

# The Dissertation Institute: Motivating Doctoral Engineering Students Toward Degree Completion

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**Abstract**— Data show that doctoral students in the United States, particularly those from underrepresented groups, are leaving at high rates before obtaining a degree because of the long, arduous and uncertain road to graduation. The primary goal of this NSF-funded research project is to offer the Dissertation Institute: a practical and timely experience for doctoral students in engineering disciplines to address issues germane to shortening time-to-degree and increasing degree completion rates, with emphasis upon underrepresented minority students (African American, Native American, Pacific Islanders American and Hispanic American). The project is a mixed-method, multiyear and multi-phased study that will create the opportunity for students from underserved populations to come together and participate in an intervention designed for their benefit. The framework guiding the project is Eccles' Expectancy-Value Theory (EVT). This work-in-progress will describe the overall project and the progress to date. We are currently in Phase 1 of the project. The research question guiding Phase 1 is: From the faculty/administrator and student perspectives, what success and value beliefs support and hinder the completion of the doctoral degree for underrepresented racial minority students in engineering disciplines? Findings will inform and facilitate the design of the Institutes in Phase 2.

**Keywords**—*motivation, underrepresented racial minorities*

## I. INTRODUCTION

According to a report published by the Council of Graduate Schools (CGS) "The Role and Nature of the Doctoral Dissertation" [1], the attrition rate of doctoral students in the US has consistently been estimated at 50% since the 1960's. The CGS deem this phenomenon as "one of the most vexing problems that the US graduate education faces" [2,3]. Data show that doctoral students in the United States, particularly those from underrepresented racial minority (URM) groups, leave at even higher rates than their majority peers before obtaining a degree because of the long, arduous and uncertain road to graduation. Specifically, for doctoral students within engineering, the 10-year completion rate for Caucasian students is 60%, as compared to 55% for Hispanic Americans, 53% for Asian Americans and 47% for African Americans. Underrepresented students often endure additional challenges beyond the rigor of the coursework and research that can be burdensome [3,4].

When a doctoral student does not complete his or her intended degree or takes greater than average time to completion, there is much to be concerned about. At the departmental and university level, degree completion rates tend to be measures of program effectiveness. If such programs are not graduating the intended amount of students to justify their allocated resources, pressures of downsizing or, in some instances, eliminating programs may be imminent, putting students at risk of not completing a degree or having a degree that is no longer recognized, and departmental faculty and staff at risk of losing a job [5]. Additionally, repercussions to faculty with respect to time and effort devoted in educating and training students who drop out tend to be greater the longer the student is under their supervision [5,6]. From a student perspective, research shows that, when students go beyond the average time-to-degree they lose momentum and determination – two essential competencies for remaining productive [7]. Furthermore, doctoral students who leave graduate school as All But Dissertation (ABD), sometimes with or without a master's degree, are often perceived as unsuccessful; a stigma that has the potential to hinder their later accomplishments in their professional careers [7].

Research has shown that doctoral attrition is weakly correlated to academic ability and more likely to be linked to other phenomena, such as accessibility to faculty and research topics, relationships established with others, time constraints, family responsibilities, apathetic advisors and mentors, non-flexible program structures and the student selection process itself [5,8]. The problem tends to be exacerbated during the dissertation writing phase, when the student has completed coursework and external motivators (such as a class deadline) are removed and a different set of motivators come at play [7]. The dissertation phase is a completely new experience for many students and particularly for first-generation doctoral students, who lack the mentorship, advice and empathy that may come from their family members.

## II. FRAMEWORK

Our project is guided by Eccles' Expectancy Value Theory (EVT) [10,11]. It is well established that motivation plays a key role in student learning and hence favorable academic outcomes by increasing academic engagement. Motivation

influences the activities that a learner chooses to engage in, as well as the level of engagement in such activity [9]. Eccles et al [11] originally developed EVT to explain gender differences among children in STEM course enrollment choices. Since then, the theory has been applied in a variety of achievement-related choice context (academics, athletics, career choice) and across different ages (children to adult) [12].

