

Engineering Students’ Learning Journeys: Identity Development

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Abstract—This Work-in-Progress Research paper explores the ways in which students make sense of their individual holistic learning journeys. Using methods of narrative analysis and grounded theory, this study examines how engineering students incorporate their unique moments of learning into a unified narrative of their growth and evolution, and furthermore, into an overall unified sense of self and identity. In particular, we explore how study participants respond to external narratives of learning that are suggested for them – whether these are their parents’ stories about them, or students’ sense of how they are perceived by the academic structures they inhabit. Our data indicate that students either find that external narratives resonate with their sense of self – consonance, – or fail to align with their understanding of self – dissonance. The process of interacting with and making sense of external narratives then helps shape students’ understanding of their identity and their sense of self.

Index Terms—learning journey, identity development, grounded theory, narrative analysis, external narrative

I. INTRODUCTION

Storytelling, or how one chooses to present themselves and the events that define who they are in the world, shapes student identity development [1], which McAdams defines as the “subjective, constructed, and evolving story of how one came to be the person one currently is” [2]. Current literature also demonstrates that a person’s narrative identity, or how they construct themselves in their stories, can give meaning and purpose to their life, in addition to providing a sense of unity across time and situations [1]. Thus, storytelling can help students to understand their position in the world, as well as how to view the circumstances that shape them.

Students adopt descriptors of themselves (or labels) and identities as a way of making sense of who they are, subject to their understanding of their traits, attitudes and behaviors as they tell their stories [3]. Students also engage in constant negotiation between their internal narratives of who they are and the outside world as they tell their stories and interpret their own role and identity within the world they inhabit [2]. Adler et al. affirm that differences in how one tells their story and how they understand the experiences that shaped them can explain differences in outcomes, even if the circumstances are similar [4]. To that end, learning how students understand their stories is vitally important for educators, who seek to support better student outcomes in all learning opportunities – formal and informal.

Much work has been done examining engineering student identities [5] - [8]. In this work, we examine how students,

through the emerging narratives of their learning journeys, come to adopt their multiple identities, one of which is the engineering identity. Engineering education scholars recently determined that students’ interpretations of engineering can evolve and expand after their participation in an engineering program [9]. We are interested in how this change in perspective might affect a student’s willingness to adopt an engineering identity. In our work we primarily examine the ways in which outside influences help shape engineering student’s understanding and narration of their identity. We also explore how certain identities and understandings can lead students towards or away from the engineering field. For example, students who want to do “good” or consider themselves to be “smart” might find themselves more likely to pursue engineering school.

In this Work-in-Progress Research paper, we seek to identify how students make sense of their own narratives in the context of learning. As a part of a larger study on understanding students’ narratives of the overall arc of their learning journeys and specific learning moments critical to their trajectories, this work focuses on students’ “book of learning,” i.e., narratives of the ways in which they see their “learning” as part of the larger picture of their life story.

II. METHODS

The data sources for this pilot study include interviews with four Celadon College undergraduate students (2 women and 2 men) from a range of class years. Celadon is a small engineering school that boasts project-based, integrated, and team-oriented learning practices through most of its curricular and extra-curricular structure. The female-male student ratio is maintained at roughly 50-50 based on institutional records of legal sex, varying only slightly each year. All names presented, including the name of the college, are pseudonyms.

We employed a semi-structured, open-ended interview protocol, which asks the students to describe their individual journeys, starting with a series of chapters in a “book of their learning journeys.” Specifically, we asked students to reflect on the following prompt, “If you were to write a book that describes a story of your learning, how would you structure it? What chapters would you want to include in this book? How would you name these chapters and what would you want to tell your readers in each of these chapters?” The research participants then shared their narratives, often changing the

chapters as they were reflecting on what may be important for them to include in their autobiographical books of learning and why.

Our analyses used methods of narrative analysis and grounded theory to write a series of descriptive and analytical memos which allowed for identification of initial emergent themes [10]. We then used narrative and qualitative content analysis methods to pull out and discuss themes from the interviews [11]. Throughout the process, we repeatedly went back to the interviews and performed internal checks among all four researchers about our interpretations, assumptions, and biases.

