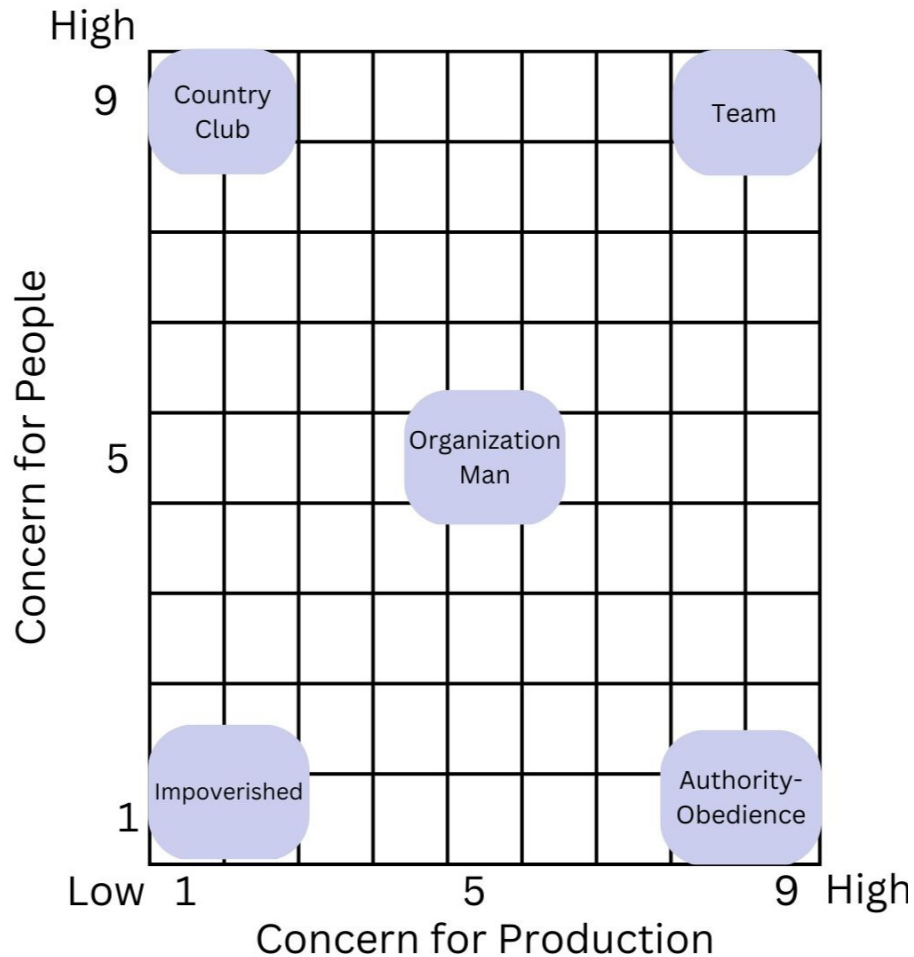


Figure 1: The Managerial Grid allows managers, or those in managerial-type roles, to identify their management style based on their concern for production and their concern for individuals. (Blake and Mouton 1978)

That being said, based on the limited literature in this space, more research needs to be done to explore how different types of mentoring practices can effect graduate student mental well-being in order to make specific recommendations on how to better position and support mentoring relationships among students

