

Majority or Minority: The Impact of Students' Identities on Their Learning Journeys

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Abstract—In this Work-in-Progress paper, we use narrative analysis and grounded theory methods to investigate and expand on our previous analyses of engineering undergraduates' learning journeys. This study examines the ways in which students process their unique learning experiences to form an individual narrative identity, contributing to a larger understanding of themselves and their identities as learners in the engineering education context. In particular, we focus on how one's minoritized identity or identities in engineering education are linked to how their narrative identity is formed. Our preliminary analyses of interviews with four engineering students identify a correlation between their majority or minority identity (based on race, ethnicity, gender, sexuality, social and cultural capital) in the engineering education and their learning journey narrative type. Specifically, students with majority identities hold an 'academic-centered learning journey narrative' about themselves that is focused on academic schooling, whereas learning journey narratives shared by students with minoritized engineering identity or identities are holistic in nature and are focused on life experiences. These two ways of narrating one's learning journey represent the types of stories students tell about their learning and their current learning experiences. This work serves to underlie and support engineering educators as they create equitable and holistic learning environments for all students.

Index Terms—learning journey, academic-centered learning journey narrative, holistic learning journey narrative, engineering minority, engineering majority, identity development, grounded theory, narrative analysis

I. INTRODUCTION

Storytelling is a method used to communicate ideas, beliefs, and learnings through stories and narratives. McAdams and McLean (2013) define narrative identity as the "subjective, constructed, and evolving story of how one came to be the person one currently is" [1]. Adler's definition of narrative identity (2012) also describes it as the "internalized, evolving story of the self that each person crafts to provide his or her life with a sense of purpose and unity" [2]. As such, a person's narrative identity, or the way that they construct themselves in their stories, allows them to make sense of and create a cohesive picture of their life experiences [1], [2], [3]. Contemporary literature indicates that students' perceptions of engineering change and stretch following their experiences in an engineering program [4]. As students' perception of engineering changes, so does their relationship to engineering and identity within engineering. For example, Adler's work (2018) with a singular engineering student establishes that

narrative identity can serve as a foundation for meaning and psychological well-being [5].

Although much research has been done in the space of engineering identity development of both majority and minoritized student groups [6], [7], [8], there is little literature that leverages narrative identity to understand students' identity development as learners. Even less scholarship focuses on narrative identity in engineering education, with Adler's work above being a notable exception.

To fill this knowledge gap, our study investigates how engineering students experience their individual learning journeys through narrating their stories of learning, both in formal and informal learning environments. In doing so, we leverage our previous work on the impact of both external narratives (i.e., those suggested for students by the world around – "whether these are their parents' stories about them, or students' sense of how they are perceived by the academic structures they inhabit") and internal narratives (i.e., those stemming from students themselves about who they think, believe, and feel they are) on formation of student identities [9]. In this paper, we seek to explore the interactions between students' majority or minority identities in engineering education (e.g., race, ethnicity, gender, sexuality, social and cultural capital [e.g., 10], etc.) and the formation of their identities within engineering [11]. Our data indicate that external narratives that a student perceives and responds to are closely linked to the level of privilege in their upbringing and whether they form an 'academic-centered learning journey narrative' focused on formal education experiences or a 'holistic learning journey narrative' drawn from broader lifetime learnings, such as emotional and relational [12]. Differences can be seen between these two types of learning journey narratives in the relationships that are valued and the ownership of the 'engineering student' identity.

This work is a part of a larger study that aims to make sense of how students' narratives contribute to the formation of self and the specific learning moments that are most impactful to their trajectories. We focus specifically on the students' "book of learning," i.e., narratives of the ways in which "learning" fits into the broader understanding of their life story and who they are. We believe that this work can provide engineering educators with a better understanding of their students' diverse experiences that shape their identities, thereby providing another way of supporting engineering educators as they design

and implement equitable and holistic learning spaces for all their students.

II. METHODS

Our study population includes four undergraduate engineering students (two female and two male) attending a small engineering college that utilizes project-based learning throughout its curriculum. The four interviewees represent a range of matriculation years. Semi-structured, open-ended interview protocol used for the study is drawn from the McAdams' (2008) life-story model [13]. The protocol invites participants to reflect on their learning journeys, structuring their narration as chapters of a book about their lived experiences before reflecting on five key learning moments within their journeys – high, low, turning, wisdom, and mystical. In this paper, we specifically focus on the responses given to the following prompt: "Imagine that you are writing a book about yourself. Think for a moment about what the chapters in your learning journey are. Tell me what you would put in a table of contents, and then tell me a little bit about each of those chapters." The duration of student narratives as responses to this general prompt ranged from about 1 to 2.5 hours.

We identify preliminary themes using narrative analysis [e.g., 14] by undergoing a process of creating multiple narrative and analytical memos for discussion, as well as practicing multiple iterative inter-scholar comparisons to identify emergent themes. Throughout the process, we repeatedly returned to the interviews to perform internal checks among all three researchers about our interpretations, assumptions, and personal biases.