III. RESULTS AND DISCUSSION

Students' narratives about their "book of learning" include an in-situ created table of contents and individual stories that students place in each chapter of their books. Students' narratives range in length from 1 to 2.5 hours. Our preliminary analyses indicate that, for the most part, the students' stories focus on their identity development. While students incorporate narratives of their formal academic experiences, these stories predominantly focus on the process of students' understanding who they are and their role in the world. One participant, Tom, shares a narrative about his formal education only "because this is a thing about learning, so it felt wrong to not include school" in his learning journey story. Two other participants focus primarily on their development as individuals, with formal academic experiences shared only in relation to how they pertain to their identity development. Even the one participant who focuses more heavily on his academic experiences describes how his view of learning has shifted since his high school years; he notes that "college is about more" than "the content of my classes," and how he is learning to "take time to reflect on what [he] enjoy[s]" rather than being "uptight" about his GPA like he was in high school.

A key emerging finding from our analyses is that students' identity development is often shaped and informed by their perception of what outside forces – other people, institutional structures, or societal values – communicate, both explicitly and implicitly, about the students. We are calling this phenomenon an external narrative. Students encounter external narratives about who they are every day. These external narratives may be placed on them by peers or family members; our participants repeatedly mention the names and labels placed on them by individuals in their social circles: "minimalist," "smart," "good," etc. Institutions may also categorize and impose external narratives on individuals. For example, placement in a "Gifted and Talented" (GT) program imposes on an individual an external narrative of "gifted and talented." Participants also note values and expectations implicitly communicated by broader society. One participant notes that "you're definitely supposed to care about what people think of you" in middle school, while another talks about how she felt "deprioritized" in a high school extracurricular club because she was a girl and girls are usually "considered not good at debate."

We identify two primary ways in which these external narratives interact with students' identity: (1) consonance: Students find the external narrative to be resonant with their current ideas about themselves, and thus often readily incorporate these consonant narratives into their identity; and (2) dissonance: Students examine the external narrative and find that it does not initially resonate with them. While they may choose to eventually reject or accept a particular narrative, we find that for many, a dissonant external narrative challenges their current ideas about themselves and causes them to experience inner turmoil. This work highlights the influence of the external narratives on student identity development in the context of an engineering education at the higher education level.

A. Consonance

As participants, through their narrative process, recount formative experiences that support their identity formation, they share stories about who people say they are. The study participants talk both about the external narratives that they readily incorporate into their sense of self, and the narratives that cause them to experience a crisis of identity, a questioning and examination of the truth of their ideas about self. When these external narratives are consistent with their current perceptions of self and their aspirations, little conflict occurs: the student incorporates the external narrative into their internal sense of self, accepting and beginning to own the narrative. Of importance is that consonant external narratives that students make part of their own narrative identity may also shift over time as new external narratives or personal experiences challenge the existing stories of self.

One aspect that seems to influence whether a student finds a particular narrative consonant is whether it aligns with one's family identity. For instance, Tom demonstrates the important role that his immediate family has in his identity formation. He posits that if he associates an idea, value, or goal with his family, then he applies that trait to himself as well, saying "Oh, I know I am good because my family is good and I align with that." Part of the reason he understands his family to be good, Tom explains, is that all through childhood, different people told him that he was "so lucky" to have his parents. People told him that his mother was a role model for them as new parents, and that his father—a university instructor—was "the reason" why many people ended up receiving higher education. Notably, as we will explain further in the following section, this external narrative of family goodness is later challenged by a conflicting external narrative. Throughout the rest of his interview, Tom describes how much of his understanding of himself is based on how he views his family. In fact, he imagines his future self by watching family members, noting that,

It seems like [my older brother's] path through life is a ... foreshadowing of my path through life.

Since family identity is key in one's identity formation, external narratives coming from a family member – whether

positive or negative – might hold more weight for an individual. One participant, Jessica, accepts her mother’s description of herself as “a minimalist” and explains that she “always get[s] the thing done and then [she’s] done.” We find that this descriptor of “minimalist,” which we take to mean someone who only does the minimum necessary to succeed, does not support Jessica’s overall narrative of herself. For instance, while she seems to minimize time on certain activities, such as the aesthetics of a presentation, she does so in order to spend more time on voluntary activities that bring her joy, like tutoring her peers. We suspect the reason Jessica accepts this external narrative is at least partly due to her relationship with her mother, which lends more credibility in adding to Jessica’s understanding of herself.

