International Journal of Engineering Education Vol. 35, No. 1(B), pp. 323–332, 2019
Printed in Great Britain

0949-149X/91 $3.00+0.00

Using Photovoice to Enhance Mentoring for Underrepresented Pre-Engineering Students*

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The aim of the study is to investigate barriers and motivators faced by American Indian students wishing to transfer from 2-year pre-engineering associate degree program to a 4-year bachelor's degree program using the active learning approach of photovoice and photo-elicitation. Five community college pre-engineering students participated in the study, which required them to meet with a faculty mentor about every 2 weeks and respond to four photovoice prompts. For each prompt students were required to take two pictures and write narratives explaining them. The photos and narratives were qualitatively assessed to identify four emerging themes related to enrolling and persisting in engineering education: (1) scheduling and prioritizing, (2) routine and structure, (3) family and community, and (4) avoidance motivation. This paper makes several contributions. First, it provides an example of how to apply photovoice and photo-elicitation to engineering education as an active learning approach to increase communication skills and reflection. Second, it highlights how the approach can be used to improve student success for non-traditional, underrepresented students. Third, the findings provide evidence for improved resiliency and increased student satisfaction when this active learning approach is combined with mentoring and applied to engineering education through the non-traditional pedagogical approach of photovoice and photo-elicitation.

Keywords: qualitative; Native American; minority; pictures; narrative

1. Introduction

Increasing demand for science, technology, engineering, and mathematics (STEM) professionals in the United States, has focused greater attention on the enrollment and retention of STEM students at universities and colleges across the nation. Specifically, there is increasing recognition of the need for individuals who bring diverse perspectives and ideas to grow a diverse workforce able to keep up with the demands of the 21st century. Doing so requires increasing access to STEM education for underrepresented and non-traditional students, including minorities, women, students with low socio-economic status, students with disabilities, and first-generation students [1, 2].

With that said, there are many barriers that exist for underrepresented and other marginalized students that result in low enrollment and completion rates in science and engineering programs. According to the National Science Foundation's Science and Engineering Indicators report 2018, about 69% of all natural sciences and engineering (S&E) major remained an S&E major two years later and the other 31% switched out to social and behavioral sciences, non-S&E, or undecided [3]. The report goes on to state that between 2000 and 2015, the quantity of S&E bachelor's degrees earned by minorities (including Hispanic, blacks, and American Indians) increased only marginally from a small quantity of about 16.7% to about 22.5%[3]. One of many barriers universities face, is how to create an inviting environment for underrepresented minority (URM) students that promotes student motivation, persistence and degree completion in engineering [4].

The American Indian demographic are of particular significance. In 2014, of all American Indians and Alaska Natives enrolled in an undergraduate degree program, only 30% had chosen a Science and Engineering major, which was substantially lower than other underrepresented groups which ranged from about 40% to 55% [5]. Furthermore, from 2000 through 2013, of those earning a bachelor's degree, 1.2% of the degrees were earned by American Indians and Alaska Natives, however, of those earning a bachelor's degree in Science and Engineering, only about 0.68% of the degrees were earned by American Indians and Alaska Natives.

Despite significant and focused efforts to foster increased diversity in engineering, research suggests that two key gaps in educational programming remain. First, scholars have indicated that experiential learning is an effective pedagogical approach to meet the needs of all students, but in particular, underrepresented populations [6–8]. Active and

* Accepted 29 October 2018.

experiential learning increases student engagement and concentration, and as a result, deepens learning in higher-level skills areas (analyze, evaluate, and create) which improves critical thinking and problem solving skills. A challenge for the field of engineering, is that awareness and adoption of experiential learning by faculty has been slow [9]. Engineering courses continue to emphasize textbooks, lectures, and theory over hands-on experiences. This poses challenges for students that thrive in more experiential learning settings, including underrepresented populations who have been found to be more visual and experiential learners.

Second, mentoring is an activity that has been shown to have a significant impact on retention [10], and while some universities offer mentoring programs, they are far and few in between. A review of the literature on undergraduate mentoring suggests that some progress has been made with respect to definitions, theory, and methods; however, gaps remain in identifying the specific program components of successful programs, assessing social validity, and employing more rigorous research designs [10]. Scholarship to date indicates that these programs tend to focus on informal meetings with a peer mentor, near peer mentor, or academic staff person, or they tend to be coupled with research opportunities with a focus more on research mentoring and less on navigational mentoring (which can include strategies to overcome alienation, develop realistic self-concept and self-appraisal, improve help-seeking skills [11]). Unfortunately, there has been a limited focus on formalized mentoring programs within STEM, or their effectiveness in assisting underrepresented students meet with faculty mentors to better understand options for overcoming barriers in academic life.