III. RESULTS AND DISCUSSION

A key emerging finding from our analyses is that individuals with majority engineering identities, i.e., their gender, race, ethnicity, sexuality, ability, social and cultural capital available within the family (e.g., networks and connections within the STEM field contributing to their sense of belonging), "as well as the social capital of the community," including formal and informal learning environments [11] present an academic-centered learning journey narrative. In comparison, students with one or more minoritized identities in engineering share learning journey narratives that are holistic in nature. In what follows, we detail these two types of narratives.

A. Academic-Centered Learning Journey Narratives: Julian and Tom

Julian is a white, cisgender, heterosexual, able-bodied man who, at the time of the interview, had just completed his first year at the college. By all measures, he holds the most privileged status of the four study participants. Julian's learning journey narrative is also the most academic-centered among all the study participants. He speaks about learning almost exclusively as emergent from his classroom experiences and gets into the specific details related to what was taught in each subject, each year. For instance, in responding to the prompt about one of the chapters of his learning journey

book, Julian provides explicit aspects of his senior year math course content, including multivariable calculus, differential equations, and eigenfunctions.

One instance that highlights Julian's privileged status is the commentary on his high school's history department's initiative to create a more inclusive curriculum. Julian discusses never feeling any discomfort in history classes, and has some disagreement with the proposed changes, saying

I think [the administration has] issues with [history curriculum] not including enough of women's perspective or a nonwhite perspective, which I get... Sure there's room for improvement, as there is anywhere else... I really enjoyed the curriculum and I hope they don't mess with what they already have too much trying to incorporate those new perspectives. 'Cause what they already have works really well.

In his narrative, Julian rarely discusses stories about himself that other people in his social circle tell him. He predominantly uses "I" language and talks about his opinion of himself without bringing in others' narratives of him. In other words, Julian's learning journey narrative is constructed exclusively of an internal narrative about who he is. This poses the question: How does Julian value the opinions of those in his social circles to make meaning about who he is? We hypothesize that the lack of external stories in Julian's narratives of his learning journey is indicative of his contentment with his understanding of his place in the world and aligned with his privileged status in engineering education as a majority white, cisgender, heterosexual, able-bodied man. This privileged status also allows Julian to narrow his learning journey story to focus exclusively on academic aspects of his trajectory at the expense of much learning that happens beyond formal academic spaces.

In comparison, other study participants, all of whom have at least one minoritized identity, share many external narratives in their stories of learning journeys. These students bring up such characterizations of themselves as "smart," "minimalist," or "good," that are suggested to them by their parents or peers. Study participants engage in constant negotiation between their internal narratives of who they think, believe, and feel they are and the external narratives, i.e., those from the outside world, as they tell their stories and interpret their own role and identity within the world they inhabit. These characterizations invite students to reflect and grapple, often in deeply emotional ways, with whether and how these external narratives resonate with them and whether and how these narratives become a part of their identity.

For example, another study participant, Tom, a white, cisgender man with a privileged social and cultural capital [11], differs from Julian by identifying as queer. Tom talks about his experience of being placed in a "Gifted and Talented" (GT) program at a young age. He remembers being told, "You kids [in the Gifted and Talented Program] can think more strongly than everyone else." Tom identifies that the GT program participants seem to develop an "ego about themselves" due to constant institutional affirmations about how "smart" they are and proclamations that they should be taught more advanced

content. This politics of “smart identity” is ubiquitous among academic institutions, most of which have some version of the GT narrative shared by Tom. This external narrative of “smartness” further causes the GT students to put more value into their academic learning journeys and focus on maintaining the label of “smart,” making academics one of the most important narratives in their learning journeys. We also note that this narrative, which may uplift one group of students and further support their intellectual development, also deprioritizes the other students and discredits their abilities, possibly without giving them a chance to succeed.

Our analyses indicate that students with majority engineering identities hold academic-centered learning journey narratives. Consistent with existing literature [7], [8], [15], [16], we theorize that these students, due to their privileged positionality in engineering education, can afford to focus exclusively on academic narratives at the expense of more holistic “life” experiences. These students further experience a greater sense of belonging and comfort with the field of engineering to speak comfortably and confidently about their academic learning as other non-academic experiences fade into the background in comparison to formal learning that they are well afforded to focus on.

Growing up with these stories and experiences enables students to better situate themselves in the engineering world. It may make the students have higher expectations of themselves in terms of engineering, which motivates and allows them to have a more academic-centered learning journey.

B. Holistic Learning Journey Narratives: Jessica and Amelia

Our other two study participants, Jessica and Amelia, identify as women and share narratives about their social and cultural capital, often referring to their upbringing in families with at least one parent holding an engineering degree. Although both participants describe their parental expertise or experiences in technical fields, they also share that their decision to enter engineering is their own.

