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BOARD # 260: IUSE: Non-Traditional Engineering Students: Lived Experience and Classroom Engagement

Dr. Ean H Ng, Oregon State University

Ean H. Ng is an assistant professor at Oregon State University. She received her Ph.D. in Systems and Engineering Management from Texas Tech University. Her research interests include engineering economic analysis, high reliability organization, safety engineering, peer effects in workplace safety, and performance measurement.

Dr. Ganapathy S Natarajan, University of Wisconsin - Platteville

Ganapathy Natarajan, Ph.D., CPEM is an Associate Professor in Industrial Engineering at University of Wisconsin – Platteville. He received his Ph.D. in Systems and Engineering Management from Texas Tech University. Gana's research interests are in engineering education, learning analytics, and novel use of data analytics in decision making.

Ingrid Scheel, Oregon State University

Ingrid Scheel is a Project Instructor at Oregon State University. She works to teach from an integrated sociotechnical perspective in engineering science and design courses. Her focus is systems engineering and program management. Scheel has experience in small business strategic planning and risk assessment, designing and deploying fiber optic sensors and sensing systems, prototype development, instrumentation, data acquisition and analysis, and reporting.

Scheel contributes to the International Society for Optics and Photonics as a conference chair, editor, and author. She is the President of Optica, Columbia Section, and works to forge strong connections between industry and academic research.

IUSE: Non-Traditional Engineering Students: Lived Experience and Classroom Engagement

Research in nontraditional engineering students (NTES) generally focused on their demographics, the challenges they faced, their deficiencies, and methods to improve the outcomes of NTES in engineering programs. None of the existing studies in NTES are asset-based and focus on their strengths such as their lived experiences, or leveraging their strengths to increase engaged student learning for all students. The objective of this study is to identify the characteristics of NTES lived experience that can be incorporated into engineering classrooms to increase engagement for all students, and create methodology to guide the creation of cooperative in-class learning activities that leverage NTES lived experience to improve in-class student engagement. Through interviews with NTES and thematic analysis, the attributes of NTES' past experience that were of interest to traditional engineering students in their engineering courses and classrooms were identified. Results show that NTES professional skills (networking and problem-identification), and the application of their work experience into technical lecture content were more frequently discussed when they collaborated with traditional engineering students. Future work for this project will include validating the lived experience of the NTES with the traditional students, and creating in-class cooperative learning activities that utilize NTES lived experience. This study is funded through NSF Improving Undergraduate STEM Education (IUSE).

Background

Non-traditional students (NTS) are defined as college students who possess any of the following seven characteristics: delayed enrollment into college, part-time enrollment, financial independence, full-time employment while enrolled in college, have dependents, is a single parent, and/or did not receive a standard high school diploma [1][2]. National Center for Education Statistics (NCES) also includes students over the age of 24 as one of the characteristics of NTS [2]. NTS population is increasing as students are attending college on a part-time basis and are taking up part-time or full-time jobs. In 2020, 40% of undergraduate students who were attending college on a full-time basis were also employed full-time, indicating a considerable NTS population [3].

Summary of Literature Review

Studies on factors affecting NTS outcomes categorized those factors as social, academic performance, demographic [4, 5], and academic and social integration. Priode et al. [6] studied self-efficacy and motivation for completing college among NTS. Jeffreys [7] added how NTS perception and abilities increase with an increase in encouragement. NTS persistence and attrition rate, and the relationship with academic performance have been studied by [5, 8-11], with varying associations. Vinto [12] touched upon NTS social integration by relating it to the sense of belonging.

Studies on methods to improve NTS outcomes focused on support factors, viz. social, academic, financial, and situational support. Social support manifests through co-curricular activities [13], strong tutor-student relationships [13], and creating other activities that may foster student engagement and belonging, e.g. collaborative group work [14], social programs [15], and small group tutorials [16]. Social support also promotes persistence due to improved integration [12].

Academic support was shown to be improved by developing engaging teaching and learning programs [17] and creating easy access to school and school materials [13]. Studies on financial support [11, 18] mainly focused on the ability of financial support structures (grants, loans, etc.) to improve the persistence of NTS. Examples of situational support structures included flexible class and program scheduling [10], [19] and counseling services [19].