The purpose of this paper is to examine the impact of active learning techniques embedded in a formalized mentoring program at an institution primarily serving American Indian students. Photovoice and photo-elicitation are participatory action research techniques [12], that can be summarized into three key steps: (1) in response to a question or prompt, participants take photographs and provide a narrative explaining the photo, (2) group discussions are used to encourage further understanding and explanation around areas of greater concern, and (3) use the ideas and concerns to develop an action plan. As part of this semester long mentoring program, students met bi-weekly with a faculty advisor. Prior to each session, students were required to take a series of pictures related to perceived barriers and challenges for persisting in engineering education. During the mentoring session, students reflected and assigned narratives to the pictures by verbally explaining why the picture represented a barrier or challenge to their education. Then, the student and faculty mentor work together to develop an action plan for overcoming the barrier or challenge.

The following research questions were used to guide the exploratory study:

1. What are perceived barriers and motivators for underrepresented student as they relate to enrolling and persisting in engineering education?
2. How effective are these active learning techniques in eliciting barriers and student success strategies?
3. How does mentoring help underrepresented students overcome barriers and challenges, and promote motivators and successes?

2. Background

2.1 Current attempts to address the diversity challenge

Minority serving institutions, so designated by the United States federal government, has played a significant role in meeting the educational needs of URMs. These include HBCUs (Historically Black Colleges and Universities), TCUs (Tribal Colleges and Universities), and HSIs (Hispanic Serving Institutions). Other federal involvement includes financial support through Pell grants offered to low income students attending college and a movement by federal funding agencies to encourage or mandate increased URM participation in funded programs. The National Science Foundation through research and educational grants has a history of making implicit investments in broadening participation in STEM, and clearly articulating the importance of broadening participation within its strategic plan [13]. This means that research proposals have to address the needs of the varying populations they will serve. In addition, there are specific funding opportunities that specifically target broadening participation, such as NSF LSAMP (Louis Stokes Alliance for Minority Participation) established in 1991 [14], and NSF INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) established in 2013 [15]. Other federal agencies have followed suit, including NASA's MUREP (Minority University Research and Education Project) Educator Institutes established in 2014 [16] and USDA NIFA (National Institute of Food and Agriculture) WAMS (Women and Minorities) in STEM (Science, Technology, Engineering and Mathematics) established in 2009 [17].

Many universities are also committed to and investing in programs designed to increase access and equity to underrepresented populations. The University of Wisconsin at Madison recently rolled out Bucky's Tuition Promise program which offers free tuition to qualified students with a family adjusted gross income of $56,000 or less [18]. Michigan Technology University recently updated its strategic plan with a goal to increase female representation to 40% [19]. Most institutions offer pre-college information sessions, to help even the playing field for first-generation students. Increasing access to online courses, night and evening courses are making higher education more accessible to [20]. Lastly, there are many administrative structures, multicultural centers and student organizations organized around diversity. For example, Society of Women Engineers (http://societyofwomenengineers.swe.org), a U.S. organization dedicated to empowering women to advance in engineering, has about 300 regional collegiate member groups and about 100 regional professional member groups.

2.2 Barriers faced by American Indian students

Researchers have pointed out that URM students face a number of unique cognitive and contextual factors that influence their interest in, and persistence in STEM fields (sources). Many theories highlight the role of value and self-efficacy on motivation and cognition [21]. More recently, researchers have pointed to factors influencing persistence, such as environmental support as shown in the Student Motivation Learning Framework (Fig. 1), taken from the text "How Learning Works: Seven Research-Based Principles for Smart Teaching [22]". This framework offers an excellent starting point to better understand student motivation for STEM. Within this framework, the concept of value takes into consideration the question "Why should I do this task?"; The concept of self-efficacy explores the question "Can I do this task?"; and Environment refers to situational factors influencing student responses to "Will the conditions and setting support this task?". The literature on motivation for learning with respect to STEM education is also supported by this framework [23–26].

Researchers have proposed that value, self-efficacy, and environment has different meanings and implications for American Indian students transferring to bachelor-degree serving institutions in pursuit of a STEM education [27]. For example, it is common that they have limited exposure to college and vocations, deal with racism, take nonlinear paths, and face paradoxical culture pressure [28]. These impact career choice, educational persistence, and ultimately success.