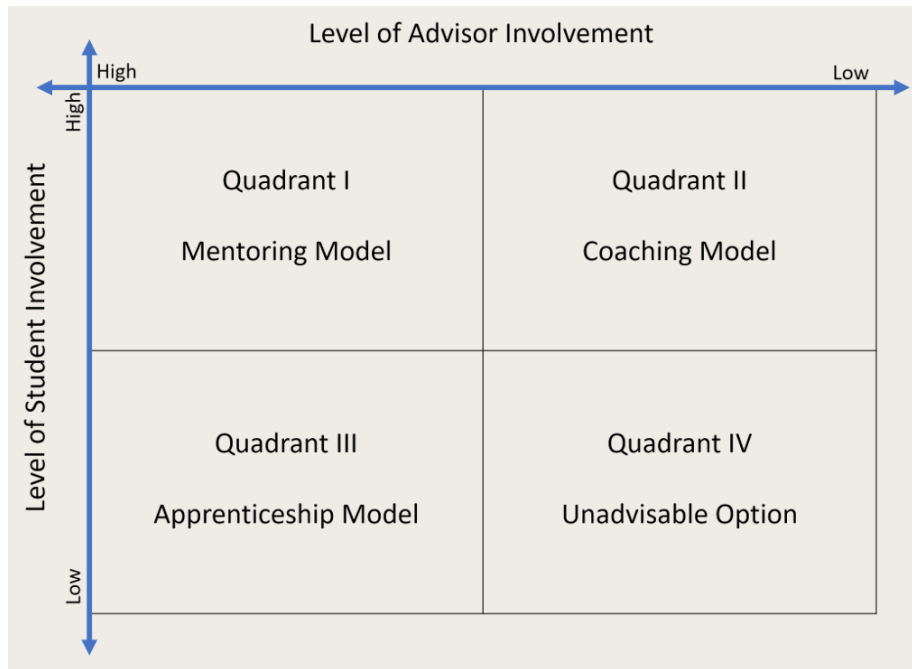


Figure 2: The Student-Advisor Involvement Matrix classifies four different types of advising relationships based on the involvement of both parties. (Single 2009)

and faculty advisors.

5 Empathy and Mentorship

A key factor is successful mentoring relationships in empathy. Mentoring has even been described as mostly listening with empathy (Gardiner 2010, p. 77). Additionally, mentoring has been shown to be a pro-social activity, categorized by other-oriented empathy (Tammy D Allen 2003, p. 135). This means that mentoring is inherently a person-centered activity that relies on the mentors ability to understand the mentees point of view (Gardiner 2010, p. 80). People more willing to mentor others have been identified by their ability to empathize with their junior colleagues (Tammy D. Allen and Eby 2010, p. 137). Empathy is, typically, an innate human characteristic, however, we all feel varying degrees of empathy for others. Empathy is how much we are able to relate to others and connect to them on a personal level. Those without empathy are more likely to be cruel to others, or perform actions without taking others interests into account. Using this knowledge can help inform how mentoring could be improved to assist graduate students more. Faculty advisors may not

be prepared to function in a mentorship role for their students, have the natural others-oriented empathy that could be used to inform their choices, or have the support, and knowledge to inform how, to match/align mentoring styles with prospective graduate student advisees/assistants. This represents a gap in knowledge.

A previous study has explored the biologic response of empathy between physicians and patients (Marci et al. 2007). Noting the importance of patient-perceived empathy of their therapists, studies have started to explore the connection between neurobiology and empathy, particularly through bioimaging techniques (Marci et al. 2007, p. 103). This study relied on the use of skin conductance and coded emotional-response to explore the empathy felt between patient and therapist (Marci et al. 2007, p. 104). The results of this study, and others, indicate that there is a neurological network shared between two people in close contact (Marci et al. 2007, p. 109). This network has been previously proven in the study of romantic couples, wherein female patients in an MRI showed pain-related brain activity when their male partner received an electrical shock (Riess 2010, p. 1604-1604). This indicates that there could be a scientific way to measure empathy between two humans and use that as a way to understand their relationship (Riess 2010; Marci et al. 2007). This relationship is often attributed to what are known as ‘mirror neurons’. Mirror neurons allow humans to have a kind-of ‘hive-mind’ where people can connect with others, the result being displayed as empathy. This is what allows us to have an understanding of someone being sad or happy despite little evidence of such being shown through their facial expressions. It also allows us to perform tasks in concert with one another without verbal or physical communication, indicating a deep level of connection. The use of the skin conductance experiment with one particular physician indicated a time in their session where the patient was clearly hiding emotions from the doctor, visible only through the skin conductance testing (Riess 2010, p. 1604). This led the doctor to change the treatment plan, ultimately assisting the patient after a period of time with no breakthroughs (Riess 2010; Alda 2019).