Our analyses also indicate that our participants may be more likely to find positive external narratives to be consonant with their developing sense of self, especially when that positive external narrative is aligned with their goals and aspirational self. Tom describes the time he was placed in a “Gifted and Talented” program in school. He remembers being told,

“You kids [in the Gifted and Talented Program] can think more strongly than everyone else.”

Later, when his friend criticizes the program as being unfair, Tom becomes “really defensive of the [GT],” because he personally benefited from the program. Notably, Tom does reevaluate that narrative as a Celadon student, observing that a program “where things are separated and where there [are] smart kids and not smart kids” is deeply problematic and inequitable and recognizing that being labeled as smart contributed to an unhealthy ego in himself and others. There is an interesting tension here as Celadon is an extremely selective engineering school that rejects many individuals each year. This in itself causes some level of separation that Tom does not address in his interview. Perhaps this is because he may still be in the process of accepting or integrating this new understanding of himself.

Three of our four participants describe at least one extracurricular activity or club that helped them develop an interest in the engineering field. We hypothesize that students are more likely to identify with the engineering identity when they have experienced an early positive association with this profession. An example of this is when one participant, Amelia, talks about her experiences at Space Camp, which she attended for “five or six” summers, as “super awesome.” After reflecting upon her fifth grade space camp experience, Amelia shares,

Engineers get to do this stuff, and sometimes engineers get to be astronauts, and that would be really, really awesome. ...and I was like, ‘Guess I’m going to be an engineer.’

It is important to note that all four study participants made a choice to attend engineering school. It makes sense then, that they found external narratives relating to engineering to have consonance in their lives. Perhaps also of import is that several participants discuss family ties to engineering. This is especially interesting when considering the relative impor-

tance and association our participants feel with family related external narratives. Many students shy away from engineering because they do not believe they are “smart” enough [12]. It is interesting then to consider how programs such as GT, might be creating a momentum towards engineering for some students (like Tom), while shifting others away, even at a very young age.

B. Dissonance

When an external narrative does not harmonize with a student’s current identity or their understanding of their lived experiences, they must decide how to view that dissonant narrative. In some instances, a student outright rejects a conflicting external narrative, but in most cases, we see students sitting with these opposing narratives. They undergo a formative process of questioning their beliefs about themselves when those do not align with the dissonant narrative. Here we will examine how several participants engage with external narratives that disrupt their current narrative identity.

Tom experiences an identity crisis when a new sister-in-law challenges his idea that he and his family are “good,” as she finds aspects of their family dynamics to be problematic. As mentioned previously in the consonance section, Tom views his identity as intrinsically tied to his family identity growing up. When his new sister-in-law challenges Tom’s idea of his family as “good,” he describes his concept of self as “crumbling down.” His security in the “foundation” of his “family goodness” begins to disappear. He describes how that causes him to question his current identity, thinking that “Oh, if my family is not good, then where do I stand?” His sister-in-law’s alternate perspective of Tom’s family identity, and thus what Tom envisions as his own identity, is a catalyst for him to reassess his values and sense of self. Tom describes the process as ongoing, but notes that he realized through the process that he can branch out, and try to be myself, and be a kind and constructive person to people in ways that my family wouldn’t do. He further notes,

I still always would have had that... [family] identity and self in a way of being to fall back on.

However, he realizes that his identity is not completely shaped by his family and that he has to choose who he wants to be in the world. For Tom, that means recognizing his family flaws and learning from both the positive and less than positive aspects of his upbringing. Interrogation of his current identity, brought about by a conflicting external narrative, is a vehicle for personal growth in Tom’s case.

Not all instances of engaging with conflicting external narratives are positive for our participants, however. For instance, Amelia encounters blatant sexism and misogynistic attitudes about women during a summer engineering internship. She shares a story about one co-worker whose loud opining about why “women weren’t succeeding in technical fields” and why the company’s goal of a 50/50 gender balance was “the stupidest fucking thing [he had] ever heard”, had greatly affected her internship experience. While Amelia internally resists the misogynistic messages from the workplace, she

also describes feeling like she couldn't confront them in her position as an intern at the time. As she recounts her story now, she describes her sense of guilt over not confronting the behavior, saying,

I knew a not good thing was happening and also didn't fix it and that felt really bad.