Recent studies suggest that American Indian students see value in education and are motivated to enroll in college as a means of escaping the disparities of unemployment and ultimately to improve life for their family and community [29]. However, there is also research that posits there is a general cultural discontinuity for American Indian students attending non-American Indian schools [30]. The result is they tend to experience a devaluation towards their traditional cultural ways of knowing, which has the potential to distract students in everyday educational settings. This can lead to a lack of belonging and questioning of identity

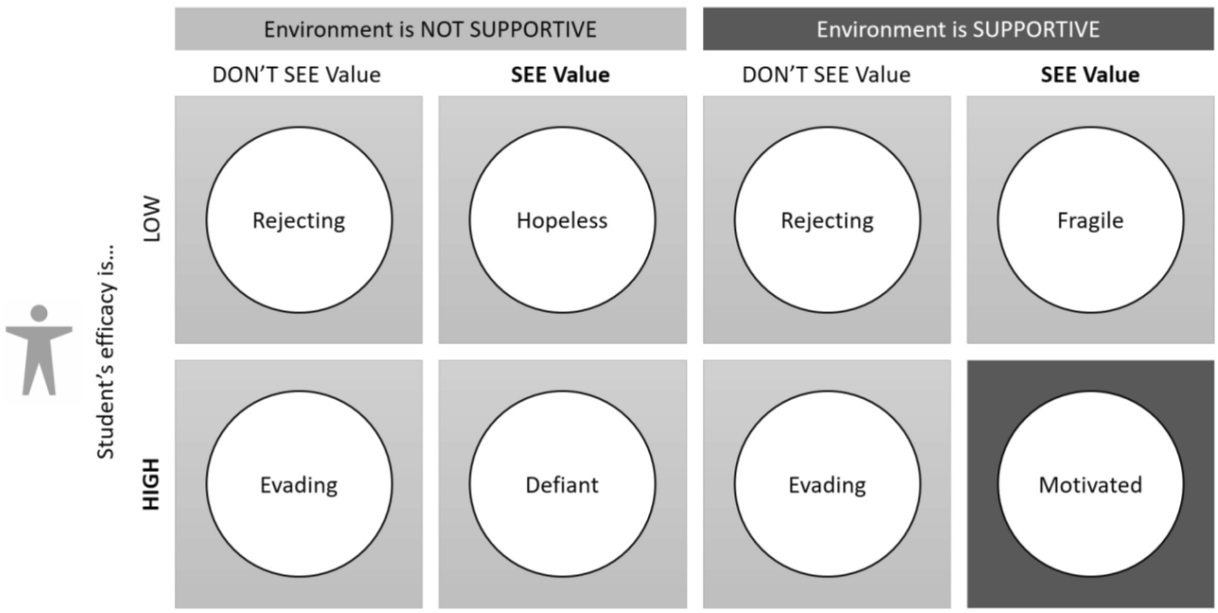

Fig. 1. Student Motivation for Learning Framework—Effects of Value, Self-efficacy, and Environment on Motivation [22]

[31] particularly those enrolled in predominantly white programs, where cultural sensitivity is not a major emphasis [32]. Since engineering identity, for example, is highly correlated with engineering retention, this implies American Indian students further disadvantaged when attempting to acclimate to places having limited awareness of traditional ways and American Indian culture [33].

Compounding the issue is the "chilly climate" (e.g., feelings of isolation, self-doubt, and questioning belonging) that is experienced by women and minorities in STEM. This results from the absence of role models for women and minorities, limited faculty interaction, and lack of effective advising, which is cited as a common cause of attrition from STEM education and the STEM workforce [27]. American Indian students are further disadvantaged because they are often first generation students (lacking access to parental guidance on college navigational skills) and typically fall into a lower socio-economic status (with limited financial resources to support professional preparation and advising for education and career pathways). Research suggests that first generation students are four times more likely to drop out of college before graduating [34]. As such, about half of people coming from high-income households have a bachelor's degree by age 25, whereas the same can be said for only about one in ten people from low-income households [35].

Research related to American Indian participation in STEM and engineering education research is limited, however, the literature suggests that an effective approach to understanding student issues and helping them overcome barriers is through mentoring [36, 37]. Raising awareness of the role of value, self-efficacy and environmental factors [22] in their success can give them the information they need to increase persistence for completing an engineering bachelor's degree [38, 39]. A better understanding of these processes can help educators and academic researchers develop more cohesive and targeted curriculum and extra-curricular activities, which relate better to their needs and interests.

