
Work In Progress: Journey Mapping as Means to Illustrate Engineering Identity Development

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Janet Y. Tsai is a researcher and instructor in the College of Engineering and Applied Science at the University of Colorado Boulder. Her research focuses on ways to encourage more students, especially women and those from nontraditional demographic groups, to pursue interests in the field of engineering. A second vein of Janet's research seeks to identify the social and cultural impacts of technological choices made by engineers in the process of designing and creating new devices and systems. Her work considers the intentional and unintentional consequences of durable structures and standards in engineering education, to pinpoint areas for transformative change.

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Abstract: The journey towards becoming an engineer has many ups and downs, external influences, turning points, and is unique to every engineering student. Asking individuals to map their own journeys through engineering, illustrating their personal pathways and specific events that have contributed to feelings of being an impostor or a legitimate engineer has proven to be an illuminating and useful means of building community within an engineering course while also encouraging a deeper look at one's own engineering identity. For three iterations of a new engineering design course offered to senior undergraduates and graduate students, a journey mapping assignment has required students to reflect on their own experiences traversing through engineering culture. These journey maps are also shared in small group discussions during class to uncover similarities and differences in student pathways, highlighting areas of overlap, commonalities, and disparate experiences. Informal student reflections on the assignment suggest that viewing others' journeys through engineering normalizes individual struggles, as no journeys are direct, all feature ups and downs, and most involve deeply questioning if engineering is the desired outcome. This work in progress paper describes the background and prior use of journey mapping in design and engineering education before proceeding to discuss how journey mapping has been used in one novel course to inspire students to examine and question their own routes through the land of engineering.

INTRODUCTION

Engineering students may feel like impostors or unworthy of pursuing engineering when they experience struggles along their educational pathways including challenging courses, poor test grades, unsatisfying encounters at job fairs or interviews, difficult roommates or living situations, personal or family health issues, frustrations with engineering culture, and myriad other situations. Giving senior undergraduate and graduate students the opportunity to reflect on their journeys through engineering offers them a chance to self-author how they tell their stories about surviving through adverse conditions and obstacles to reach the present day. Sharing these individual journeys can be a powerful experience for students to claim their personal engineering identities and compare how their pathways have both similarities and differences to other engineers.

BACKGROUND

Journey mapping is a commonly used technique in design thinking and human-centered design to map out every step of user interaction systematically and comprehensively, to identify areas for potential improvement or influence [1]. For example, a Starbucks coffee journey map illustrates all possible customer touchpoints from the moment a potential customer thinks of being thirsty/wanting coffee, through driving/parking at a store, walking into the store, waiting in line to place an order, interacting with a barista, waiting for their order, drinking the desired beverage, leaving the store, and remembering/reflecting on the experience [2]. Displaying this journey in a graphical format enables other dimensions of the user experience to be considered, including the aroma and ambient temperature in the store, brand awareness and wait times, barista greetings and price points, etc. for the Starbucks coffee example.

Journey maps have also been employed in engineering education research, notably by Meyer and Marx [3] in a qualitative investigation to uncover why undergraduates leave engineering. In their study, students sketched out their journeys through undergraduate education, many using images of falling off cliffs or needing rescue helicopters to take them away from their difficulties overcoming obstacles like calculus or physics to bring them to more stable ground in majors like communications or business.

The related concept of a “failure resume,” in which a designer self-authors a list of struggles and failures to become more aware of the necessity of taking risks in the creative process has been popularized through the design thinking curriculum at the Stanford d.school [4] and described in IDEO founder Dave Kelley’s book *Creative Confidence* [5]. The journey map shares the idea of self-authorship and illustrating individual struggles and obstacles with a failure resume but adds a visual element and sense of a person’s trajectory through time rather than a text-based list. While the failure resume is used in design education contexts to illustrate the necessity of trying things out of the box that may not work at all in order to unleash one’s creative potential, the journey map focuses instead on individual reflections and interpretations of critical inflection points along one’s path, specifically through engineering undergraduate education.

The journey mapping approach has been utilized for the last three iterations of a novel design elective titled “Design for Inclusion,” offered to senior undergraduates and graduate students in a mechanical engineering department in the mountain west region. The class focuses on understanding biases in engineering and technology, beginning with an analysis of how engineering education and engineering culture is itself biased, before moving onto examples of bias in modern systems. The class closes with students employing multiple different design frameworks to redesign artifacts of interest for greater accessibility, usability, and ultimately inclusivity. The journey mapping assignment is used in this class not to uncover why students leave engineering, but rather for them to be able to describe what has led them to stay in engineering. This work in progress paper poses the research question: How does the journey mapping assignment and discussion affect students’ engineering identities?

