



Breaking points: exploring how negative doctoral advisor relationships develop over time

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Abstract

Prior literature has documented the importance of faculty advisors in the doctoral student socialization process, with a few studies describing negative advising relationships characterized by disengagement, disinterest, unsupportive behavior, and interpersonal conflict. We extend this research by exploring how negative advising relationships emerge and develop over time. Examining longitudinal interviews over four years with 15 doctoral students in biological sciences in the USA who experienced negative relationships with their advisors, we illuminate how negative advising relationships unfold over the course of graduate studies. We find two primary patterns in challenging relationships: some students show a *gradual decline* in relationship health over time, while others point to a *single event* altering their relationship trajectory. We also identify specific factors that shape each of these negative relationship types. By revealing the different social processes that underlie the emergence of negative advising relationships, our findings provide a valuable contribution to understanding the complex social landscape of doctoral education. The findings further the dialogue on how faculty advisors can craft successful pathways through graduate education, thereby supporting the academic and professional success of doctoral students.

Keywords Doctoral education · Socialization · Advising relationships · STEM

Introduction

Doctoral education in science, technology, engineering, and mathematics (STEM) is preparing the next generation of experts who will advance science and innovation through research and discovery. Reflecting high labor market demand in the USA (Jelks & Crain, 2020), STEM doctoral students undergo rigorous training, positioning themselves as drivers of change as innovators and scientists. Despite growing demand for STEM

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professionals, doctoral programs are experiencing a crisis of attrition (Maher et al., 2020). According to the Council for Graduate Schools (Sowell et al., 2015), just under three-quarters of students who embark on doctoral programs successfully navigate the demanding path to completion, revealing a notable loss of potential.

As graduate school enrollments decline (McKenzie et al., 2023), fostering greater retention and persistence becomes paramount. The journey to attain a doctoral degree is fraught with challenges stemming from high demands and the pressure to excel (Fernandez et al., 2019; Gardner & Mendoza, 2023). Graduate students report higher levels of mental health challenges than the general population—including stress, burnout, anxiety, and depression (Allen et al., 2022; Evans et al., 2018; Hyun et al., 2006)—all of which may be amplified when students struggle to complete their degrees (Sverdlik et al., 2018).

While myriad factors may contribute to students experiencing challenges in their programs, and considering leaving, faculty advisors play a particularly prominent role (Burt, 2019; Griffin et al., 2023; Sweitzer, 2009). Previous research shows that faculty advisors shape doctoral student experiences, socialization for the field, and professional development (Austin, 2002; Austin & McDaniels, 2006; Golde, 2005). In the midst of documenting the importance of faculty advisors, a few studies have also illuminated experiences of negative relationships, reflected in a lack of care, disinterest, unsupportive behavior, and interpersonal conflict (Barnes et al., 2010; Noy & Ray, 2012; Tuma et al., 2021). This work, however, has not explored how negative advising relationships emerge and develop over time. Since relationships evolve and doctoral programs take five or more years to complete, supporting graduate students necessitates understanding how negative relationships develop over time.

Drawing on longitudinal interviews over four years with 15 doctoral students in biological sciences who experienced negative relationships with their advisors, we address two research questions: (1) How do negative advising relationships evolve over time and (2) What are the characteristics associated with these adverse advising relationships? We find that negative relationships reflect two main types with some students experiencing a *gradual decline* in relationship health over time and others reporting a *singular event* that alters their relationship trajectory. We also identify specific factors that shape each of these negative relationship types. By revealing the different social processes that underlie the emergence of negative advisor relationships, our findings provide a valuable contribution to understanding the complex social landscape of doctoral education and ways to support successful pathways through graduate education, which is crucial to addressing national challenges related to PhD completion.

Theoretical framework and literature review

Socialization refers to the process by which individuals acquire values, norms, beliefs, attitudes, and behaviors salient to an organization, and in the context of this study, doctoral education. In American literature, the socialization model represents the dominant framework for understanding doctoral students' experiences. Weidman and colleagues (2001) describe a process through which doctoral students become aware of and embrace the normative, behavioral, attitudinal, and cognitive expectations of faculty-student and peer-to-peer interactions while observing others' roles. As they navigate through their graduate programs, doctoral students internalize and accept the values and adjust their behavior

accordingly to meet the expectations of their programs, departments, institutions, and academic disciplines.

Research has demonstrated that socialization in doctoral education can impact a student's progress toward degree completion and overall sense of belonging in one's field (Austin, 2002; Austin & McDaniels, 2006; Gardner, 2008; Weidman, 2010; Weidman et al., 2001). At the crux of this developmental journey are faculty advisors who act as guides and gatekeepers—transmitting the cultural values, knowledge, and skills necessary for a successful socialization experience (Gardner, 2008). Doctoral student socialization, which served as a framework for this study, has allowed us to shed light on the extent to which breaking points in advising relationships can have immediate or long-term implications for doctoral student development.

Importance of advisor relationships in doctoral programs

Doctoral students participate in a variety of socializing relationships that facilitate learning and development throughout their graduate school career, including faculty, peers, post-docs, and lab groups (Austin, 2002; Baker & Pifer, 2011; Burt, 2019; Sweitzer, 2009). Among the various relationships, faculty advisors are considered to be among the most important in shaping doctoral students' experiences (Barnes et al., 2012; Gardner, 2008). The role of faculty advisors is particularly prominent in the STEM fields, where doctoral students' time, research experiences, and funding are often dependent on their advisor's lab (Maher et al., 2020; Pearson & Brew, 2002).