2.3 Benefits of mentoring for nontraditional and underrepresented students

Tinto's [40] social integration model is considered an influential framework when working towards understanding student persistence in higher education. Every student approaches the trials of college from their cultural base; as a result, "social integration with peers and faculty can be crucial" in the persistence of underrepresented students [41]. Research suggests that mentoring increases minority student enrollment, academic achievement and retention specifically in STEM disciplines [42]. Findings also suggest that organized mentoring programs that connect same-race mentoring allows for empowerment in academic success and fosters the development of a "critical consciousness" which is a mutual understanding among the same cultural group [41]. Results of a study by Phinney, et al. [43] suggest that mentors help to alleviate psychosocial risk factors, which improves academic success. Lastly, a national survey of American Indians completed by WHO [44] revealed three factors that contribute to low retention rates, including: absence of faculty support, problems related to being a nontraditional student, and difficulties in acculturation.

Generally speaking, scholars suggest that student retention and success are improved through programs specifically designed to help nontraditional students, establishing support groups, and through peer or faculty mentoring. Although there is limited research on specific retention strategies for either non-traditional *and* underrepresented students, much of the current evidence suggests that social, and academic support and mentoring are successful strategies that should be implemented to increase the success. Offering social support and mentoring opportunities to engineering students can be the solution to increased student motivation for learning and successful academic achievement.

2.4 Experiential learning as a pedagogical strategy for nontraditional and underrepresented students

Active learning is an educational pedagogy that engages students through thought-provoking concepts such as applying, analyzing, and evaluating. It runs counter to passively listening. Examples of active learning approaches include think-pair-share, debates, and online discussions [45]. Some consider experiential learning to be a type of active learning, whereas, the learning process is accentuated through experience. It is based on the learner creating his/her own knowledge based on their experience. Kolb's Experiential Learning Theory defines successful experiential learning "as the process whereby knowledge is created through the transformation of experience"[46]. Knowledge results from the combination of grasping and transforming experience. Examples of experiential learning approaches are problem-based learning, simulations, and designing/building-based projects [6].

Photovoice and photo-elicitation are types of active and experiential learning in which students take pictures to document and reflect on a particular topic area, allowing students to construct meaning through actively participating in inquiry and reflection [47]. Photovoice provides students the opportunity to "voice" their thoughts through a visual representation and is an effective tool for marginalized and underrepresented populations [48]. The use of photovoice benefits participants as it empowers them to communicate about issues impacting their lives as well as provide an opportunity for them to document concerns that they face [49]. Through the use of pictures and written narratives, participants can share their perspective as someone with firsthand experiences. A student who participates in photovoice and photo-elicitation benefits by gaining hands-on, active learning experience through the application of inquiry, reflection, critical thinking, relevant class content, and opportunities for displaying multiple forms of communication. Photovoice and photo-elicitation compliment traditional classroom learning (lectures and textbook readings) by giving a student the opportunity to participate and apply knowledge and skills learned while increasing communication skills and the likelihood of student success. Motivating students with real and relevant instruction has been shown to increase their learning of theoretical concepts as well as provides students with a positive outlook towards the learning process [50].

3. Methods

3.1 Study design

Students enrolled in the associate's degree in pre-engineering, at a small community college primarily serving American Indian students, were offered the opportunity to participate in a semester-long mentoring experience requiring students to engage in participatory action research. Participants were recruited through a campus-wide email. The study design was approved by the intuitional review board. This exploratory study employed a qualitative methodology and action research.

3.2 Participants

Five students participated in the study, which is appropriate for a qualitative study, as well as the population in the particular context sampled. All five participants were enrolled in an associate's degree in pre-engineering at a small minority-serving community college in northern Wisconsin, U.S.A. Four of the participants identified as American Indian. All five participants fit the category of nontraditional due to either part-time enrollment status and/or non-continuous enrollment. One participant was female. Four of the participants were first generation students. Two participants were parents. All five qualified as low income students.

3.3 Measures and data collection

To collect the necessary qualitative data, the mentoring program required that students meet with their faculty mentor 8 times during the course of the semester. Students were given "homework" assignments requiring them to take photographs as a response to a prompt. All students were provided a Wi-Fi-enabled, unlocked Smartphone (TracFone LG Rebel 4G LTE) which included the following features: 5 megapixel camera and 2 megapixel front facing camera. The following prompts were used to promote reflection and elicit discussion during the mentoring sessions.

