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Reflections on Mentorship – Being the Change You Want to See in Engineering Education

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Abstract

The educational pathway of engineering is often fraught with obstacles and challenges. While students that participate in research labs get through with less difficulty, there can be instances where students enter with both academic and personal issues. In this paper, I will specifically highlight one of my most recent mentoring experiences, in which I help mentor an international student through a difficult period of both academic and personal turmoil. I will go through the process of navigating this issue and discuss what literature shaped the way I handled this situation. Through academic and professional development, I was able to help my student learn how to manage their time so that they could appropriately prepare themselves for class and complete their assignments on time. As part of their personal development, I talked with them about the issues they saw with their home country and the difficulties of being an international student. Taking these experiences into account, I point to the difficulties I had to navigate in ensuring to maintain a professional identity with the student and helping them in ways that did not violate the ethical principles of engineering and teaching. The results of this interaction were that the student made it successfully through the semester and is finishing their program in good standing. The final takeaways from this experience are the use of empathic mentoring, being the change that one wishes to be in engineering education, and taking extreme ownership of one's mentoring role to develop and guide their mentees.

Introduction

Engineering as a discipline has had a reputation for having a difficult curriculum where many students do not succeed [1]–[7]. The most recent numbers regarding engineering retention rates for United States universities show that approximately 38.8% of all engineering students completed their degree in engineering within 6 years, and only an additional 8.3% completed a degree in another STEM field [8]–[10]. Reflections and reviews of why students leave engineering point to six major reasons: classroom and department climate, grades and conceptual understanding, self-efficacy beliefs, preparation in high school, interest and alignment with career goals, and the interplay of race and gender [11]. As graduate students who have had experience in the undergraduate engineering curriculum, some of us know all too well a difficulty or obstacle that we had to overcome to achieve our degrees in our respective fields of study.

As graduate students, there can be times when we interact with undergraduate students, either as teaching assistants or as mentors during a semester. In this latter role, we are tasked with guiding students through research endeavors and giving them an introduction to engineering investigations. While in some instances this can be a straightforward task, there are times when the role of a mentor can be physically, mentally, and emotionally taxing. Some students have a harder time being able to grasp the research method or process, and it can lead to more drawbacks than benefits to the project. But what of the instances outside of the laboratory? Certainly, our role as a mentor is to guide students and give them advice and mentorship

regarding their research endeavors. Do we just tell them that their problems are outside of our jurisdictions or prerogatives, and tell them to work on their problems themselves?

We as graduate students are pulled in many different areas and foci. Of course, we cannot give our full attention to every undergraduate student that works in our lab. But we also know that sometimes there are individuals who shape students into being successful, sometimes taking the chance on them and allowing them an opportunity to succeed. Perhaps reading this, you think of a time when you were one of these students, and perhaps someone helped you get through the particular difficulty you faced academically to be where you are today. If that is the case, why not pay it forward? Why not be that for someone else?

In this reflection paper, I want to highlight some of the mentoring practices that I had during my time as a graduate student and researcher. I will use this paper to explore a case study of my own mentoring challenges when a student was dealing with an academic difficulty and was in danger of leaving the university. I will explore my thought process, and my hope is that this can be used by others to guide their own mentoring practices, as well as to hold conversations regarding what it means to be a mentor.

Positionality

Before discussing this case study, it would be important to also discuss my positionality at the time this took place. When I was mentoring this student, I had recently joined my current university. I did not leave my previous one on the best of terms. There had been a struggle within my department, and I had left with some level of disappointment. I felt that my advisors at the time had not understood me, or tried to connect with me, or help me navigate my academic career. I was also adamant that I would not allow what happened to me to continue with others whom I would advise or mentor.

Being an engineering education student, I also was interested in learning more about educational topics, and I had read many works on leadership and being an effective professor and mentor. Several of these readings also helped guide my process and continue to do so when mentoring other students. I will be referring to the specific texts when discussing the case study, and encourage others to view them, as there is a plethora of valuable information in them.

Case Study

The specific context for this paper was that of an undergraduate that I had for the Fall of 2021 and Spring of 2022. While initially hired in the fall semester, it was clear that some external pressures were enacted on the student during their spring semester. Their work output was not meeting their usual levels. After a few weeks of this being the case, I sat down with the student outside of normal meeting time to ask them what the concern was. In that moment, the student broke down. The stresses of their studies were clearly getting to them, and one class was especially difficult for them. Their first exam was returned for this class, and they received a poor grade. They didn’t think that they could stay in the lab and continue to work while also making enough time to study for this class.