Extensive research has documented the faculty advisor's role in students' experiences, degree completion, and professional outcomes (Austin & McDaniels, 2006; Golde, 2005; Pifer & Baker, 2016). Advisors are important sources of information, mediators to the school and department, and dissertation supervisors who guide students through their programs and into the career (Lovitts, 2001; Nettles & Millett, 2006). In addition, advisors serve in a range of roles including mentors, sponsors, counselors, supporters, and facilitators, and they interact with doctoral students across a range of developmental domains to support their success (Bieber & Worley, 2006; Lyons et al., 1990; Noy & Ray, 2012; Rose, 2005). Recent research reveals that doctoral students also value the role faculty advisors can play in providing support and demonstrating personal care (Burt et al., 2021; Griffin et al., 2020).

The characteristics of advisor relationships can take a number of different forms, which has important implications for student experiences. For example, Noy and Ray (2012) identified six advisor types including affective, instrumental, intellectual, available, respectful, and exploitative. Similarly, Curtin et al. (2016) found that faculty advisors engage in different kinds of mentoring including instrumental assistance, psychosocial support, and sponsorship. Studies aiming to categorize advisor relationships typically have a negative category, and a small but growing body of research has focused more explicitly on those negative relationships.

Negative advising relationships

Several studies examining negative advising relationships note their detrimental influence on students' personal well-being, academic persistence, professional development, and overall satisfaction with their studies (Barnes et al., 2010; Blanchard & Haccoun, 2019; Burt et al., 2021; Golde, 2005; Knox et al., 2006; Lovitts, 2001; Perez et al., 2020; Tuma

et al., 2021). For instance, Barnes and colleagues (2010) described negative relationships with advisors who were inaccessible, transactional, unhelpful, and uninterested. Advisors that embodied these attributes were often disengaged in students' research, unavailable to provide guidance on academic benchmarks, and displayed a lack of care in their advising relationships. As a result, students' descriptions of these relationships reflected feelings of hopelessness, disappointment, and abandonment by their advisors.

More recent STEM education research has uncovered additional characterizations of negative advising relationships. For example, Limeri et al. (2019) identified that undergraduate students in STEM experienced negative advising relationships in seven main ways, including (1) absenteeism, (2) abuse of power, (3) interpersonal mismatch, (4) lack of career and technical support, (5) lack of psychosocial support, (6) misaligned expectations, and (7) unequal treatment. Building upon Limeiri et al.'s characterization of negative advising relationships, Tuma and colleagues (2021) uncovered that STEM doctoral students, like undergraduate students, face similar points of tension within their advising relationships that impact personal and professional development. Based on a study of Black male graduate students, Burt and colleagues (2021) offered a categorization of graduate-level advising relationships on a spectrum of "strong," "basic," and "weak." They argued that the strength of advising relationships was dependent on the degree to which advisors displayed a genuine concern or "care" for their advisees. In the absence of care, weak advising relationships manifested as harmful to students' academic progress, psychological well-being, and wholeness.

While recent scholarship has identified categories, attributes, and characterizations of negative relationships, there is a lack of understanding for when and how negative relationships develop over time. To address this gap in the literature, we analyze longitudinal interview data collected from 15 doctoral students over the course of four years who reported experiencing negative relationships with their advisors.

Data and methods

Data collection and analysis

The data for this manuscript are drawn from the interview portion of a mixed-methods study of graduate students who began doctoral programs at universities with high research activity in the USA in the Fall of 2014. The participants were followed longitudinally across the course of their doctoral programs through entrance into the career. The specific fields represented in the study are part of the larger umbrella of "bench biology," including microbiology, cellular and molecular biology, genetics, and developmental biology. Each year, participants completed an annual survey about their experiences and a sub-sample of survey respondents were invited to participate in the interviews.

This project is a descriptive qualitative study, based on identifying themes within the text of narrative interviews (Patton, 1990). Our data analysis utilized a grounded approach to shape concepts inductively from the language of the interview participants (Charmaz, 2000). This methodological technique is particularly useful for exploring how individuals draw meaning from their lived experiences and social interactions (Corbin & Strauss, 2008). An inductive lens was appropriate given limited research on this topic and our interest in understanding how negative relationships evolve over time. The primary questions analyzed are those focused on the student and advisor relationship, including the following:

How has your relationship with your faculty advisor changed or evolved over the past year? Can you tell me more about the nature and quality of that relationship?

In most biology programs, students spend the first year in rotation and begin to work with their primary advisors in the 2nd year. Thus, we examine the advisor relationships over four years (Y2–Y5). Sixty-three students participated in interviews at all four time points. We coded each year of data for each respondent (63×4), categorizing them into positive and negative relationships. We distinguished negative relationships by the extent to which an advisor's behavior had negative implications for student's well-being and overall academic and professional progress. In the interviews, participants disclosed their negative advising relationships using language such as but not limited to, “bad,” “poor,” “terrible,” “horrible,” “toxic,” and “hostile.”

Based on this initial round of coding, we identified 15 respondents who reported having a negative relationship with their advisor in at least one year. Although the original sample of 63 respondents included 44 women and 19 men, the 15 respondents with negative relationships were all women, which we did not anticipate and discuss in the discussion section. While we recognize the profound influence of identity, particularly gender, racial/ethnic background, and first-generation status in STEM education spaces (e.g., Gardner & Mendoza, 2023; Griffin et al., 2020; Piatt et al., 2019), supplementary examination within this study did not unveil discernible differences tied to race/ethnicity or first-generation status among the 15 participants with negative advising relationships (see Table 1).