EVT theorizes that an individual's expectation for success coupled with the importance or value they attach to the task at hand contributes to his or her choice to engage in the task. For this context, the task is completing a doctoral degree but more specifically the task of writing the proposal and subsequently the dissertation. Therefore, expectancy of success encompasses an individual's beliefs about whether or not he or she can be successful in completing a dissertation and the values are the importance assigned to doing so. Task value can be broken down into four categories of values: (1) attainment value – the degree to which an activity is consistent with sense of self; (2) cost value – the expense of engaging or not engaging in an activity; (3) interest value – the enjoyment associated with an activity; and (4) utility value – the usefulness of an activity with respect to other ends [13,14]. Together, success beliefs and task values promote the motivation needed to set dissertation completion goals and engage in the behaviors that will lead to completion of the dissertation.

### III. METHODS

To achieve the outcomes of our project, we have designed a multi-method, multi-phased study. In Phase 1 (currently in progress) we will gather qualitative and quantitative data to help us understand the needs for students, as well as the faculty and administrators that advise/mentor them. We will use the outcomes of this phase to enable us to design the Institute to be consistent with literature suggestions and best practices but also contextually relevant for the selected sites in Phase 2. In Phase 2, we will engage in conducting the Institutes and collect interview and survey data to assess Institute effectiveness at each site. We anticipate hosting 10 students in Institute 1, and 40 students for Institutes 2, 3 and 4. In Phase 3, we will comparatively analyze the data across sites to allow us to identify the key elements to focus on when considering transferability of the Institute to additional sites. Table I shows the overall study design including the research questions guiding each phase and the data to be collected.

#### A. Partner Universities for Institute Implementation

Going forward, the research team has identified 7 potential partner institutions for the implementation of the Institutes. These institutions were initially identified based on their geographical location and on the PI's known opportunity of collaboration among them.

A description of all institutions, as identified by the Carnegie Classification of Institutions of Higher Education [15] and their regional locations across the United States is presented in Table II and Fig. 1.

Timeline	Research Question	Data Sources
Phase 1 (Year 1)	From the faculty/administrator and student perspectives, what success and value beliefs support and hinder the completion of the doctoral degree?	<u>Faculty/Admins:</u> Interviews with participants at partner schools and national surveys to gain a broader perspective  <u>Students:</u> Interviews with participants at each school and national surveys to gain a broader perspective
Phase 2 (Years 1-4)	What impact does the Dissertation Institute have on student success beliefs, value beliefs and time-to-degree completion?	<u>Pre and post surveys:</u> Quantitative surveys with all participants at each site tracked longitudinally to measure success and value beliefs and time between degree milestones  <u>Extended post interviews:</u> Interviews with participants at each site to measure success and value beliefs and time between degree milestones
Phase 3 (Year 5)	What are the critical contextual differences that are important to consider with regard to transferability of the Dissertation Institute for future sustainability?	Comparison across the 4 Dissertation Institute sites

TABLE II. DESCRIPTION OF PARTNER UNIVERSITIES

Institution	Region	Description
U1	Region 1	Research 1, public, large
U2	Region 1	Research 2, public, large
U3	Region 3	Research 1, public, large
U4	Region 2	Research 1, public, large
U5	Region 4	Research 1, public, large
U6	Region 4	Research 1, public, large
U7	Region 1	Masters 3, public, large