- Reflect back over the last few weeks and take pictures to identify two challenges or barriers that negatively impact your educational experience.
- Reflect back over the last few weeks and take pictures to identify two successes or motivations that positively impact your educational experience.
- Prior to enrolling in this pre-engineering program, take pictures to identify two challenges or barriers that had a negative impact on you, and potentially helped guide your decision to enroll.
- Prior to enrolling in this pre-engineering program, take pictures to identify two successes or motivations that had a positive impact on you, and potentially helped guide your decision to enroll.

The mentoring approach applied in this study was grounded in participatory action research, where students use reflection and inquiry to understand and acknowledge the issues they are facing, then apply experimentation in an effort to make positive changes to improve motivations for student success. Thus, instead of university faculty and staff telling students what they were thinking and what changes they should make, students were guided down a path of self-discovery.

During each mentoring session, the SHOWED method [51], as shown in Table 1, was used as an active learning technique to elicit an explanation from the pictures. Real-time transcription captured participants' reflective, thought-provoking responses. The elicitation was designed to allow participants to take ownership of the explanation, and provide approval of the final submission. The data (including pictures and narratives) were stored on a common shared drive within a folder, which only the researchers could access.

4. Analysis, results and discussion

The NVivo 11 qualitative analysis software was used to analyze the transcripts. All data documents were imported into NVivo and the researchers read through the documents several times. Two researchers individually coded and highlighted the documents with the purpose of identifying themes related to the research questions and picture taking prompts. Upon completion of the independent

Table 1. SHOWED Method1

1.	What do you ***See*** here? What is this photo about?
2.	What is really ***Happening*** here? Why does this photo represent to you?
3.	How does this relate to ***Our*** lives? How does this challenge/barrier or success/motivation impact your life?
4.	***Why*** does this concern, situation, strength exist? Why does this challenge/barrier or success/motivation exist? What would prevent/stop it from existing?
5.	How can we become ***Empowered*** through our new understanding? Now what? How can you overcome the challenge/barrier? How can you leverage the success/motivation?
6.	What can we ***Do***? What are the next steps? What are your goals for moving forward?

analysis, the researchers compared their results, read through the documents again, and came to a consensus for developing themes and a coding framework. Analysis of the photovoice and photo-elicitation documents led the researchers to identify four themes related to enrolling and persisting in engineering education: (1) scheduling and prioritizing, (2) routine and structure, (3) family and community, and (4) avoidance motivation.

4.1 Scheduling and prioritizing

All participants acknowledged that scheduling and prioritizing were important skills required to successfully navigate higher education. Furthermore, the students expressed difficulty with time management and the likelihood of distractions (e.g., work, transportation, hobbies) getting in the way of completing school-focused tasks.

> "When the issue occurred with my vehicle it demanded my full attention. I was fully focused on getting it fixed and it took me away from focusing on school work."
>
> "This picture [of a TV] represents my procrastination and my ability to not control myself. It makes me lazy and keeps me from doing my homework."
>
> "Work tends to take up a lot of my time that would be better spent either studying or sleeping."
>
> 'This picture represents a calendar and how I need to find a way to balance out and organize my schedule."
>
> "Moving forward I want to stay on task with my time management in terms of planning ahead of time, so that assignments are submitted according to its deadline."

Discussion

These findings justify that students could benefit from capacity building that focuses on time management, including the ability to schedule and prioritize tasks. For example, first-year student success strategies should focus on methods for effectively organizing and planning. Here, students should be introduced to Google Calendar (or a similar digital application) and/or using a hard copy calendar to organize assignment due dates. In addition, students should be encouraged to create a daily/weekly schedule to aide in organizing their work, school, and family responsibilities. Furthermore, given the role that faculty can play in a student's schedule, it is critical for faculty to develop a course schedule at the beginning of the semester *and* stick to it.

4.2 Routine and structure

Several participants acknowledged that routine and structure were important to successfully navigating higher education. The students expressed the desire for control, accountability, and clear instructions, both directly and indirectly.