To further investigate negative relationship dynamics from a longitudinal perspective, we engaged in a comparative analysis of student narratives and relationship trajectories, which revealed two distinct patterns of experience: *gradually deteriorating* relationships or negative relationships *stemming from a single event*. In the context of these overarching

Table 1 Participant information

Participant pseudonym	Participant college generation status	Participant race/ethnicity	Advisor gender	Advising relationship trajectory
Cassandra	First-generation	Asian/Latina	Female	Gradual
Antonia	Continuing-generation	Latina/White	Male	Gradual
Addison	First-generation	White	Female	Event
Ava	First-generation	American	Male	Gradual
Mila	Continuing-generation	Indian/White	Female	Gradual
Aria	Continuing-generation	Latina/White	Male	Event
Charlotte	Continuing-generation	Asian	Male	Event
Camila	Continuing-generation	White	Female	Gradual
Hazel	Continuing-generation	White	Male	Gradual
Harper	Continuing-generation	White	Male	Event
Joan	Continuing-generation	White	Male	Gradual
Marina	First-generation	White	Female	Gradual
Marie	Continuing-generation	White	Female	Event
Rylie	First-generation	White	Male	Gradual
Grace	Continuing-generation	White White	Female	Gradual

This table presents the participants' pseudonyms, college generation status, race/ethnicity, advisor's gender, and relationship trajectory

themes, students delineated specific characteristics that influenced their relationships over time. Careful analysis of the narratives revealed six factors associated with negative advising relationships: (1) mismatched workload expectations, priorities, and management styles; (2) gatekeeping academic milestones; (3) perceived lack of personal interest and care from advisor; (4) hostile interpersonal interactions; (5) unexpected change in advisor status at the university; and (6) abrupt failures in research experiments. These categories were derived inductively but align with existing themes from work on negative advising relationships by Tuma et al. (2021) and Limeri et al. (2019). We describe the manifestation of each category and their inter-relationships further in the results section.

Trustworthiness and positionality

The authors engaged in a constant-comparative approach to data analysis to ensure the codebook captured emergent findings and reinforced consistency in themes. We generated the initial codebook collaboratively and followed peer debriefing protocol in making sense of the data through critical discussion of interpretative claims (Carspecken, 1996). To ensure trustworthiness, two authors coded an initial sample of transcripts independently and wrote detailed analytic memos focusing on notable patterns and themes across the narratives (Saldaña, 2013). Memos were then shared with all authors for review and critical discussion. Qualitative research can be understood as a dialogic collaborative process that involves substantial interaction between researchers throughout the analysis stage (Creswell & Creswell, 2018; Paulus et al., 2008). Group discussion was vital in establishing rigor and transparency, and key findings were determined through ongoing conversations focused on language in the narratives.

Qualitative research is a social process, and researchers' own subjectivities play a meaningful role across each stage of the study. Because interviews for this study are part of a larger project, the authors did not collect the interview data themselves. The authors of this manuscript identify as a Latina, white woman, and white man. In addition, the authors hold advanced degrees in sociology and higher education. In this sense, we are positioned as cultural outsiders within the natural sciences and bring a social scientific lens to this context.

Findings

This study was guided by two research questions: (1) How do negative advising relationships evolve over time? (2) What are the characteristics associated with these adverse advising relationships? Data analysis revealed two main types of negative relationships. Ten participants experienced advising relationships that became *gradually negative* over time while five participants described a *singular event* that dramatically shifted the trajectory of what was once a positive relationship.

A gradual decline in advising relationships

Negative relationships that deteriorated over time were often characterized by a combination of four distinct factors: (1) *mismatched workload expectations, priorities and management styles* reflecting variations in expectations and boundaries regarding project priorities, work-life balance, along with concerns about advisors' inaccessibility or

non-communicative behavior; (2) *advisors' gatekeeping of academic milestones* by slowing down students' progress toward the degree; (3) advisors showing a *lack of interest or investment* in students' personal well-being and academic progress, which left students feeling unaffirmed and invalidated by their advisors over time; (4) *hostile interpersonal interactions* with their advisors, including instances of harmful or toxic behavior both inside and outside the lab.

As shown in Table 2, which includes information on all respondents, while there is no single factor that is present across all cases, gradually deteriorating relationships often included several of these factors. To illustrate the richness of these experiences within the constraints of the journal word limit, we present a detailed account of one case that captures the different factors, and then follow it up with a few abbreviated examples.

Ava's experience provides a prototypical example of how advising relationships can deteriorate over time, with all four factors manifested in this case. In her earliest interviews, Ava characterized her advising relationship as "turbulent," including frequent conflict with her advisor. The turbulence was associated with her feeling underappreciated and overworked in the lab. In the second year, she explained, "I nearly quit my lab. I was perceiving that I was not being valued, that I was a means to an end. I was a means to complete a project...I didn't have the support of the PI. These are things that are not what I should have been doing as a second-year grad student. It was just expected that I do it without it being appreciated or recognized."

Frustrations over misaligned expectations intensified over time. Despite spending a lot of time in the lab, Ava noted that her advisor believed she had not been adequately productive. In a wave of frustration, she explained "it feels like he thinks we're not working hard enough, and not doing as much as we should. He's said a few times, 'Well, what are you doing between the start and end of that experiment? You can't just sit around on your hands and wait for those results.' Well, no, obviously not. I'm working nonstop on all of these other balls that I'm juggling."

