The Impact of Disciplinary Knowledge and the Curriculum on the Development of Student Identity

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I am a Ph.D. candidate in educational research and evaluation. I have expertise in research methodology, with a focus on psychometrics, narrowing achievement gaps, and bias. I use qualitative and quantitative methods to understand social science phenomena.

Exploring the development of students' affinity identity in their choice of institutions and programs of study

This paper is a work in progress. Identity theorists contend that each person possesses their own set of personal traits or identity that varies as they move from one context to another. Based on the work of Gee, primarily the affinity identity category of his theory, we posit that students develop identities within their discipline from the earliest days of their choice of what and where to study. Data were collected from 65 first-year Chemical Engineering, Chemistry and Biochemistry students at a large public rural-based research and engineering intensive university and an urban public research institution with a more diverse student intake based on its geographical location.

The disciplines were chosen to highlight the distinctive features of engineering formation and two closely related science programs at each university. The focus on Chemistry, Biochemistry and Chemical Engineering for this study was also deliberate. As both disciplines derive their roots from very similar bodies of knowledge, it allows for a comparative understanding of how curricular knowledge differences arise due to disciplinary differences, which eventually lead to differences in students' development of identity in each discipline. Using these three disciplines will allow us to examine how the process of student engagement with knowledge in pure disciplines (Chemistry and Biochemistry) differs from that in an applied one (Chemical Engineering). From our preliminary analysis of the first-year data, we show how students' choice what to study relates to their emerging identity.

Introduction

Gee [1] notes there are four different ways to view identity: nature identity, institution identity, discourse identity, affinity identity. First, nature identity is developed from the circumstances of one's birth. For example, having a certain color of the skin or body features forms one's nature identity. Second, institutional identity is derived from the power vested by institutions. For instance, one's educational qualification or educational attainment provides one with their institutional identity. Third, discourse identity derives from the power of dialogue among individuals. For instance, the language used amongst a group demonstrates a shared way of thinking about the world. Finally, affinity identity is derived from one's affiliation with the shared practices of an affinity group. For instance, one may develop the identity of a hiker by participating in the shared practices of hikers around them.

For this study, we consider engineering as an affinity group with a set of distinct practices that set them apart from other disciplines. Prior work on the professional identity development of engineering students focuses mainly on two major aspects related to the context in which engineering teaching and learning or engineering work takes place: the college campus and its culture, and the interaction of students' social identities with the engineering culture [2]. Similarly, Mann, Howard, Nouwens, and Martin [3] note a variety of factors including peer network, mentors, industry experience during the engineering degree, academic staff identity, and life experiences that shape the professional identity of engineering students in colleges. These factors either directly relate to the college environment (e.g., peers, mentors, industry

experience) or the interaction of student's social identities with the engineering environment (e.g., family status).

Methods

Study design
This paper represents a small portion of a larger comparative longitudinal study where students enrolled in four-year programs are studied each year of their program. The two universities of focus are public, considered STEM universities, and have similar in- and out- of-state tuitions. U1 university is rurally situated while U2 is suburban. U1 has an enrollment of over 27,000 and U2 has an enrollment over 11,000.

Participants
First-year students in Chemical Engineering and Chemistry programs at two distinctively different research-intensive institutions were recruited to participate in the study. Thirty (30) Chemical engineering students, 20 Chemistry and 15 Biochemistry students were interviewed. Biochemistry majors were added to the participant pool because of the low numbers of Chemistry students who agreed to participate in the study. Also, there is significant content overlap between Chemistry and Biochemistry. In total, there were 65 participants in the study. The table below illustrates the breakdown of participants by their fields of study and institutions.

Table 1. Breakdown of participants by discipline and institution

Institution	ChemE	Chemistry	BioChem	Total
University 1	15	14	8	37
University 2	15	6	7	28

Data collection and analysis
Data were collected using a semi-structured interview protocol where students were asked to reflect on their university experiences as they relate to learning within their disciplines and their future visions for themselves. The interviews ranged from 45 minutes to an hour and while participation was completely voluntary; students were compensated for their time at the end of the interview with a $15 Amazon gift card. The interview transcripts were analyzed using a coding framework developed deductively after collaborative deliberation among researchers across all the contexts of the larger study for which the data were collected. The coding framework organized the data into broad themes closely related to those of the interview protocol. These broad themes were then broken down into sub-themes that served as nodes in the NVIVO software.

Preliminary Results and Discussions
Gee posits affinity identities are developed by the shared experiences of a group. Consequently, affinity identity development is dependent on the individual's choice to join the group and to fully engage in activities associated with being a member of the group. Across the data set, our participants described their path to their respective universities and degrees, choice of major and

where they saw themselves in the future in various ways. Even though the students were in the second semester of their first year, we see them actively choosing to affiliate with a group and starting to express this choice as part of an affinity identity.