Additionally, it is noted that, over-time, humans become desensitized to the emotions of others (Riess 2010, p. 1605). Doctors are not as empathetic to the pain of their patients undergoing routine procedures as to not allow themselves to burn out from feeling strong emotional responses regularly. However, this dehumanizes the patients and can lead to serious consequences in how the patients are treated (Riess 2010, p. 1605). The medical community is attempting to fix these problems by educating doctors on the importance of empathizing with their patients. They indicate the physiological benefits of empathy (namely better immune function) and the scientific knowledge that an empathetic relationship provides better outcomes for patient and doctor (Riess 2010, p. 1605). This education will, hopefully, revive the empathy doctors feel for their patients. Similarly, faculty advisors may become desensitized to the stress their graduate students are under and the negative work-environment surrounding academia. When they no longer feel empathy for their students, they could begin to lack

the skills and personal relationship needed to mentor them. However, education, the use of scientific data, and incentive through seeing the benefit of being good mentors could help to revive the empathy experienced by academic advisors. To the researchers knowledge, no current study has explored the needs of graduate students with regards to their advisor.

6 Next Steps

Graduate student mental health continues to have repercussions within academia, with several reports of graduate students completing suicide as a result of the current work environment (Smithson 2019; Woo 2019; Flaherty 2019). (Author note: common verbiage has changed from “committing suicide” to “completing suicide” to help remove stigma and remove implications of suicide as a crime.) The response of academia within the next several years will set the tone for how concerns of graduate student mental health are addressed at individual institutions and will be instrumental in ensuring future students have more options and support. Next steps for improving graduate student mental health and well-being can occur at the system, university, department, lab, and individual levels.

At a system level, we should be working together to promote a safe, inclusive eco-system, where reaching out for help and support is celebrated. Current societal standards make it difficult for those struggling to seek help. Asking for help can be perceived as weak or an indication that something is “wrong” with an individual. Small changes throughout the system could change these perceptions. Those of us who do seek professional help can be vocal about our help-seeking. By making discussions of therapy, psychiatry, counseling, and other support-systems normalized, the act of seeking out these services is no longer “abnormal”. This is especially true when those who are vocal about these services are people in power, who act as mentors, and who have success within their field.

At a university level, we can work to make therapy, psychiatry, counseling, and other support-systems more accessible to graduate students. As discussed, many of the mental health services available to students at universities are structured to make them easy to access for undergraduate students. This may mean providing counseling services in dorms, ensuring more resources when traditional classes are in session, and utilizing undergraduate programs and courses to advertise services. This makes the services less accessible to graduate students. Universities should work to find locations where graduate students gather (such as a graduate student government office or graduate student lounges) and provide resources in those locations. Additionally, universities should be aware that the needs of graduate students are year-round. Most graduate students live in the area near the university and do not visit family during breaks or the summer. Ensuring resources are available during these periods allows for graduate students to obtain the support they need at any time.

Universities can also work to ensure graduate student stipends are at a level

where financial insecurity is no longer a concern. Graduate students are often at a life-stage where they are building financial independence and need to be able to support themselves. Many institutions do not competitively pay graduate students for the work they provide to the university and to live comfortably in housing surrounding the university.

Departments can also ensure the financial stability of their students by having policies and procedures in place for continued student funding. Stress from not knowing if they will be funded in the next semester or over the summer can be detrimental to many graduate students. With some form of ensured funding mechanism, student financial-stress could be greatly reduced.

Departments can also assist in ensuring graduate students have a positive work culture and promote work-life balance. Department culture is a critical component of graduate students feeling welcome and encouraged. Having events that support graduate students, assistance programs for students, and encouraging positive interactions between graduate students, faculty, and staff can all generate this positive culture. Additionally, setting reasonable expectations for time in lab versus time at home helps to promote positive work-life balance for students, while also removing some of the peer pressure that can occur from others to stay later at work or push oneself more.