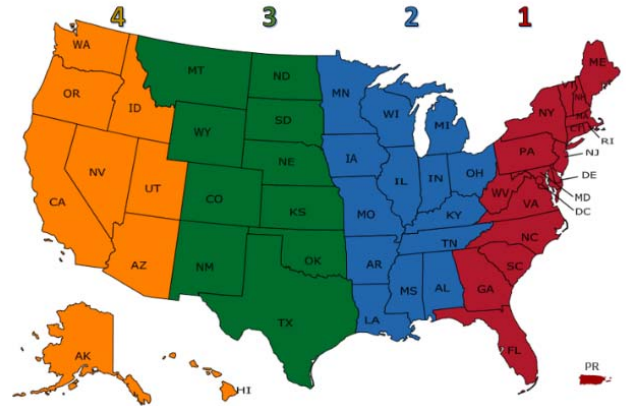


Fig. 1: Geographic Regions for Partner Universities

TABLE I. OVERALL STUDY DESIGN

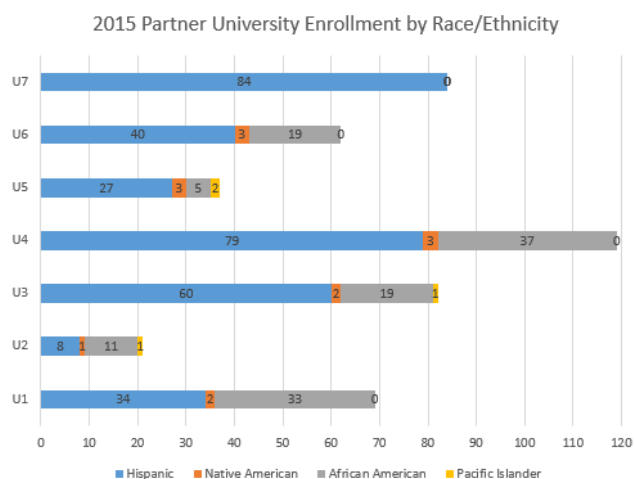


Fig. 2: URM doctoral students enrolled at partner universities in 2015

We want to maximize exposure to as many URM doctoral students as possible through our institute implementations. As such, we gathered enrollment data on all our partner sites and present the count for URM (specifically Hispanic, Native American, African American and Pacific Islander) doctoral students in engineering enrolled in 2015 at each institution in Fig. 2. Values of zero indicated either not-reported or indeed a zero count. This 2015 enrollment data gives us a direct depiction of the population we could potentially impact, either by virtue of direct participation in the institute or by virtue of learning through vicarious experiences observed and shared from peers who participated in the institute.

### B. Pilot Study

We are currently conducting a pilot study in support of Phase 1. The research question guiding this phase of the study is: From the faculty/administrator and student perspectives, what success and value beliefs support and hinder the completion of the doctoral degree for underrepresented racial minority students in engineering disciplines? The Pilot Study consists of survey and interview data gathered at one of our partner sites to inform the initial offering of the Dissertation Institute in terms of context and assessment/evaluation data. We are conducting the Pilot Study at a large land-grant Research 1 University located in the Eastern United States.

Recruitment began in April 2016 for students and faculty/administrators at the Pilot Study institution. We identified a gatekeeper [16] within the College of Engineering who forwarded our recruitment email to all doctoral URM students across the engineering disciplines within the college. The recruitment email prompted potential participants to complete a screening survey designed to provide us with more in-depth information about their demographic information and current degree progress to aid in our selection of students that met our eligibility criteria. Six students were identified and selected for interviews based on a purposeful, self-selected sampling approach [16]. The identified students were selected based on the following criteria: 1) must identify as belonging to a URM population and 2) must be currently involved in the proposal or dissertation writing stages of their program.

Although actual participation in the Institute will be restricted to US citizens and permanent residents, student participants in Phase 1 of the study will include Foreign Nationals (i.e. international students). Given the possibility that some URM doctoral students in engineering may have been naturalized prior to their participation in this study or may have been raised in a household that did not speak English as a first language, we want to allow ourselves to collect data on international students who have English as their second language, as their experiences may still be relevant for future Institute participants. Preliminary information on survey results are presented in subsequent sections.

Approval from the Institutional Review Board (IRB) has been obtained and interview protocols were developed and vetted by the research team, as well as by members of the external advisory board of the project. Faculty/administrators were identified based on a snowball sampling approach [17] to identify faculty who are currently advising and/or have advised underrepresented doctoral students. Four faculty members were selected and invited to be interviewed based on a known history of advising and/or mentoring doctoral students in engineering from URM background.

#### 1) Preliminary Screening Survey Findings for Students

The screening survey included two open-ended question prompting students to explain: 1) what challenges, if any, they have faced thus far in the proposal and/or dissertation writing stages (if currently in their proposal and/or dissertation writing stages) and 2) what challenges, if any, they anticipate facing during their proposal and/or dissertation writing stages (if currently not in those stages). Those students who are not currently in their writing stages were not selected for interviews. However, their responses may still be relevant for institute design since potential Phase 2 Institute participants may be experiencing some of those challenges, or perhaps the anticipation and anxiety related to those challenges may deter engagement in the writing stages. These responses serve us well in the sense that we can begin to identify common pitfalls and roadblocks before students even reach the writing stages and provide management strategies and perhaps redirect behavior.

a) *Responses from students not in writing stages:* Preliminary survey answers indicate that respondents were, indeed, anticipating challenges as part of the writing stages in their programs. Most commonly, they reported feeling like they lacked writing skills, specifically as it relates to writing in a structured manner. One participant felt insecure in anticipation of perceived isolation during the writing stages, which, as this participant explained, would be a “complete departure from the collaborative journey that [will lead to that] stage.”