In terms of choosing their university, some of the most commonly reported reasons were associated with the reputation of the program and/or institutions, familial or social influence, personal preferences, as well as geographical location. Students did not struggle to express a very definite set of reasons as to why they chose the university they were attending. Below we share some key excerpts from the transcripts that highlight participant choice of university. The terms that specifically indicate the student's choice is emphasized.

> *I guess **I really wanted to do research**, so I feel like this was the best school for that and I just felt like this would be the best pick for me - Kiran, U2, Biochem*

> *Out of all the other choices, **I narrowed it down** based on distance from the school, cause I'm a commuter. Then, the programs that I have. Back in high school, there's no question like if I'm going to college or not. I'm definitely going to college. So, **U2's like my top two schools. Then, also, I love the programs with the scholarships available**. - Soledad, U2, ChemE*

One distinct finding that indicated a significant difference between institutions was the role of undergraduate research experience which is very salient at U2. Students discussed how their involvement in research helped their perception of their program of study to evolve beyond what they initially thought it was. While U1 is also a research-intensive institution it is still unclear if students are encouraged to engage in research as undergraduates or if their involvement is purely voluntary. Additionally, U2 was reported by the students to have multiple funding/scholarship opportunities which they found to be extremely advantageous.

The participants also offered varied rationales for choosing their majors and how the body of knowledge associated with the discipline, and a university degree by extension, is beneficial for their current and future academic interests.

> *To learn. To help obtain knowledge. It's like more, like for high school is more like general gives you the basics, understanding. But college you get more thorough understanding. You get exposed to the material in ways you never seen it before. So it's like a whole new understanding of subjects. And also, **I'm so interested in the sciences** and getting a University degree would help me to succeed in the field. So yeah. - Janine, U2, Chem*

> *[Chemical Engineering] combines my passion for chemistry and math at the same time. And during the first week of Chem 101, our professor, Professor XX, she told us that there are a lot of branches in Chemistry. You can go from industry, education, you can be a consultant for, you know. And then that's **why I really like Chemical Engineering**. - Frankie, U1, ChemE*

Some participants discussed how they chose their major because of its potential to impact broader society and their interest in being a part of the effort.

I kind of just really wanted to have a job where I felt like I could feel like whatever I was doing is like making change, like having an impact on whoever and I could have I think I could have... Like there's obviously a lot of jobs which had that same feel... Give you that same feeling but it just seemed **engineering like the amount of impact they had just just improving society and like, you can just you can just like see it every day.** *How much impact engineers have in just improving and* **I kind of want to just be part of that.** *- Devi, U1, ChemE*

Well, long story. We've a had a history of cancer in the family, and I knew that I had exposure to medical research and things like that. So **I definitely wanted to do that**, *and I took IB chemistry in high school, and I really enjoy the organic section, which I figured I'd struggle with and hate, but actually really enjoyed it.* **To me that's why I want to it is to do medical research and things like that and try to help develop a cure for what we call incurable diseases right now, and just find a way to treat those and save some lives**. *- Drew, U1, ChemE*

Our preliminary results indicate that academic disciplines are major influences of students' emerging identities. However, there are also individual traits that fuel students' decisions to enroll in a particular major or attend a given institution. As Gee posits, individuals must choose to participate with group practices in order to truly identify with the group. The above excerpts have demonstrated that our participants hold various reasons for choosing their disciplines and institutions. This finding requires further exploration of how an individual's background might influence their choice of adjoining with a given group. Meaning, based on Gee's theory one's affinity identity develops through participation with the group but if the individual already has background influencers that propel them to join with a given group how might this be explained? Consequently, we propose to future explore other identity theories or personal motivation as a precursor of engaging with a particular group among engineering and science students.

Conclusion and Future steps
So far, our analysis has shown that some students have specific reasons for choosing their intended majors and, even more so, their institutions. Students discussed their initial interest in their programs of study and university by reason of the reputation of the institution, their love of research or wanting to make a difference due to a personal life event. The excerpts included in this paper demonstrate that some students come into their chosen major with some broad idea of the knowledge they will be exposed to and how this will shape their future career goals while others are content with just exploring the discipline until they make concrete decisions about where they will end up. Conversely, we have some students who are not able to articulate much in this regard, and others who already have substantial identification with the disciplines. However, this discussion is very preliminary. Future research plans include continued analysis of interviews to explore what differences or similarities exist between students at our two institutions and among the six programs of study. One key area of focus will be further exploration of participants' familial background, first generation, socioeconomic status and career intentions as influencers of choice.

References

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