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Supporting Student Success by Embedding Personal Narratives in Engineering Courses

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Supporting Student Success by Embedding Personal Narratives in Engineering Courses

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Abstract—Student persistence in STEM programs is linked to student sense of belonging and identification with their major or profession. Lack of professional identification and lack of belonging exacerbate departures of Black, Latinx, Native, and Female students from STEM programs, for whom exclusionary department cultures and biased policies have amplified impact. This workshop provides an overview of the science and craft of storytelling which has been developed with The Story Collider.

Index Terms—diversity, broadening participation, student experience, storytelling

I. OVERVIEW

This interactive workshop led by the NSF project team (engineering faculty including The Story Collider board director president and education faculty) uses a sequence of active learning techniques to show The Story Collider’s model of personal storytelling and how it may be deployed in various classes.

Goals of this workshop are to (1) promote multidisciplinary pedagogies for improving climate in engineering curricula, (2) provide hands-on practice with personal storytelling, and (3) disseminate the impact of personal storytelling interventions.

Participants will be introduced to the art of storytelling, why stories matter, and will identify facets of their journey for crafting personal stories about science. Through developing specific “Events”, “Consequences” and “Characters” in individual and group activities, participants will finish with at least one potential story kernel. Participants will get guidance on best practices for beginnings and endings in live stories and will have opportunities to share stories or story pitches with others as time allows.

II. LITERATURE CONTEXT

Professional Identity and STEM education: People possess co-existing identities [1], which continually evolve given personal and contextual forces. Professional identity is a type of identity that evolves from “personal identification with the duties, responsibilities, and knowledge associated with a professional role” [2]. People beginning their careers learn to embody new norms that prescribe how members act within their field [2]. Researchers have labeled these efforts “identity work,” and peoples’ success in constructing a professional identity is associated with career success [3]. Limited work exists on the development of professional identity among STEM students. Past research has described the student experience as involving initiation into a research community through disciplinary practices, instruction in research methodology, and faculty and peer interactions [4]. This enculturation process is contingent upon whether students personally accept and incorporate elements of professional identity into their self-views. Students’ ability to respond to professional challenges shapes their professional identity: those able to reconcile day-to-day activities with professional development acquire a stronger sense of professional identity, while those who have challenges with this process experience identity fragmentation [5]. Thus, reflection and sensemaking—that a person can bring into one’s consciousness by telling a story about a meaningful experience in a professional context—contribute to development and strengthening of professional identity Narrative Identity and Metacognition: Narrative identity is a person’s internalized and evolving life story, integrating the reconstructed past and imagined future to provide life with unity and purpose [2,6]. In recalling and interpreting past experiences, it is not the objective event itself that is central to a personal understanding; but rather how the person constructs and assigns meaning to the story [7,8,9]. Personal narratives vary in their motivational and affective themes in ways that influence an individual’s overall well-being [10].

III. WORKSHOP OUTLINE

This workshop combines elements of the personal storytelling curricula we deploy in undergraduate engineering
classrooms, a targeted review of the science of storytelling in engineering contexts, and discussions of how storytelling activities can be deployed in other contexts. The overall structure of the workshop is as follows:

- The Story Collider - 1h15m
  - Intro, expectations, norms
  - Events: Activities focused on finding pivotal moments we can structure stories around. We’ll workshop a story draft around one of these ideas today.
  - Consequences: What are the stakes in your story, and how can we share them in a way that your audience will care as much as you did?
  - Characters: Who is science, and who were you at the time of your story?
  - Break
- Putting it together - 1h15m
  - Narrative arc: How can we think about the flow of a story from beginning to end, and how can we use this to structure our stories?
  - Narrative breakouts - Story pitches
  - Launchings and landings: What are best practices for starting and finishing stories?
  - Characters: We revisit your character in the context of your event.
  - Break
- Results from Boise State University - 30m
  - Research context
  - Quantitative findings
  - Interviews and content correlations
  - Discussion

IV. PRELIMINARY RESULTS

Having deployed this approach in six undergraduate classrooms across Materials Science and Engineering, Mechanical and Biomedical Engineering, and Civil Engineering, we find significant shifts in student attitudes and complex story themes that both reinforce and counter prevailing social narratives about engineering. Quantitative survey analysis and interviews have been completed for the first three courses and analysis of the latter three are ongoing. For the first three courses ($N = 91$, with 24 female students), Lickert-like responses to “I identify as a materials scientist”, or “I identify as a mechanical engineer” shift from 3.89 to 4.15, for a $\Delta = 0.26 \pm 0.16 p = 0.11$, and “I am confident I can do well in this course” shifts from 3.81 to 4.13, for a $\Delta = 0.33 \pm 0.12 p = 0.009$. In the female subpopulation, these shifts are amplified ($N = 24$), going from 3.83 to 4.25 ($\Delta = 0.42 \pm 0.29, p = 0.16$) for “I identify...” and shifting from 3.31 to 3.91 ($\Delta = 0.60 \pm 0.24, p = 0.02$). That is, the work shows potential for a single storytelling assignment to improve professional identity and course confidence, which are linked to persistence and retention.

Overall the story writing experience in the classrooms is overwhelmingly positive, though students share that doing so in engineering courses is initially uncomfortable. For many students, this is the first time a faculty member has ever asked about their personal lives. Nearly half of stories shared by students (42%) describe their origins as an engineer, a third describe stories of persistence and overcoming challenges, and a quarter of stories describe important traumas experienced by the students. The origin and persistence stories shared by students are consistent with master narratives around engineering, including that the process of becoming an engineer is a difficult task that requires overcoming hardships, “hero’s journey” narratives. A small fraction of stories are coded as “counterstereotypical” (6%), in that they describe full lives of students loving music, art, or fashion. Between the counterstereotypical and origin stories shared by students, we find evidence that the real paths traveled by students to become engineers are far more diverse, interesting, and inspirational than master narratives such as “I have always excelled at math and science...” or “I went into engineering so I could earn a lot of money”.

V. AUDIENCE

About 10 audience members per facilitator, up to 15 per (30-45 total)

VI. ROOM REQUIREMENTS

2 Cordless microphone for participants Speaker system (in-ceiling or standalone speakers OK) so all participants can hear microphones Lavalier mics for presenters (3) Projector (HDMI) and screen

REFERENCES