The Approach

An immediate recognition of my own situation from a few years prior came back to me. I remembered how I felt in the office of my former advisor, and I remember what I wished would have happened when I was under similar circumstances. I could have just nodded sagely, a look of disappointment but understanding in my eye, and wished the student well in their academic endeavors, saying it was for the best. But I did not. Instead, I asked the student how they planned on meeting their goals. What was their study plan? How did they study for exams or class regularly? How do they know how much time to put aside for studying? What I learned was that this student did not have a clear plan to meet their goals. They simply thought that if they just had more time, it would all work out.

Beginning with Empathy

In my experience with engineering, I have seen that there is rationale to be seen as fair or rational in the framing of decisions. With my previous department, the advisors and mentors discussed their decisions about my time within the department with the air of rationality and unbiased logical thinking. And while I agree that this is necessary, there were several times during my period in that department where this appeal to rationality was unwarranted and certainly not the right tactic to ensure that the student felt they were being treated fairly. I realized only after my time within the department that what was missing was empathy. The faculty there seemed to value rational and unemotional thought over empathizing with their students, a culture that led to bad relationships between students and their advisors. I was not alone in having a troubled or strained relationship with their advisor, and it was seeing this happening that led me to incorporating empathic mentorship as part of my strategy.

When my student came to me with their dilemma, I felt myself being pulled back to my time in my department. I thought about what my advisors would have said to me in that time. I felt their mindset would have been to throw some questions out to me, like the ones I had mentioned previously, told me to look into some of them, but then usher me out the door. The cold rationale being that this was something that they could not help with, as it was outside their duties as the advisor. So, I took the empathic route, I remembered what I would have liked to have seen my advisors do in that situation. I validated their feelings; I told them they were not alone in their struggles. I told them that we could work together to develop a plan to help them to be successful in their coursework.

Mindset: Extreme Leadership – And Extreme Mentorship

One of the resources that I was thinking about when dealing with this issue was the book *Extreme Ownership: How U.S. Navy SEALs Lead and Win*, written by former U.S. Seals Jocko Willink and Leif Babin [12]. The book is a valuable resource for understanding some of the aspects of leadership and responsibility. While there are several aspects of the book that are useful, one aspect of the story really stood out was that the leader is ultimately responsible for all outcomes of their team. The authors discuss how, ultimately, a blame game can occur where the leader will put responsibility of failed projects on others, and not take any accountability for how the project or mission went wrong. Leaders, according to the author, take full responsibility

when things go wrong. Owning failures in this way allows for introspection on behalf of the leader and allows for them to learn and grow in their position and gives them the opportunity to figure out new strategies to be successful.

While I would never consider a student a failure for needing to leave the lab, I took some aspect of this extreme responsibility to heart. I thought of how it would be easy to let this student go, no longer make them my problem. Alternatively, I could own my responsibility for this student as their mentor. If there was ever a moment where a student needed a mentor, it was here and now. Seeing this mentality in the student, I decided to take on the ideal of extreme ownership. After hearing that the student did not have a plan other than to just "study harder," I decided that it would be better to offer them some assistance. I offered to give them tips on how to study and how to use time management skills to help them better prepare for the class and make sure that they are keeping track of their mental health. The student agreed, and we set up meetings so that we could go over time management and academic success strategies.

Building Resilience and Mental Health – Seeking Counselors

One aspect of my student's struggle was clearly that they were dealing with a lot of mental labor. Whatever was on their mind at any time was distracting them, making them unsure of their next move; what to do to make sure they were going to pass and succeed in their engineering education. As a first action, I ensured that they knew that there were mental health professionals that they could talk to on campus. When dealing with my own issues during the events with my previous mentor was discussing my struggles and issues with a counselor. Mental health professionals are a valuable resource and sometimes students do not know that they have access to them through the university. A counselor can help them to establish good mental health habits, build resiliency, and better their mental health.

My own experiences of dealing with mental health challenges at my previous university have been a guiding point for me when dealing with other students. I do my best to look for signs of mental health difficulties, such as lack of sleep, sudden changes in bathing or hygiene habits, or signs of not eating well [13]. When I brought up mental health services, the student felt it was a good idea to get in contact with them. In doing so, they ended up getting an introductory appointment with the service and having regular meetings, which I learned from our time management sessions.

Making Positive Change – Time Management Skills

Outside of the work that the student was conducting in the lab, we met regularly to build the students' time management skills. While I am not a perfect manager of my time, I am thankfully someone who has delved into time management and office management strategies during my time in my previous department. It was necessary that I developed these strategies to ensure that I wasn't spending too much time in the lab.

