Paper Title The Role of Precollegiate Heuristic Knowledge: Expanding the Local Model of Minority-Student Success

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The Role of Pre-Collegiate Heuristic Knowledge: Expanding the Local Model of Minority Student Success

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To make money, one must first have money. Similarly, to acquire knowledge, one must first know how to play the game of knowledge acquisition. The Local Model of Minority Student Success (LMMSS) introduced by Padilla, Trevino, Gonzalez and Trevino (1997) suggests that successful minority students acquire certain campus-specific heuristic or informal knowledge enabling their success. This heuristic knowledge is the locally-specific, practical understanding of how to be a student on that campus, e.g., course repeat/grade forgiveness policies. As the name heuristic implies, it is generally acquired through experience, but can also come through other informal channels. Additionally, the acquisition and expansion of informal knowledge early in student careers is crucial for retention in college. Not addressed is the role of informal knowledge students bring to college nor the interaction of informal knowledge with acquiring formal or theoretical knowledge. We theorize that accumulative advantages linked to pre-collegiate family capital are a factor in differing trajectories of knowledge acquisition within populations of under-served minority undergraduate engineering students.

The Research Institute for STEM Education (RISE) at the University of Oklahoma (OU) seeks to identify factors contributing to the successful completion of an engineering degree at a predominately white, research institution by under-represented and under-served minority students. 159 African American, Hispanic American, Asian American and Native American undergraduate engineering students were interviewed using theoretically grounded qualitative methods. Our one to two hour semi-structured ethnographic interview research design invited students to share their experiences in undergraduate engineering education. Interviews were transcribed, coded by themes, and analyzed using an iterative-interpretive approach. Additional quantitative data were generated from a preliminary demographic questionnaire and academic transcripts. This paper reports on the experiences of mixed-race Native American undergraduate students in multiple engineering disciplines.

Data suggest student paths to success vary as a result of differential accumulation or absence of advantages linked to family capital categorized as financial, human and social capital (Coleman, 1988). Thirteen high capital students entered college already "experts" possessing knowledge of the discipline or local academic environment and the resources for action. One or both parents of all thirteen possess a 4-year degree. Seventy-seven percent of high capital students' grandparents, parents, or siblings are practicing engineers. Eight high capital parents are graduates of OU. Five high capital students have siblings who attended or are attending OU. This "legacy effect" is critical in providing heuristic knowledge as well as important institutional and social contacts as the following student articulates:

> Interviewer: Did you look up anything about the College of Engineering before you decided to come?
> Participant: Not really, my father is also an engineer, and he graduated from here. So, he had most of the knowledge that I needed.

Accumulated advantages resulting from pre-collegiate human capital and other sources of social capital favorably impact the acquisition of formal knowledge. Eleven high capital students described their high school preparation as "excellent." All attended high school in urban/suburban school districts that offered AP classes in mathematics, physics and chemistry. All eleven entered OU 'calculus ready' and advanced through the calculus sequence without issue. As a result of higher ACT scores, higher performance in core classes, and associations derived from family capital, high capital students spend less time negotiating an unfamiliar academic and social environment and less energy acquiring formal and informal knowledge. Eighty-five percent of high capital students are involved in a student professional organization.

Conversely, eight low capital students entered college with little informal knowledge or resources to negotiate the social and academic environment. All eight represent the first generation to graduate from college. No family members have STEM careers and only one student has a sibling attending college.

> Interviewer: Did they (parents) go to college or was it expected that the kids would go to college?
> Participant: No, no one ever really helped me in that direction. I mean I could have done pretty much anything and my parents probably wouldn't have cared. That's part of the reason it was so mysterious when I first came up here, I was like, "this place is so big." It's something I don't know anything about.

Low capital students expend more time and energy negotiating an unfamiliar environment, building peer-to-peer networks and developing institutional relationships to acquire the heuristic knowledge needed to become "experts" at being successful in college. No low capital students had AP mathematics classes and only two entered calculus ready. Six students came from rural or small town high schools. As a result of beginning in remedial mathematics, these six students lost the benefits of moving through the difficult engineering curriculum with their entering cohort and later spent time and money "catching-up" by taking courses at community colleges.

> Interviewer: What do you think was the most difficult thing to deal with and why?
> Participant: It would be adjusting to the curriculum coming from a small school that really didn't offer much. I just always felt like I was a little behind, because everyone else knew what was happening in this class, and I was just trying to learn it.

One of the consequences of lack of informal knowledge and accumulated advantage is the ability to become involved in nurturing environments. Only three of eight low capital students were members in student organizations.

By focusing on accumulated advantage, we expand the examination of differential success of undergraduate engineering students across and within various ethnicities and backgrounds by thinking beyond homogenous ethnic/racial assumptions. We seek to encourage further examination of the power and politics impacting access to knowledge that favors some and disadvantages others. Symonette (2004) reminds us that administrators and faculty need enhanced understandings of related systemic processes of asymmetric power relations and

privilege, not simply awareness and knowledge of difference and diversity. Assuming the challenges faced and the resources available to overcome those challenges are understood and experienced universally prevents education reformers from thinking and acting beyond homogeneous racial suppositions. Failure to link socio-cultural diversity with patterned differences in educational opportunity and outcome will leave inequities in higher education and engineering largely unabated. (997 words)

References

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