2) *Responses from students currently in writing stages:* As part of the response to this question in the survey, some participants expressed having faced the following challenges in their writing experience thus far: insecurities with feeling the need to publicly demonstrate competence in order to compensate for possible bias/stereotyping toward oneself,

navigating co-advising situation, difficulty identifying discrete portions of the project to divide into three manuscripts, time management and self-discipline, understanding how to convey the information resulted from data analysis into an overarching story and the linguistic barrier of English as a second language.

### 3) *Preliminary Findings from Student Interviews*

A total of 6 participants identified based on their screening survey responses were selected for interviews. We received 16 survey responses, out of which 4 finished less than 50% of the questionnaire. Due to this, the research team had difficulty assessing their eligibility and hence these respondents were not selected to be interviewed. Three respondents did not provide contact information, and other 3 respondents were deemed ineligible. This brought our count to 6 respondents to whom we extended invitations to interview.

Out of six invitations extended, four participants followed up and completed interviews with the Graduate Research Assistant. Interviews were held between the months of April and June, 2016. Our participants consisted of 3 males and 1 female, 2 African/African American and 2 Hispanic/Latino/a, 2 who have English as their first language and 2 who do not, and 2 international students and 2 domestic students. Interestingly, one of the domestic students does not have English as a first language and one of the international students does, which provides us with an indication supporting our initial rationale for including international students in Phase 1. Out of all four participants, one is currently finishing a Master's degree in the same institution as part of their PhD requirements and one has not advanced to candidacy yet but is in the proposal writing stages of their program. Interviews were audio recorded and transcribed; they have also been loosely coded, although more rigorous coding is still underway using a priori coding techniques with EVT's framework [16]. Nonetheless, the data has yielded the following preliminary findings, as stated by the students interviewed:

a) *Time management and procrastination*: all four student subjects indicated that, by far, the issue they struggle with the most is time management and procrastination. Some participants felt that research at the doctoral level in their respective fields was characterized by a certain "loneliness" and that completion of their dissertations depended on their internal drive, perseverance and strategic management through goal setting.

b) *The Impostor Syndrome [18]*: three of the students interviewed mentioned putting in question their abilities more often than they would like, and often feeling like their accomplishments were not deserved, generally dismissing them as luck or timing. Some also indicated that, in anticipation of a specific writing task, they had high self efficacy (i.e. they believed they could succeed if put forth the effort), but at the time of actually completing the task, were overwhelmed with the opposite, resulting in anxiety and leading to unwillingness to complete the task, which in turn resulted in this so-called impostor syndrome after completing the much dreaded task.

c) *Managing teams and research group*: Two of our participants indicated that, as part of a larger research group, they often had added responsibilities, particularly if they were regarded as the most or one of the more senior members in the group. Although they acknowledge the potential of the extra help amongst peers, they noted additional duties (such as needing to train a new lab member) were often detrimental to their writing progress.

d) *Family expectations*: Two of our participants also conveyed feelings of isolation and despair when it came to managing their family expectations. This was expressed in two distinct ways: first because their families placed high demands on the student with respect to graduation times, as well as economic support upon graduation; and second because the students felt unable to bond over doctoral struggles with family members unfamiliar with academia.

### 4) *Interviews with Faculty*

A total of 4 faculty members were identified and invited for interviews in this Pilot Phase. Three responded and were interviewed by the Graduate Research assistant in the month of June, 2016. Interviews were audio recorded and transcribed, but have not been analyzed yet.

## IV. FUTURE WORK

For completion of the Pilot Study in Phase 1, interviews with student participants, as well as faculty members will be rigorously coded using a priori coding techniques [16]. Advanced data analysis will begin in the month of August. Findings from the interviews will be utilized as preliminary data to design a draft program for the first Institute implementation, by directly addressing students' needs and providing helpful strategies for capitalizing and maximizing one's motivation, as identified in the data and consistent with literature suggestions. To increase the transferability of our findings, we also conducted a focus group at a large, engineering education-focused professional conference. We presented participants with preliminary findings and engaged in member checking [16]. We will continue to collect interview and survey data at each of our partner sites throughout the 2016-2017 academic year.

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