METHODS

The journey mapping assignment is just one written assignment out of approximately eleven total that students complete during the semester-long course. The specific details of the assignment are provided in the Appendix. Students are asked to clearly identify their “starting” and “ending” points for their journeys on their maps, as well as indicating the precise items they are choosing to represent on their maps. For instance, some students draw journeys that describe how much they feel like an engineer from the start of undergraduate through completion of a bachelor’s degree. Other students illustrate how motivated they have been to be an engineer through high school until graduate school, noting the roles of external influences and other factors on their feelings of motivation along the way.

Students are asked to share their journey maps in small groups of 4-5 students during class, and then to comment on observed differences or similarities across the maps. As part of the assignment, students are asked to reflect on their own journeys and note what stands out to them from their past experiences, if they have noticed changes since where they started, and if anything surprises them from the process of making the map.

RESULTS

This Work-In-Progress paper presents segments of two example journey maps from past courses.

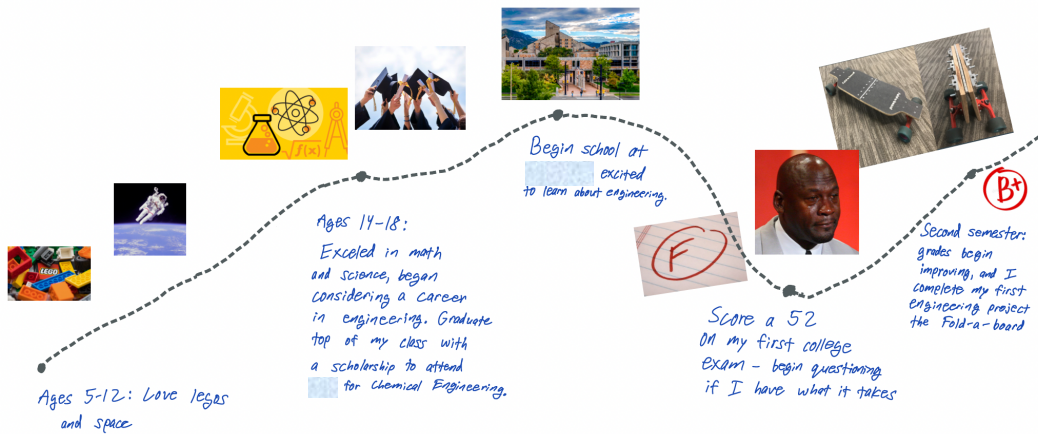


Figure 1: Journey Map #1 from (de-identified) Student Describing “Motivation Level to Be an Engineer”