This external narrative of misogyny is harmful to Amelia, in that she feels responsibility for allowing her co-worker's voice to be heard, even though she feels powerless to give an outright loud opposition to those messages. She talks extensively in the interview about how hurtful those messages were, and how potent her sense of responsibility to resist was, even breaking down in tears at one point in the interview about the subject.

Two of the interview participants describe their struggle with harmful external narratives about what being "smart" means. In Amelia's experience, her high school peers communicated to her that since she is "a smart person... school must be super easy for [her]." However, Amelia struggled with some of her coursework. She describes how "some of those things were just hard" and "those things weren't necessarily easy for [her]". This led Amelia to become "pretty frustrated" with her personal experience conflicting with her friends ideas about smartness. Because her peers equated being "smart" with not needing to work hard to get good grades, Amelia grapples with the question of "Why was it harder for me than it was for other people?" Her personal experience of the necessity to work hard to succeed in school, and her friend's narrative about smartness as a natural gift, causes Amelia to question her held identity of a smart person.

Jessica describes a similar struggle with the "smart" identity. While Jessica does not describe an explicit external narrative around smartness as did Amelia, she also has an experience that makes her re-evaluate whether she is "smart." She shares a story about a time when she and her peers were given a test with instruction to not study beforehand. When she performed poorly in comparison to her classmates, her classmates' reaction was "What? What happened? You're usually so good at school stuff." Jessica describes her classmate's surprise at her poor performance on the test as "kind of a blow" She then engages in re-evaluating "the difference between being smart or being able to work really hard and then do well" and whether her academic achievement is due to her being a hard worker or being naturally "smart." Amelia and Jessica describe their experience of understanding themselves as merely hardworking, as opposed to having a natural aptitude for performing well on academic assessments, as "harmful," "frustrating and disappointing" to them.

We note that, although not explicitly addressed in their interviews, Amelia and Jessica imply that natural aptitude is superior to diligence. Their self-esteem suffers when they re-evaluate their "smart" identities due to their struggles with some aspects of school. Their peers' communicated narrative, that hard work is in opposition to smartness, puts them in the inferior group, the group of diligent workers who are not quite as valuable as those with natural aptitude for achieving high marks on academic assessments. These are values implicitly

communicated by their peers and likely society at large. Another factor that perhaps shapes these participants' experience with "smartness" is their gender: Amelia and Jessica are both female-identifying, and thus may be speaking to a predominantly female experience in engineering. Amelia and Jessica's experience with their smartness being questioned stands as a contrast to Tom's, who was told in GT that he could "think more strongly" than his peers, a message that he readily accepts. The message that natural aptitude is valued higher than hard work may steer students who do not consider themselves "smart" away from spaces such as engineering. Our analysis suggests that female students may question their smartness more than their male peers, though whether that is because they are more influenced by societal messages around "smartness" than their male counterparts or because their male peers hear more positive messages about their intelligence, is unclear.

IV. CONCLUSION

The external narratives identified in this study, whether they come from academic institutions, relationships with friends and family, or broader society, can be powerful forces that help shape a student's identity development. Both consonant and dissonant narratives can enhance a student's understanding of themselves and their role in the world, when they communicate positive values or challenge a student to re-evaluate their current values in light of new information. However, these external narratives can also cause students to doubt themselves and their abilities, perhaps setting them up for failure or discouraging them from pursuing their ambitions.

One of the engineering educators' roles is to support students' identity formation. Although some of this work may be done through consonant external narratives, much of it is usually performed through the process of intentionally creating internal conflict and supporting students in resolving those conflicts, i.e., dissonant external narratives.

Opportunities that allow students to narrate their stories, such as these interviews, are critically important reflective moments in students' self-understanding. Through contemplating their "learning journeys," our participants were able to examine the role of external narratives in their lives, all the while being supported by the interviewer in their process of discovery. To this end, we intend to analyze participant responses to a prompt about how narrating their stories during the interview process has helped them to understand themselves. It is such critical opportunities that allow students to sit with what is and to reflect on who they are that become pivotal learning moments of growth and evolution of their personal and professional identities.

ACKNOWLEDGMENTS

This project received funding from the Celadon Independent Project Fund and the Barbara Peterson Ruhlman '54 Fund for Interdisciplinary Studies. We would also like to thank Eriel Wiston (Olin '22), who served as a researcher on this team in an earlier phase of the project.

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