Most of the time management skills that I have developed came from the work of Stephen Covey, specifically his book *The Seven Habits of Highly Effective People* [14]. There are many useful time management skills and tactics within the book, but I focused on mainly three of the

strategies that Covey discusses. First, is to begin with the end in mind. While not exactly a time management skill, beginning with the end in mind allows the person to develop their personal mission statement. By creating the personal mission statement, the student was able to determine what was the most important to them, and what they wanted in life. From there, it became important to start thinking about what activities and actions the student needed to make to be successful in meeting those goals.

The next step was to make sure that first things were first. Once we figured out what were the necessary activities to ensure they are meeting their personal goals, we then have to plan out when they do each of these activities. For this section, we went over how to make a weekly schedule. When scheduling with first things first, the schedule is filled in with the tasks that are required by the student, such as classes and seminars. Once that is complete, the schedule is filled with the important activities that would meet the student's personal goals. The rest of the time is filled with other tasks that would be important, but not necessary for the student's goals. By setting up their week in this way, the student was able to realize how much time they actually had during the day to complete their tasks and goals.

The last important point that we discussed from Covey was about how to be proactive. One of the things that was bothering this student was that they felt that there were many things beyond their control. When being proactive, one has to understand that there are certain things that are outside of one's control. Understanding what one can control and what one cannot is important so that cognitive load is not spent on aspects that cannot be changed by one's actions. The student needed to realize which aspects of school were in their power to control, and which were not. Once this was discussed, it was important for the student to develop some healthy mindsets regarding focus on the things that they could do. We developed a checklist of what to go through if something came up, and what necessary actions needed to be taken to ensure that they were staying true to their personal mission.

The Outcome

After several weeks, the student started to see improvements in their mental and emotional health. They were able to study for their exams, make time to meet with friends, and still get their projects and homework complete. Their sleep was better, and they had more self-confidence in themselves. They completed the semester, passing their classes and moving on in their program. The student stayed in the lab for one more semester before deciding to leave to focus on their studies.

Synthesis and Reflection

To start, I would say that I understand that this could be considered a radical course of action. While professional boundaries were certainly not crossed, the level of responsibility I took for this student could be seen as going beyond what is considered necessary. I do not know if I would go through with this same tactic with other students. However, it is important to understand the mindset that I had and why I felt it necessary at that moment of time. Certainly, there are aspects of this time that I would still use and ensure that I bring up whenever I am mentoring students.

The main reason I would not do some of these actions again is mainly one of timing and ensuring I am not being preferential. Mentoring the student in this way was a considerable effort that took a good portion of my time. While it was necessary for the student to gain these skills, it would be an untenable practice if I continued with this sort of practice with all my mentored students. It would be unfair if I only used this method with one or a few of the students that I would mentor in my lab. All students should have the same amount of access with their mentors. And while I believe that mentors should do all they can for their mentees, they should consider how they can spend so much time on each of their mentees without sacrificing resources necessary for other responsibilities. I am also unsure as to whether this would be capable in a group setting, as each student has individual needs that might not be met in a group setting. There is certainly a balance that needs to be kept between the mentor and their mentees, and the level of focus that I had for this student would not be sustainable or feasible if there were multiple students that I was mentoring.

So, what would I keep? I believe that helping students develop their professional and personal mission statements, or at least getting them to think about them, is certainly beneficial. The more students can reflect on their personal and professional goals, the better they can prepare for it. I would also probably go through scheduling as a group and talk about how scheduling is important from a professional and personal standpoint. Lastly, I would ensure that I am keeping myself empathic to the needs and mindsets of my students. It can be easy to sweep away the concerns of others, especially if we take the mindset of "it's just the way it is." This philosophy is one that we as engineering educators should all be trying to change; else why would we devote ourselves to this field?

Conclusions

I think that any person who has gone through an engineering curriculum will remember a particular challenging point that they had during their education. A few might even mention the mental, emotional, and perhaps even physical toll that it had on them. The challenges and difficulties that I faced within my previous department have certainly left their mark on me, and in doing so have given me a new perspective on the importance of mentoring students. This perspective was implemented after leaving that department and moving to another school, in which I mentored a student through a time of academic difficulty and turmoil. Leading through empathy was the first point, and shaped how I interacted with the student when they first came to me with their feelings and their problems. I also undertook the mentality of extreme ownership, and applied that to mentoring the student, agreeing to work with them on developing a plan to get them back on the right path. The mental health of the student being foremost in my mind, I ensured they knew of the mental health facilities and resources that were available to them. In developing their plan, I used time management techniques that I used myself that I felt would help steer the student in the right direction. I will continue to model my mentorship in this way, although perhaps modifying the implementation to ensure that when multiple students are being mentored, they feel that they are being treated with effort and with care. My hope is that this paper can lead to some reflections in others about how they go about mentoring their students, and perhaps see some techniques or skills that they would like to explore for themselves.

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