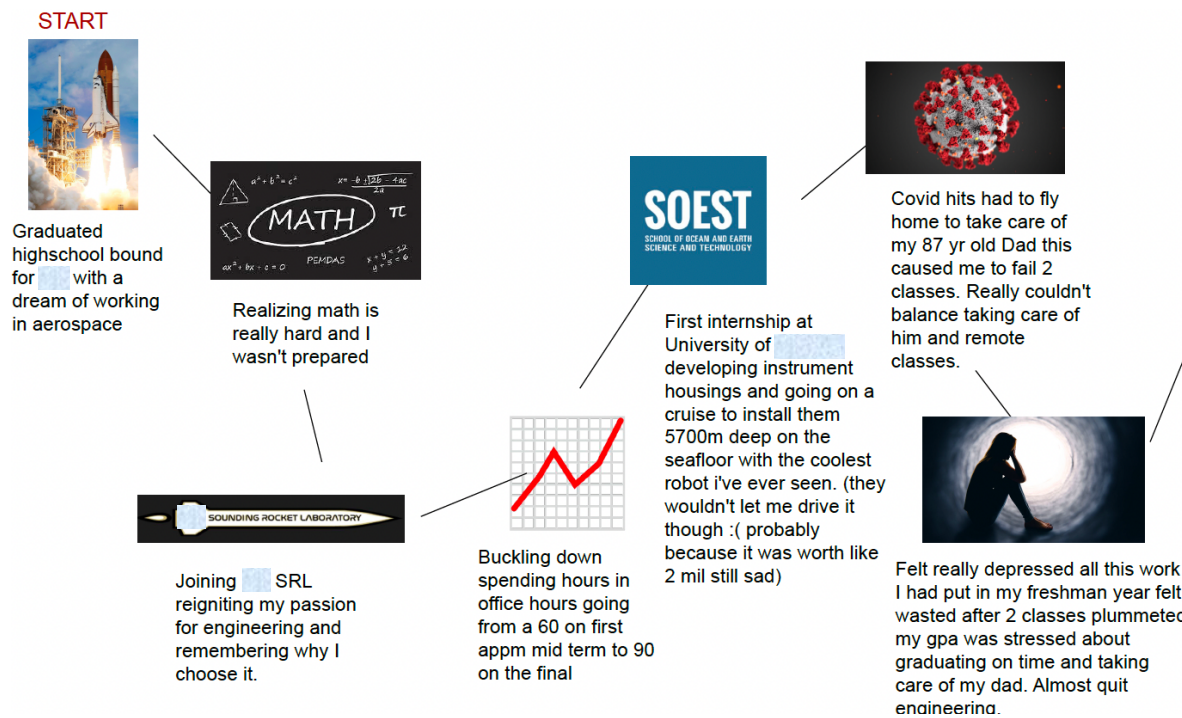


Figure 2: Journey Map #2 from (de-identified) Student Describing “How Much Have I Wanted to be an Engineer?”

DISCUSSION

The primary research question this Work-In-Progress paper asks, is: “How does the journey mapping assignment and discussion affect students’ engineering identities?” Even from the two sample journey maps shown in the Results section, it is notable that no students have a straight line to describe their motivation or feelings of wanting to be an engineer, there are many fluctuations over time. When sharing and commenting on one another’s maps, students commiserate on the shared experience of doing poorly on a midterm in a fundamental math or science course. Years after those exams have taken place, students still recall their exact scores and the feeling accompanying getting a low-test grade back. The second journey map shown above also explains the feeling of “buckling down” to study and improve from a score of 60 on a midterm up to 90 on a final exam, a notable accomplishment. Informal student reflections on the assignment suggest that viewing others’ journeys through engineering normalizes individual struggles and feelings of doubt, as most maps illustrate feelings of confusion and deeply questioning if engineering is indeed the desired outcome.

As the journey map assignment continues to be utilized in the Design for Inclusion course, it can be a fruitful source of data to further analyze and understand the development of engineering identity through students self-authored pathways. The journey maps are always personal and revealing for each student, showing the peaks and valleys of undergraduate engineering education as experienced by individuals.

REFERENCES

- [1] Interaction Design Foundation, “What are Customer Journey Maps?,” *The Interaction Design Foundation*. <https://www.interaction-design.org/literature/topics/customer-journey-map>
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- [4] D. McGraw, “Expanding the Mind,” *ASEE Prism*, vol. 13, no. 9, pp. 30–36, Summer 2004.
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APPENDIX

Response Assignment: Your Own Journey Map

Instructions: No assigned reading this week - instead, you'll embark on a personal journey through your past, unearthing your own personal artifacts and finding relevant sources and documentation along the way.

Create a journey map that documents your pathway through engineering. A few pointers:

- Your journey map should be more detailed than the ones the instructor showed in class on day 7 or 8. The shape of the journey is just one part - add explanatory text, images to explain what the high and low points are, links to other documents, icons, etc. to add detail and nuance to your journey. Pay particular attention to any turning or inflection points on your map - recall what was influencing your mindset and decisions at that point, and tell us on your map!
- Be clear on what you are mapping - you can use one of the prompts from class (see below) or come up with your own, but make sure it is indicated on your map:
 - How much have I felt like an engineer?
 - How much have I known (accurate or inaccurate) about engineering?
 - How much have I wanted to be an engineer?
 - How hard has it been for me to be an engineer?
 - How motivated have I been to be an engineer?
 - ... (your own question)?
- Be clear on where the “start” and “end” points are on the map. Choose where you want to start - is it the start of your current degree? Or a different point? Make sure you have enough time/distance between the start and finish to tell a compelling story about your journey through engineering.
- Remember to mine your own archive - look for and save your past:
 - Admissions essays, scholarship essays, personal statements
 - Cover letters & applications for internships, jobs
 - Blog Posts
 - Social Media feeds
 - Lists/emails – any personally significant documentation

While you're looking through your past - note what stands out to you. Are you surprised by any of your past attitudes or opinions? What has changed since then? Is that represented on your map?