Jessica, a white able-bodied participant, in describing her learning journey, shares a story of joining her high school’s robotics team, where she “feel[s] like an outsider for several reasons.” Jessica then reports that the main reason for this feeling is that she is the only woman on the team. And yet, Jessica chooses to stay on the team, and even recruits other women to join. Her narrative is a weaving of external stories of who she is as a woman in robotics into her identity of non-belonging in the field.

Amelia, a white able-bodied participant, shares a narrative about facing glaring sexism and misogynistic attitudes about women during an engineering summer internship. One of her co-workers rants about why “women weren’t succeeding in technical fields” and why the company’s initiative to have a 50/50 gender balance is “the stupidest fucking thing [he had] ever heard.” Amelia is greatly affected by these comments and describes an ongoing emotional rollercoaster that persists for many months after her engagement in this internship. Through tears and loud sobbing during the interview, she

further shares the guilt she feels for not confronting this behavior. Amelia finds this external misogynistic narrative to be harmful in a number of important ways. Firstly, this external narrative contributes to the ongoing discourse about the gendered difference in students’ “innate” abilities in science and engineering [17]. Secondly, Amelia now feels that she is responsible for allowing her co-worker’s voice to be present and to persist. This experience furthermore serves to trigger Amelia’s memories of her high school’s debate team. She recalls a time when her debate coach invalidated her feelings while she was struggling with sexism within debate field, saying

If you don’t get over your feelings, you’re just gonna start losing, and you’re gonna lose a lot, and everyone’s gonna know it’s your fault.

These two study participants with minoritized gender identities describe their struggle with harmful external narratives about what being “smart” means. Amelia recalls that by labeling her as “a smart person,” her high school peers communicated to her that “school must be super easy for [her].” Amelia recalls struggling with some of her coursework describing that “some of those things were just hard” or that “those things weren’t necessarily easy for [her].” She further describes grappling with the question of “Why was it harder for me than it was for other people?” Feeling “pretty frustrated” with this unresolved tension between the external narrative of “being smart” and realization of the need to “work hard,” Amelia finds herself questioning her held identity as a smart person.

Similarly, Jessica describes a struggle with the label of “smartness.” While Jessica does not describe an explicit external narrative around smartness, she also has an experience that makes her re-evaluate whether she is “smart.” Jessica 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. Importantly to this study, our findings indicate that both of these study participants with minoritized identities as women in engineering, when recounting stories of their learning journeys, talk about both academic-centered experiences and also those of personal nature, associated with heavy emotional labor and sense-making about their positionality as learners in engineering context. They just simply cannot “afford” to focus exclusively on formal academic learning

when learning for them is about a great deal more than content knowledge. For example, Amelia recalls her parents teaching her the importance of learning and gaining as much knowledge as possible. We therefore posit that it is this particular attitude of learning from all experiences – positive and negative, those within and outside of formal academic spaces – that allows Amelia to become aware of learning moments that lie outside of formal educational spaces and gain valuable insights from them. Amelia's story of her interactions with her debate coach and learning from this "life" moment, possibly emerging from both her minority identity and the critical support she receives from her family, is certainly representative of a learning that goes beyond the academic walls and purely academic experiences that both Julian and Tom seem to focus on.

CONCLUSION

As students go through the narrative process of the interviews, we find that they may challenge and broaden their pre-existing notions of who they are by engaging with external narratives and interrogating internal narratives while developing agency over their own stories of their selfhoods, including their learning identity within engineering context. We find that students with one or more minoritized status often describe the external narratives about their identities as constricting and harmful, yet sometimes these same narratives can guide them into their current experiences, which invite or possibly force self-reflection. We also find that students with predominantly majority status build their narrative identities predominantly on the internal stories and focus on academic-centered aspects of who they are. As such, we wonder whether narrative process of interviewing may also serve as an opportunity for such students to critically interrogate their positionalities and support development of narratives that go beyond academic focus. We believe that supporting students' identity development through a process similar to the one used in this study may allow for a more holistic growth for students and provide educators, particularly engineering educators, with a deeper understanding of how they can hold more open and non-judgemental spaces for students' evolution.

Providing students with an opportunity to self-reflect during an interview while creating an open environment causes them to recall the most important experiences of their lives and think about them from the perspective of their grown selves, understanding and reflecting on their actions and thoughts then and now. This process also provides them an opportunity to acknowledge their growth and reflect on their learner and engineering identities development. Using this process allows students to develop an understanding about their learning journeys and their ever changing personal and professional goals, providing engineering educators a better understanding of how to equitably and holistically support their students' development. One of the main limitations of the current study and an important future direction of this work requires inclusion of other minoritized voices, including racial and ethnic minorities as well as students with non-binary or transgender identities and those with various abilities. By understanding

the learning journeys of these students, we believe engineering educators may be better prepared to support development of all students, in all of their diverse ways of knowing and being.

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