In addition to taking the brunt of the workload in the lab, in the third year, Ava noted that much of her learning and development had been on her own as a result of a very "hands-off" advisor. As Ava put it, "my mentor doesn't want to help me or pave the way." She continued,

I'll present something that I've thought through, done research on, diggin' into literature, tryin' to see what's known about different aspects that could contribute to this idea, and I present it to my mentor. It's a very solid argument, and it just gets brushed off that this isn't important, this wouldn't move us forward. Then a year later, some other group is proposing the same thing...all of a sudden it's a brilliant idea and we're gonna help them accomplish this goal.

Instead of supporting Ava's ideas, her advisor dismissed them as "trivial" and "insignificant" leading to Ava's belief that her advisor lacked interest in supporting her intellectual development and discovery.

Ava also shared that her advisor was critical without being constructive throughout her time in graduate school, saying that "This [work] is garbage. You're going to fail," but not in any kind of constructive way of why it was garbage or why he felt like I was going to fail." The advisor's discouraging comments and prediction of failure without providing guidance further contributed to the breakdown in communication and their overall relationship health. These instances led Ava to speculate that her advisor engaged in gatekeeping by attempting to delay her oral defense. She elaborated, "...he postponed my oral defense by several months...it just felt insulting. And there weren't specific reasons why." Ava

Table 2 Distribution of participant advising relationship trajectory and relationship characteristics

Pseudonym	Advising relationship trajectory	Lack of personal interest and care	Mismatched expectations	Hostile interpersonal interactions	Gatekeeping of academic milestones	Abrupt failures in research experiments	Unexpected changes to PI's status
Cassandra	Gradual	Yes	Yes				
Antonia	Gradual	Yes	Yes				
Ava	Gradual	Yes	Yes	Yes	Yes		
Mila	Gradual		Yes				
Camila	Gradual	Yes	Yes	Yes			Yes
Hazel	Gradual		Yes	Yes	Yes		
Joan	Gradual	Yes	Yes				
Marina	Gradual	Yes		Yes			
Rylie	Gradual		Yes	Yes			
Grace	Gradual	Yes	Yes		Yes		
Angelica	Event		Yes (after event)		Event		
Aria	Event	Yes (after event)	Yes (after event)			Event	
Charlotte	Event		Yes (after event)		Event		
Harper	Event	Yes (after event)					Event
Marie	Event	Yes (after event)	Yes (after event)				Event

This table illustrates the advising relationship trajectories of the participants, including the occurrences of characteristics associated with such relationship

believed that some of his critical feedback was baseless and revealed that she did not trust her advisor after the many letdowns and toxic interactions she experienced.

By the end of her doctoral program, Ava characterized her advisor as being even more “critical and condescending without being constructive than ever before.” She shared that everyone in the lab was experiencing similar struggles with their mental health due to the toxic work environment in the lab. She disclosed, “some people are seeing counselors, some people are taking antidepressants...literally, all of us are. It kinda speaks to the conditions in the lab, not feeling supported, not getting the guidance and mentoring we need.” Ava’s story illustrates a perpetually negative advising relationship that kept deteriorating over time due to misaligned expectations, lack of advisor’s interest and care, gatekeeping, and hostile interactions.

Like Ava, Antonia’s relationship was characterized by a perceived lack of personal interest and care from her advisor, coupled with mismatched expectations. Antonia described her advisor as unavailable and uninterested in her work throughout her doctoral program. For one, they did not meet regularly. Antonia discussed meeting with her advisor monthly in year three and only twice a year in year four, noting, “We had a twice-monthly meeting for two months and then he stopped showing up to them. We meet like once a year in person.”

They communicated primarily through email, which made Antonia feel that she did not receive his full attention and support. Describing her thesis project, she shared, “he emails me a lot. They’re usually just really frustrating emails for me to read. And they’re not helpful...I just sent him a draft of the manuscript for the project I’m supposed to be wrapping up and he replied to it without even reading the draft.” When they did get an opportunity to finally meet in person, the conversations were often unproductive. She explained, “I’ll come in with a list of questions that I need to be answered and he doesn’t give me a direct response, and I just felt that it wasn’t very helpful for me to meet with him that often anymore and he couldn’t provide me the time so I wasn’t going to try to force it anymore. I just thought this is just a complete waste of my time.”

This lack of engagement impacted not only the development of her research skills and scholarly development but also her career prospects. In year four, Antonia disclosed that her advisor had not been available to discuss her career goals. She stated, “we’re supposed to have an annual discussion about what career path I want to choose, but he’s never available to meet. There’s a form we have to fill out and he has to sign, so I email it to him and ask him to review it, and give me any comments if he has any but he never does, so he usually just signs it without reading it.” Her advisor’s lack of attentiveness around career development coupled with his lack of communication was considered evidence for her perceptions that he did not “care” about her future and professional trajectory.

In addition, Antonia disclosed that tensions continued to build in their relationship due to differences in project prioritization. Her advisor wanted her to prioritize projects and lab duties that set back progress on her own thesis project. In year four, Antonia stated, “I’m having a lot of issues with my PI recently and he’s kind of forcing me to stop working on projects that I thought really had potential and now he wants to revise this project that my committee decided I should not be working on.” Feeling stuck, Antonia expressed that she was contemplating leaving the program and wanted to do anything to graduate at that point: “I’ve just had a lot of issues with him lately. I just wanna do what it takes to graduate now...I thought a lot about just leaving the graduate program lately.”