Based on a review of existing literature, studies focus mainly on the deficiencies of NTS as compared to traditional students and how to overcome these deficiencies through different support structures. NTS have lived experiences, which are an asset that can be used to improve not just NTS education but also classroom engagement for all students.

Project Objectives

Given the diverse background and diverse lived experiences of NTES and our limited knowledge on NTES lived experience, we use a qualitative approach to identify the attributes and themes of NTES' lived experiences that can be leveraged to increase engaged learning in engineering classrooms. Based on the lived experience, we will then create methodologies to guide the development of cooperative learning activities that engage the learning of all students.

The NCES' seven criteria to identify NTS include criteria that some students might not be comfortable sharing. Therefore, for this study, we define an NTES as one who has any of the following characteristics:

- Delays enrollment (does not enter postsecondary education in the same calendar year that they finished high school)
- Attends part-time for at least part of the academic year
- Works full-time (35 hours or more per week) while enrolled part-time or full-time

Methodology

To identify the NTES lived experiences in classroom teaching that are of interest to traditional engineering students, we conducted two sets of semi-structured interviews: (1) interview with NTES to identify the attributes of their lived experiences that are of interest to their peers and (2) interview with traditional engineering students to verify that the attributes of NTES lived experience are of interest. The target sample size is 15 students per study.

To create methodologies to guide the development of cooperative learning activities, we will develop four cooperative learning in-class activities using the themes identified through the semi-structured interview, deploy them in our classrooms, and evaluate their effectiveness. Based on our learning from the four pilot cooperative learning activities, we will develop the overall methodology. To evaluate the effectiveness of the cooperative in-class learning activities, we will adapt the Classroom Survey of Student Engagement (CLASSE) survey for in-class activity and validate the adapted CLASSE.

Summary of Preliminary Results

<u>NTES Interview and Analysis</u>

Following approval from the individual Institutional Review Boards, Participants were recruited through an online recruitment and screening form distributed by instructors who taught third and fourth-year engineering courses and through institutional email listserv of upper-level

engineering students. Participants who completed the online form and met the criteria for NTES for our study were contacted to schedule an interview with the researcher. 16 students were interviewed, six from Institution A and 10 from Institution B. All interviews were professionally transcribed and coded by three research assistants at Institution A. The intercoder reliability for the interviews is 0.8 (Krippendorff's Alpha), with 67 codes identified. The codes show two major themes – NTES interactions with other students, and their skillsets that are often observed and discussed with other students.

NTES interactions with other students

Ten of the 16 interviewees specified that their work experience included technically focused work. Thirteen interviewees mentioned that their non-traditional status was shared with other students during small talk, and four interviewees mentioned that their non-traditional status was mentioned during scheduling discussions, which indicates that their non-traditional status factored into how their schoolwork was undertaken. Some students also indicated a lack of willingness to mention their NTES status, and some observed negative experiences when sharing their NTES status. In group settings, positive experiences were reported by seven interviewees, five interviewees reported negative experiences, and four interviewees reported needing extra scheduling adjustments to account for their non-traditional status, which reflects the non-standard experiences that NTES face in an academic setting.

NTES skillsets

With regards to skills obtained, additional time management ability, practical perspectives, responsibility, leadership skills, and teamwork skills were reported in addition to the ability to apply previous work experience to current coursework. Some students also mentioned an increased ability to make connections and gain personal clarity for their career paths based on their prior work experiences. These prior experiences also gave NTES the ability to observe traditional students lacking technical skills, interest, motivation, practical perspectives, responsibility, time management skills, or communication skills. These trends, along with the observed interpersonal dynamics, indicate that while the in-school experiences of NTES can be inconsistent and not wholly positive, the skills and perspectives that they gain can be currently lacking in the experiences of traditional students.

Work in Progress

Traditional engineering student interviews have been completed, and the coding of the interview transcripts is in progress. The CLASSE survey has been adapted and will be validated in the spring 2025 semester.

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