Setting work expectations can also occur at the lab-level. Individual labs can help to set working hours and known “on” or “off” times to help promote work-life balance. Labs might even hold their own casual events to promote inclusion and provide a way for students to socialize. This also assists in the generation of a positive work culture.

On an individual level, all academics can promote change at the different levels of an institution. Primary investigators will also be able to make changes at a lab-level without much input from outside forces. This allows for faster change at these more local levels. Individuals can also dedicate themselves to speaking about mental health and well-being more regularly and positively. One person normalizing the topic will permeate throughout a community.

The individual level of change also directly ties to the role of the faculty advisor/mentor. Faculty advisors often become the default mentor for graduate students, especially in STEM fields where the advisor is likely directing the research and necessary lab work. As discussed in section 4, the advising relationship is a critical component towards the well-being of students. Contrary to this important role, is the lack of training faculty receive on skills related to teaching, managing, mentoring, and advising.

As stated by Felder and Brent, “It would be unthinkable to allow people to practice a skilled profession without first being trained for it, especially if their mistakes could cause harm to others ... unless they are college faculty members.” Felder and Brent 2016.

There is a noted need for faculty advisors to receive training on aspects of their job outside of the skill-sets they required to become experts in their field. Knowing the types of assistance students will need at different points along their graduate studies is not an inherent skill. While some faculty will seek out existing training programs provided by universities, not all faculty will know

about, find necessary, or see the value in attending said programs. Small, dedicated changes to departmental or college policies can help to put some of these skill-sets into the necessary bureaucracy of academia. For example, required documents that have graduate students and their advisors setting semester-ly goals, agreeing to a certain amount of deliverables, and having a plan for publications will lead to these conversations occurring. This provides structure for students and sets clear expectations for their work, which can lead to better work-life balance. While the faculty member may have not been trained on providing their type of mentoring, the documents will guide them so the mentoring has to occur.

This also takes the burden from solely the advisor or the student and places it on the relationship between the two. Both parties will be aware of the necessary paperwork, especially after the student has gone through one round of the paperwork. They will both want to ensure it is taken care of and that there is an understanding of the work necessary for the semester. This strengthens the mentoring bond in a natural way.

Another consideration for improving mentoring relationships is to assess the types of mentorship that advisors feel comfortable giving and that students like receiving. As seen in Figures 1 and 2, there are models to identify types of management and advising styles. Using these models, students can identify what style works best for them, as can advisors. When deciding on joining a program, students and advisors can reflect on their styles and determine if the working relationship would be beneficial.

6.1 Engineering Education

It should be noted that there are no, to the authors' knowledge, specific studies on graduate student well-being as it relates to engineering and engineering-technology programs. However, STEM students commonly have to interface with their advisors more than non-STEM students due to the nature of how STEM research projects are developed and managed. Often, advisors have specific projects and grants that they must fulfill and the graduate students are assisting with those goals. This requires more communication between advisors and students to ensure the requirements are being accurately met. Studies further exploring the advisor-student relationship in engineering graduate students should be implemented.

Additionally, a core component of mentorship, as discussed, is empathy. Studies have shown that engineers tend to be less empathetic than non-engineers (Linkoping University 2013; Rasoal, Danielsson, and Jungert 2012; Boyatzis, Rochford, and Cavanagh 2017; Strobel et al. 2013; Riemer 2005; Walther, Miller, and Sochacka 2017; Hess and Fila 2016). With low empathy comes poor mentorship skills. The issue of positive mentors in engineering positions could be inferred to be worse in engineering professions due to this empathy-gap. Further studies should be completed to better understand the role of empathy in engineering mentorship.

7 Conclusion

Graduate student mental health and well-being is a topic that needs further exploration and concrete steps to improve. The mentoring relationship between an advisor and a student is a driving factor in the well-being of graduate students. While there are several options at various levels of academia that can help to improve graduate student well-being, there needs to be specific ways to help improve the advising relationship. Guided, required work for the advisor/student pair can help to naturally bring up mentoring topics, provide assistance to faculty who may not have training on mentoring and managing, and build the mentoring bond.

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