Reflecting similar themes as the other women thus far, Camila experienced a poor advising relationship stemming from mismatched expectations, perceived lack of personal interest and care from her advisor, and a negative work environment. Many of the mismatches

stemmed from her advisor's frequent travels. Due to travel, Camila's advisor was often not in tune with the progress of ongoing lab work, causing tensions with her students, including Camila. Camila noted that her advisor did not have "a finger on the pulse of what's going on" and "ask[ed] for details that aren't really related to things that we're working on at that point, and she wants it yesterday."

Her advisor's absence also created issues in their communication and disconnect in expectations around mentoring. Camila noted that her advisor was "hands-off" in terms of mentoring which caused friction because she desired a greater level of support and guidance. She desired to have more time with her advisor, despite the challenging relationship: "The one thing I would love, and that I craved for so long but never got, was that one-on-one time. It would've been nice to have learned from her expertise."

Overall, there was little communication between the two, as Camila reflected in year two:

She's not even around a whole lot. Our interactions aren't always pleasant...but it's hard to feel valued when somebody walks into a room, they can never say hi...they always seem angry. It's hard to get a read on my boss. I would never stop in, and say hi. It's awful to make small talk, if you try to ask where she goes on vacation, she'll ask, 'Why do you need to know?'

Camila's reflection reveals a lack of approachability and positive interactions with her advisor. Her advisor's infrequent presence, unfriendly demeanor, and reluctance to engage in casual conversations created a challenging and uncomfortable work environment. Camila's sentiments also demonstrated difficulty in feeling valued and establishing a connection with the advisor due to these behaviors. These feelings were exacerbated when her advisor suggested that she should move labs, "A few days before Christmas. I think she actually recommended, she's like, 'There's this open house for another department that you might be interested in, if you want to go to it.'" Despite feeling pushed out, Camila persisted in the lab, remaining hopeful that things would change. However, things did not improve. In the third year, Camila noted: "Not having a lot of contact with my PI has been difficult. That's been one of my biggest issues. I've spent very little time with her in the lab, going over things on the microscope, which I believe would have been very helpful." And a year later, it was clear that the relationship would be difficult to remedy. Camila noted, "I never had that relationship with her at all" and "I felt kind of unsupported throughout the whole thing [graduate school]."

At the end of her graduate program, Camila continued to report that her advising relationship was "unhealthy," "strained," "aggressive," and "hostile." As a result, Camila disclosed the impact that the relationship had on her mental health in year four, "I just haven't been sleeping a lot, and it's just a ton of stress, and I do not like talking to her, and any time I know that it's coming up, it fills me with unbelievable amounts of dread...So the motivation to do anything kind of disappears." In year five, Camila continued to discuss the decline of her mental health as a result of the "incredibly tough" interactions she had with her advisor noting, "I was very, very depressed...Truly like getting out of the bed—getting out of bed every morning was an absolute struggle. It was so hard. I was not in a good condition to work." Camila's advising relationship continued to sour after years of unmet expectations regarding communication and availability as well as an unmet desire for mentorship, care, and a healthy work environment.

Like the others, Cassandra experienced a strained advising relationship due to mismatched expectations as well as a perceived lack of personal interest and care from her advisor. Cassandra expressed frustration throughout her interviews regarding her advisor's

“poor management” and “lack of support” in the lab. For instance, she recounted how she felt unsupported by her advisor to pursue her own projects to advance the lab’s ever-changing research agenda, “She changes her mind on what she wants for the [lab] paper. Then, I’m stuck doing the experiment instead of doing what I want to actually do. That feels very frustrating, obviously, because it’s—I’ve gotten some preliminary data that’s very exciting, and then I’m sitting on it, basically.” The pair had been unable to see eye to eye on project management and priority as well as work-life balance matters. In her third year, Cassandra described a time when her advisor had shamed her for taking a vacation. Although she had previously discussed taking time off, her advisor docked her pay, she said,

I had asked her about vacations. I had planned a year in advance to go and she was fine with it. We verbally talked about it multiple times, and she seemed really excited for me to go...recently, I’d say about a month or two ago, she came to me and said that I’ve been taking too much time off... I will be honest with you. I thought about quitting the program because I was so offended and upset because she told me it was okay and I didn’t take a vacation for the whole year. She said she thinks I had too much time off and docked my pay for the summer.

Disagreements about priorities escalated when Cassandra became engaged and pregnant. At that point, Cassandra’s advisor questioned her ability to finish her program and “pushed her to master out” despite her intention to finish the program. Cassandra noted, “It was a little bit tense when I told her I was pregnant, and that was a little bit hard for a little while because I felt that she wanted me to quit...I didn’t really want to tell her that I was pregnant. I waited a while.” Cassandra’s changing personal life and expanded family contributed to a rift that continued to sour the relationship between her and her advisor.

Marina’s experience was also marked by a lack of support and genuine interest from her advisor, coupled with the hostile work environment that stands out for its severity, which resulted in filing of a formal complaint with the university. In her earliest interviews, Marina reported that her advisor had a reputation for yelling at students which made the lab environment tense and uncomfortable, “Honestly, there’s a reputation of her being terrifying, and she makes people cry. I’ve had her screaming at me to the point where it’s like if this were at a company, she’d be fired for breaking just about every HR policy.”

Expanding on this, Marina provided clear examples of the abusive comments she received from her advisor during the course of her program like, “two weeks before I turned in my dissertation, or like a week before actually, my boss told me I didn’t deserve my PhD” and “She would make comments about how you looked, what you wore, your religion, where you grew up, she’d pick on me for anything and everything.” By her fourth year, Marina took action against her advisor to file a complaint at the institution for verbal abuse and harassment noting,

So, my PI is currently being reported for the amount of verbal abuse she has done to me. And she made my life a living hell. Like, the amount of horrible things she said to me, the way she’s treated me, belittled me, screamed at me, called me names, you name it, just all of that stress manifested itself, and I didn’t sleep well and I broke out in hives or [was] constantly having nightmares about messing something up or just her yelling at me.

