

WIP: Investigation of Recruitment Communication Channels and Student Awareness of an Engineering Bridge Program via Cross-Disciplinary Collaboration

Dr. Xinyu Zhang Ph.D, P.E., West Virginia University

Dr. Xinyu Zhang is a Teaching Assistant Professor in the Fundamentals of Engineering Program of Benjamin M. Statler College of Engineering and Mineral Resource at West Virginia University. She received her Ph.D. in Environmental Engineering in 2012 from University of Illinois at Urbana-Champaign. She is a licensed P.E. in North Carolina. Her research interests include STEM education such as broadening participation in engineering and advanced technologies for STEM education, engineering entrepreneurship, environmental engineering, and sustainable biomanufacturing. She started to lead a summer bridge program for incoming first-year engineering students called Academy of Engineering Success (AcES) in 2021.

Li Wang

Lynette Michaluk, West Virginia University

is a social sciences researcher at the West Virginia University Center for Excellence in STEM Education. Her research interests include broadening access to and participation in STEM. She is Co-PI of the National Science Foundation KY-WV Louis Stokes Alliance for Minority Participation and Research Scientist for Secure and Upgrade Computer Science in Classrooms through an Ecosystem with Scalability & Sustainability. She is evaluator for RII Track 2 FEC: Enabling Factory to Factory (F2F) Networking for Future Manufacturing, and Department of Education Title III Strengthening Potomac State College, as well as several National Aeronautics and Space Administration STEM education initiatives.

Dr. Robin A.M. Hensel, West Virginia University

Robin A. M. Hensel, Ed.D., is a Teaching Professor in the Benjamin M. Statler College of Engineering and Mineral Resources at West Virginia University and an ASEE Fellow Member. As a mathematician and computer systems analyst, she collaborated in engineering teams to support energy research before entering higher education where she taught mathematics, statistics, computer science, and engineering courses, secured over \$5.5M to support STEM education research, led program development efforts, and served in several administrative roles. She has been recognized for her teaching, advising, service, and research and as an Exemplary Faculty Member for Excellence in Diversity, Equity, and Inclusion.

Isabel Perez, West Virginia University

Isabel Perez is an undergraduate student attending West Virginia University in the Benjamin M. Statler College of Engineering and Mineral Resources. She is majoring in Biomedical Engineering and minoring in Biology and Medical Humanities and Health Studies to pursue a career with a focus on research and development to improve human health. She is an active member of the Society of Women Engineers, the Biomedical Engineering Society, and the Society of Hispanic Professional Engineers and helps with the Academy of Engineering Success (AcES) summer bridge program.

Clayton Scott Hammond, West Virginia University

Ian Bush

Ryan George Cao

WIP: Investigation of Recruitment Communication Channels and Student Awareness of an Engineering Bridge Program via Cross-Disciplinary Collaboration

Abstract

The Academy of Engineering Success (AcES), a summer bridge program for incoming first-time freshmen (FTF) engineering students at West Virginia University (WVU), faced challenges in recruiting underserved students for years. To address this issue, research was conducted via a collaboration among faculty in engineering and business, with support from an undergraduate researcher and faculty in the Center for Excellence in STEM Education. A mixed methods study using surveys and interviews was designed to assess recruitment communication channels and student awareness of AcES and another university-level trip-based summer program to explore any misalignment and propose suggestions to improve future recruitment of diverse students. Results from 91 survey responses and 2 interviews are discussed. This paper also describes how cross-disciplinary non-tenure track faculty collaborated on engineering education research.

Introduction/Background

Engineering summer bridge programs exist to support students' success and broaden engineering participation in the U.S.; but many such programs encounter challenges in underserved student recruitment. Few studies have assessed their recruitment strategies and resource allocations to reach underserved (women, minorities, first-generation, low income) students [1], providing limited knowledge on how to recruit those students effectively into bridge programs, particularly with legal, institutional, and financial constraints. Pipeline and targeted recruitment tactics used in university recruitment to reach underserved students may not apply to engineering bridge program recruitment tactics with different constraints and resource allocation [2]. Evidence suggests recruitment tactics may affect effectiveness in reaching students from various demographic and socio-economic backgrounds [3]. A graduate recruitment process evaluation found misalignment of recruitment tactics within STEM doctoral programs, showing the need to assess recruitment alignment [4]. This study is based on the Diffusion of Innovations (DOI) theory that proposes the communication channel as one key element in diffusing information [5]. The existence and importance of bridge programs may still be new to many prospective students and their families, particularly those lacking resources to access knowledge of the programs.

The AcES program at WVU encountered challenges in student awareness and underserved student recruitment. This study assessed AcES recruitment communication channels and student awareness via three research questions: How many Engineering students surveyed knew about AcES? Of those who said they knew about AcES, how did they learn about AcES? Of those surveyed, what communication channels did they suggest best to distribute AcES information?

Methodology

Cross-disciplinary collaboration

Non-tenure track (NTT) faculty in engineering, business, and social science collaborated in this research. Key barriers for Engineering NTT teaching faculty to conduct education research are funding and time. In Fall 2022, AcES engineering faculty collaborated with business faculty familiar with Institutional Review Board (IRB) requirements and survey and interview protocols in Fall 2022 via an Honors business core course that uses service-learning projects with local or

on-campus partners on event planning, research, procedures and policy updates, and social media campaigns to achieve student learning and comprehension of business concepts. Faculty designed an IRB-approved research study and guided a business student team to design survey and interview protocols and distribute the survey as course project tasks. A former AcES student received a NASA fellowship to further the research in Spring 2023. A research faculty member from the Center for Excellence in STEM Education that aims to break the cycle of poverty in WV through equitable STEM education opportunities for all students guided data analysis. This collaboration addressed NTT faculty's barriers in personnel, time, and prior human subject research experience for education research.