Ava, Antonia, Camila, Cassandra, and Marina illustrate steadily declining relationships with their advisors. All five women reported challenges arising from mismatched expectations and a perceived lack of personal interest and care from their advisors. Whether through infrequent meetings or lack of approachability, these women faced difficulties in

effectively communicating with their advisors, hindering their progress and overall experience. Three of the five women also reported negative impacts on their mental health due to their challenging advising relationships. The toxic environments, unmet expectations, and, in Marina's case, severe verbal abuse contributed to stress, anxiety, and, in some cases, depression. These examples highlight that early signs of poor advisor matches foreshadow long-term unsuccessful advising relationships. The manifestation of these characteristics not only impacted the women's socialization within their academic environments but, in some cases, also their inclination to persist in their programs.

A singular event altering relationship trajectory

In contrast to advising relationships that gradually declined over time, advising relationships impacted by a singular event experienced a sudden negative shift. Early advising relationships in this group were described as "respectful," "professional," "helpful," "understanding," "fair," and "supportive." However, one of three types of events changed the trajectory: (1) gatekeeping of academic milestones at the end of the program, (2) unexpected change in PI (advisor) status at the university due to relocation or tenure denial, and (3) abrupt failures in research experiments. After these events, the relationships began to resemble those in the gradually declining category, often demonstrating mismatched expectations and perceived lack of advisor interest and care.

It is notable that while gatekeeping is observed in both types of relationships, there are important distinctions. In cases of progressively strained relationships, gatekeeping was part of a broader constellation of factors and was coupled with misalignment of expectations regarding work and project priorities. In the singular event category, gatekeeping was the crucial event that derailed the relationship—it occurred as participants neared graduation and advisors began impeding their progress by withholding support and approval of crucial milestones in order to keep them contributing to their labs.

Charlotte exemplifies the pattern of gatekeeping that turned a positive advisor relationship into a negative one. She cultivated a strong working relationship with her PI, noting in year two that "He [the PI] always takes time to talk to me and discuss my project and help me troubleshoot. Just over the last couple of months, a lot of personal issues have come up, and he's been very, very understanding." These sentiments carried over the years. In her fourth year, Charlotte characterized her advising relationship as "very supportive" and noted that the relationship had evolved to being collegial: "He sees me as an actual scientist as opposed to more of a trainee. He values my opinion..."

However, the relationship had "soured" in the 5th year. Given that Charlotte was the only employee and graduate student in the lab other than the technician, her advisor relied on her to run the day-to-day operations of the lab as well as experiments. As the time neared for her to graduate, her advisor began falling behind in providing feedback on her dissertation and consistently missed deadlines that were imperative for her to graduate on time. Charlotte grew frustrated waiting for her advisor's feedback on her materials. She said, "he'd be like, 'Okay. Once you get this done, we can move forward.' I'd get it done, and he'd be like, 'Actually, no. We just need to try this other thing first. We can't move forward yet.' That happened every week for six months. That was really frustrating." In Charlotte's opinion, this was a way for her advisor to undermine her timeline for graduation. She articulated, "I think he had a hard time with the idea of me leaving, because his lab is very small. It was just the three of us. After I left, obviously, he didn't have work that was getting done. It was cut in half. He just wasn't really ready to let go of me."

Angelica similarly had a harmonious relationship with her advisor which took a negative turn in the last year as her goals of completion began to conflict with her advisor's pressing need to conclude particular lab projects. Disagreements arose between the two regarding the next steps for specific projects, changing project workloads and directions and consequently the prospect of Angelica's graduation. As Angelica described, "There's a very clear power dynamic where she has my graduation as a big incentive for me to do what she wants to do, right? It's been different to work around that feeling that she is my boss in the end, and she can decide, at the end of the day, whether I graduate or not." This power imbalance and the prospect of delayed graduation created tensions and disagreements in her final year.

Healthy advising relationships were also negatively impacted by an advisor's relocation to a new university or being denied tenure, as experienced by Harper and Marie. Harper initially enjoyed a positive professional and personal relationship with her advisor. When her advisor was asked to relocate universities, Harper willingly obliged and accompanied her in year two. However, despite the smoothness in the initial phases of the move, things changed rapidly as the responsibilities and challenges associated with setting up the lab began to have a significant impact. By year five, Harper took on many of the lab's supervisory roles, which caused frustration and stress. While trying to balance her dissertation, lab duties, and wellness, Harper felt overburdened by managing multiple projects, training new staff and students, and overseeing day-to-day operations in the lab. As she described,

He brought in a lot of undergraduate researchers this past year that did projects with us over the school year, and I had to supervise them. It's a lot to supervise three or four people while you're also trying to finish all of your dissertation work. There was a lot of tension between us, I think because he was really asking a lot of me, but not really acknowledging all of the work that I did, I got a bit burnt out and a bit upset with him over the past year because of that.

Like Harper, Marie initially fostered a positive rapport with her advisor which changed once the advisor was unexpectedly denied tenure. The once highly communicative dynamic between Marie and her advisor shifted dramatically, and became characterized by distance, disengagement, and a notable lack of involvement. Marie elaborated on this change,

I would say initially she was much more engaged, like every week, and now it's to the point where I meet with her on a much less regular basis...There's been several months where I haven't talked to her at all except over email, so it's been difficult. It has definitely changed, and that's mainly due to changes in her status as a professor. She didn't get tenure, and so things have changed, because of that. She hasn't been as engaged in the research process.

As the support dwindled, so did Marie's confidence, both in their relationship and in her own work. Her advisor's increased disengagement led to further strained communication between Marie and her advisor during the fifth year, reaching a point where Marie expressed the challenge of "having to fight for attention." Thus, a once very positive and supportive relationship suddenly became a challenging one.

Aria's case illustrates the last factor that led to a sudden shift in a relationship associated with abrupt changes in a student's research progress. Early interviews portrayed Aria's advisor as "genuinely invested" and "interested" in her development as a researcher and scientist. This interest and investment dwindled in Aria's last year of graduate school when her research progress came to a halt. Aria described that she had "a bunch of mouse experiments set up, only to find that the model we were using really wasn't very reliable...I

went back to the drawing board and have been building up a mouse model of experimental metastasis from scratch. Even though that's been good, because I've been really methodical about it, it feels like really slow progress." The tensions started to arise when her PI felt that she should be moving faster: "Over the past year, we've both grown more frustrated with the lack of progress...he doesn't seem to understand why it's taking me so long... he got through this process in three years as a postdoc."

Noticing a drastic change in their rapport, Aria disclosed that her advisor seemed less interested in her work during meetings and had taken a more hands-off approach to mentoring. Aria explained that she needed more assistance and guidance from her advisor as she struggled with the more complex parts of her projects but was not receiving it. Aria's confidence in her abilities and overall mental health declined. When she expressed her concerns to her advisor, he dismissed them: "I was developing a lot of anxiety-related behaviors, unable to answer emails, just really feeling paralyzed by a lot of things. He just didn't really seem phased by that, like 'Okay. Well, I had it hard in my postdoc, too.'" Aria's experience underscores how a sudden disruption in research progress can swiftly transform what was once a supportive advisor relationship into a highly contentious one.

The narratives of these five women served as notable examples of positive relationships that were suddenly and significantly impacted by a single event. Charlotte's and Angelica's initially positive relationship soured in the fifth year as advisors undermined graduation timelines. Harper and Marie experienced disruptions when their advisors faced relocations or tenure denial, whereas Aria's advisor, who was initially invested, distanced himself when her research progress slowed, causing a swift deterioration in their relationship health. Despite varying events, the impact was profound, suddenly transforming once positive relationships into challenging ones. These narratives underscore how singular events can significantly impact doctoral advising relationships.

Discussion

While previous research has noted the importance of faculty advisors in graduate student learning and development (Barnes et al., 2012; Gardner, 2008; Griffin et al., 2020), and described some of the characteristics that define negative advising experiences in doctoral education (Burt, 2019; Noy & Ray, 2012; Tuma et al., 2021), scholars have not attended to how negative relationships develop over time. Gardner (2010) argues that faculty members act as gatekeepers in and out of doctoral programs, formally and informally transmitting cultural values, knowledge, and skills to students during their socialization processes. Consequently, faculty members have the potential to either hinder or support students throughout their doctoral journey, and our analyses illuminate the consequences of negative advising in the socialization of doctoral students. Based on longitudinal interviews over four years with 15 doctoral students who experienced negative relationships, we found that most students experienced a *gradual decline* in the relationship throughout their programs, while some experienced a *single event* that drastically altered the relationship trajectory. We also illuminated six different factors that characterized these negative relationships.

The presented findings extend prior work on the prevalence and characteristics of negative advising relationships in doctoral education (Barnes et al., 2010; Burt et al., 2021; van Rooij et al., 2021) by illuminating *how* relationships deteriorate over the course of graduate study. The distinction between gradual and single event trajectories is quite consequential as it implies that different points in time provide diverse insights for understanding

relationship trajectories. While relationships that gradually deteriorate may appear similar regardless of when students are interviewed, single event declines look very positive until the a specific point of the program.

Moreover, we identify how specific factors contribute to negative relationships, underscoring concerns about advisor match, differences in communication styles, expectations of workloads, availability and support, respect and care, and the nature of work environments. It is notable that not all factors are present across all negative relationships, which provides a critical nuance to understanding how negative relationships develop. While some prior studies have noted that dissatisfaction arising from poor advisor match, supervision, and a high workload significantly increases doctoral student intentions to quit their programs (e.g., van Rooij et al., 2021), our findings show that these experiences accumulate over time. Signs of a poor match manifest throughout years of suboptimal interactions within lab settings, differences in workload expectations, and insufficient availability for advising and non-academic support. The weight of accumulated negative experiences led to growing dissatisfaction, lack of support for meeting academic and professional goals, and decreased well-being and mental health challenges. Thus, even if students do not leave their programs, they often experience significant negative consequences, and mental health, in particular, is a growing concern in graduate education (Bekkouche et al., 2022; Breen & Gonzales, 2022; McCallum, et al., 2023).

In addition, challenges in establishing a sense of safety and comfort within laboratory settings, arising from the toxic behavior of advisors, intensified negative interactions for participants in this study. Participants openly shared feelings of being uncared for and voiced concerns about their advisors' lack of interest in their work. Moreover, some participants grappled with overtly critical advisors who demonstrated a lack of empathy during different junctures of their personal lives and academic journeys. While Gardner and Mendoza (2023) emphasize the importance of providing both support and critique for the development and socialization of graduate students, our work reveals that uneven levels of support and toxic approaches to pushing students hinder the development of trust in relationships that diminish student confidence.