Survey and interview design, data analysis methods, and samples

The summer bridge program awareness and adoption survey collected data via Qualtrics on student demographics, awareness of AcES and communication channels used, participation in AcES and reasons, suggested communication channels, and resource limitation. Responses on student awareness and enrollment of a university-level trip-based summer program, "Adventure WV first year trips" were also collected. The survey was distributed in the first-year seminar course in business and engineering, entry-level engineering courses, residence halls, classroom buildings, and student organizations in Fall 2022 and Spring 2023. Follow-up interviews with those who opted into the interview in the survey were conducted via Zoom or in a study room. Excel was used for survey data analyses. Descriptive statistics were computed for all items.

We received 199 survey responses with 163 valid after removing responses under age 18 (10), non-consent (19), and duplicated submissions (14, only keeping the 7 older responses). A total of 91 responses from Engineering students (78 White, 2 Black or African American, 3 Asian, 1 Native American or Alaska Native, and 2 more than one race; 5 Hispanic, Latino or Spanish origin and 77 Not of Hispanic, Latino or Spanish origin; 28 females and 59 males; 18 first-Gen and 70 non-first-Gen; the remainder did not disclose their demographics information) made up the analytic sample. Both interviewees were non-first-Gen White males.

Primary Results and Discussion

Of 91 responses, only 18 students (including 1 minority, 3 first-generation students, and 9 females) reported awareness of AcES (19.8%) and 8 attended AcES (8.8%), indicating current communication channels inadequate to distribute AcES information. Of the 18 students aware of AcES (10 from multiple channels), 15 learned of it from emails, 3 from phone calls, 3 from social media, 2 from family and friends, 1 from campus tours, and 1 from WVU website. One interviewee was not aware of AcES, and one heard about it via email. Both often received college-related program information from high school counselors and checked emails regularly.

Figure 1 shows top communication channels suggested by students; email and social media ranked as the top choices. However, it contradicted the results of practice, since in 2021 and 2022 AcES adopted both channels yet they did not yield the expected return. Upon reflection, AcES used Twitter, Facebook, and Instagram accounts of the Engineering College and the Fundamentals of Engineering Program (FEP), and local Facebook groups that have limited student connections. For example, FEP Facebook only has 206 followers, and most posts have no likes or comments from prospective students. In addition, given all these social media platforms are follower-based, key influencers need to be identified to achieve effectiveness.

Prospective students in high schools use social media for social and entertainment but rarely follow official university accounts due to heterophily, timing, lack of access to computers or internet, etc. DOI theory proposes homophily as a barrier to diffusion because social networks are typically based on commonalities that do not yet exist between high school students and colleges due to timing of high school students. The diffusion process itself relies heavily on social capital and suggests that AcES information is not available to the students it needs to recruit [5]. Mail and in-person events targeting students of interest at high schools were rarely used by AcES but highly recommended by students, which may help reach more prospective students. In the future an inexpensive method based on DOI theory may be to ask former AcES participants to act as social media influencers to spread the information and visit their former high schools as STEM ambassadors.



Figure 1. Student-suggested recruitment channels (top 5: email, social media, mail, high school, and campus tour)

Limitations. We had few minority and first-Gen participants in survey and interview responses even though we contacted minority student organizations (no response). This result may be due to student demographics (84% White) and historical difficulties in getting minoritized groups to enroll in research [6]. Clicks and interaction of emails and social media through university accounts not belonging to the AcES leader were not tracked due to lack of access.

Future Work. We will analyze survey results on resource limitations and compare responses on AcES and Adventure WV first year trips. We will improve the sampling methods to recruit more underserved students to better reflect their perspectives.

References

- [1] M. Ashley, K. M. Cooper, J. M. Cala, and S. E. Brownell, "Building better bridges into STEM: A synthesis of 25 years of literature on STEM summer bridge programs," *CBE—Life Sciences Education*, vol. 16, no. 4, p. es3, 2017, <https://doi.org/10.1187/cbe.17-05-0085>
- [2] J. A. Youngman and C. J. Egelhoff, "Best practices in recruiting and persistence of underrepresented minorities in engineering: a 2002 snapshot," in *33rd Annual Frontiers in Education*, 2003, vol. 2, pp. F2D-11, doi: 10.1109/FIE.2003.1264705
- [3] X. Zhang, L. Santiago, and S. P. Hines, "WIP: Effectiveness of Recruitment Strategies for Underrepresented Groups in an Engineering Bridge Program," presented at the *First-Year Engineering Experience* East Lansing, Michigan, 2022. <https://peer.asee.org/42256>
- [4] W. E. Wall Bortz et al., "A Competitive System: Graduate Student Recruitment in STEM and Why Money May Not be the Answer," *The Journal of Higher Education*, vol. 91, no. 6, pp. 927-952, 2020, doi: 10.1080/00221546.2019.1706017.
- [5] E. M. Rogers, *Diffusion of innovations*, 5th ed. New York: Free Press (in English), 2003
- [6] R. Cropanzano, J. E. Slaughter, and P. D. Bachiochi, "Organizational Justice and Black Applicants' Reactions to Affirmative Action," *Journal of Applied Psychology*, vol. 90, no. 6, pp. 1168-1184, 2005, doi: 10.1037/0021-9010.90.6.1168.