Relationships that deteriorated due to a single event stand out by a sudden shift in the relationship quality. A few studies have noted the significance of doctoral students for supporting PI research in the labs (Maher et al., 2019; McAlpine & Emmioğlu, 2015) and our findings illuminate the negative impact this can have on students' relationships with their advisors when the prospect of graduation threatens a PI's research agenda. While typically portrayed as synergistic, the interests of advisors and students can diverge, and due to a pronounced power differential can threaten students' timely graduation. This crucial developmental relationship can thus unexpectedly become a source of concern, tension, and decreasing well-being.

Finally, it is important to note that all of the negative relationships in this study were among women doctoral students. While we did not anticipate this, these patterns support previous research examining the role of gender in STEM graduate student experiences—including relationships with advisors. For example, Noy and Ray (2012) found that gender influenced how women doctoral students understood the faculty advisor's role in their development, revealing a spectrum of different relationship types. Gender shapes how students perceive their advisors, understand faculty interactions, and engage the research process, all of which have important implications for their relationship trajectories (Dinsmore & Roksa, 2023; McCain & Roksa, 2023; Rose, 2005). Though we do not foreground the role of gender inequality in our analysis, it is critical to acknowledge that our

findings amplify its importance in understanding variance in doctoral student socialization experiences.

Implications

This study also has a number of important implications for practice and supporting graduate students. Faculty advisors serve as pivotal professional mentors to their doctoral students and their developmental role is especially prominent in the STEM fields, where doctoral students' academic life and labor are structured around their advisor's labs (Burt, 2019; Maher et al., 2020; Pearson & Brew, 2002). It is crucial to carefully consider ways departments can support students who experience negative relationships with their faculty mentors—relational dynamics that can undermine student progress and success. This includes reimagining the structures that enable doctoral students to feel supported, manage interpersonal challenges, and ultimately thrive (Burt, 2019). For example, departments should organize regular check-ins with program leadership to encourage open communication about students' ongoing experiences with faculty mentors, creating a space with psychological safety for discussions with heightened vulnerability and emotional sensitivity. Given that relationships that started negative tended to stay negative over time, providing check-ins early on in the program is critical. Without becoming aware of and addressing negative relationships in the early stages, they are likely to continue on their negative trajectory throughout students' time in the program.

In addition, faculty advisors occupy a significant position of power over their graduate advisees (Friedensen et al., 2024) and these dynamics often play out unseen within the walls of scientific labs. This lack of transparency and power imbalance creates an environment where doctoral students may struggle to voice their concerns directly to their advisors. Graduate programs should provide alternative pathways for reconciliation, including structured opportunities for conversations with third party mediators such as other professors, department leaders, or university staff who work in conflict resolution. Moreover, departments should encourage doctoral students to build wide networks of professional mentors (Sweitzer, 2009) who can provide critical support throughout their program, especially during times of interpersonal crisis with their primary advisor. It would also be beneficial for department chairs and deans to proactively provide support to students in cases when faculty move institutions or do not receive tenure—these changes in PI status can have notable impacts on students, which may go largely unnoticed.

In addition, all negative relationships in this study were among women doctoral students, which raises critical questions about the role of gender in shaping relationship trajectories. Previous research has demonstrated that women encounter gendered doctoral experiences in the sciences (Curtin et al., 2016; Wofford & Blaney, 2021). This includes stereotypes that reinforce hierarchies in academic career paths (Joy et al., 2015), more reliance on peers for support (Šaras et al., 2018), and systemic disadvantages in faculty mentoring experiences (Noy & Ray, 2012). The development of negative relationships may be more prominent among women who face persistent gender inequities throughout their graduate programs. It is crucial for doctoral programs to consider the compounded challenges that women encounter in building successful mentoring relationships with faculty, and work to address relational inequities through practices, structures, and systems of support.

While this study offers novel insights into how negative doctoral advisor relationships emerge and develop over time, our sample is limited to one discipline: the biological

sciences. That is beneficial for the purposes of this study since research indicates that relationship quality varies across disciplines (Barnes, 2010; Nettles & Millett, 2006; Noy & Ray, 2012). The findings may thus not be generalizable across disciplines. It is likely that there are negative relationships across disciplines, but the particular forms of those negative relationships may vary. Future research is needed to investigate the extent to which negative relationships follow similar or different trajectories across different disciplinary contexts.

It is also important to note that our data are situated within a US context. While the patterns described in this study were prominent aspects of experiences in American doctoral programs, relational dynamics may vary across other national contexts with different doctoral education structures. This consideration is critical, given the wide variance in how doctoral education is organized and administered, and its impact on student experiences. Future research examining negative relationships across national contexts would be particularly beneficial in illuminating the extent to which similar or different relational dynamics lead to negative relationships.

Finally, this study is based on longitudinal interviews with doctoral students about their experiences with their faculty advisors. Students' perspectives are critical in understanding the nature of these evolving relationships, but these narratives do not include the voices of the faculty advisors. By foregrounding the student perspective, we amplify the impact of negative relationships on the lives of graduate students in particular, while necessarily backgrounding perspectives from the other side of these relationships. Future research would benefit from studying negative student/faculty relationships from the perspective of both parties in the mentoring binary, providing further nuance to how these relationships are shaped through mutual interactions over time.

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Data availability Data for the project on which this analysis is based are available on the Open Science Framework website: <https://osf.io/hymus/>.

Declarations

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