> "[Enrolling a child in early education] introduces them to social structure and highly increases the chance they will attend higher education."
>
> "Seeing the organizational chalk board on my fridge whenever I grab a snack helps to keep me on track with my goals. My chalkboard allows me to structure my days to maximize productivity."
>
> "This picture represents my home life; because I am so particular about everything in my house and I want everything to be a certain way. This makes me feel good because I can control everything in my house."
>
> "That picture shows the assignments that we have to do but he [instructor] breaks them down in how he wants them done and how they should be done. I haven't had other instructors do that before and having him tell us what he wants done shows that he cares and that motivates me."

Discussion

These findings imply that students could benefit from resources and tools that focus on routine and structure. For example, course modifications could increase value to students by incorporating "small teaching" techniques (e.g., small activities which require minimal preparation and allows for easy grading [52]). Furthermore, sometimes instructors may think they are doing students a favor by extending deadlines and allowing them to turn in low-quality work, but these findings suggest students thrive best under terms which include structure, accountability, and "certainty". This approach might be particularly advantageous for first-year students and general education courses; instructors should stick to the syllabus and provide clear guidelines up front. Consistency and established processes is key.

4.3 Family and community

All participants acknowledged that family and community were key motivators in completing their engineering degree. The students expressed a desire for a recognition or shared sense of pride in celebrating family related successes.

> "Everybody sitting at the table has some type of college degree with the exception of my grandma. They tell me if "we can do it you can to".

> "Going back to school was a big step but my family helped push me to go for it. This strength exists because it is one of the written rules that family always pushes you to be better."

> "My dad had shared with me some information about the Pre-Engineering program and decided I would give it a try."

> "My dad is from [location], and I have a lot of family that live there. My goal once I graduate is to get an Engineering job downtown [location], and hopefully live downtown or in a nice suburb outside of [location]."

> "This photo represents civil engineering while protecting the environment. I'm empowered and it provides motivation for me to make change in my community and in society as a whole."

Discussion

These findings show that student success is not limited to the individual, instead, family and community play a constant role in student motivation to succeed. Thus, academic institutions should consider and allow opportunities for family and community to celebrate in the successes of students after the completion of key milestones (e.g., capstone courses, graduation, visit to transfer school, acceptance into transfer school). In addition, marketing and recruitment materials should provide consideration for family pride and family values. Lastly, higher education institutions should provide a "center" or a place where all parents and family members feel welcome and comfortable, and they should provide meaningful resources for parents to educate themselves on how to become a college advocate and advisor for their child.

4.4 Avoidance motivation

Many participants acknowledged that avoidance of heading down a negative path was a key motivator for enrolling in the engineering degree. The students expressed a desire to escape certain adverse lifestyles (e.g., debt, loneliness, alcoholism, and gaming).

> "I've pretty much lived my life paycheck to paycheck and I wanted this to change."

> "A challenge that helped with my decision to enroll in college was the loneliness and isolation I felt when I first moved to [location]."

> "This photo is a challenge for me because before I returned back to college I was out partying a lot!"

> "The time I spend on playing games can provide a major setback for someone who is a major gamer like myself."

Discussion

These findings propose that a significant driver for student enrollment in college and the pre-engineering program was to avoid going down a "bad" path. For several of the participants, the choice to enroll in college was as an avoidance mechanism. They recognize they are going down a "bad" path and know that school presents opportunities for going down a "good" path. That being said, many students don't come to college with a long-term plan. They come with a short-term mindset seeing education as a "way out". Thus, more often than not, students don't know what major to enroll in or even what career path to follow. Higher education institutions should recognize the potential that students will change their major multiple times, and they should have processes and procedures in place to allow students the option to easily and efficiently switch majors. Higher education institutions should also provide seminars and workshops that give students the opportunity to learn about a variety of disciplines and should provide guidance counseling for staff to help students figure out where to start. Lastly, providing support and assigning a mentor early on in a student's college career allows for ongoing discussions and encouragement as well as feedback which empowers students to persist.

4.5 Summary of findings

The findings suggest that participants benefit from the semester long photovoice oriented mentoring in a variety of ways. First, the real-time transcription of photovoice elicitation appeared to empower students, providing them ownership and clarification of their thoughts and perspectives. Second, by sharing their thoughts with a faculty mentor, participants appeared to showcase contentment associated with validation of feelings. Third, by documenting and acknowledging their perceived barriers and fears, students were then empowered to take action through brainstorming options and consequences with the faculty mentor.

The accountability required by the mentoring program provided the structure and frequency of interactions that were beneficial to students. Participants appeared to enjoy the emotional support, not typically offered while they traverse family, work, and school balance which forces them to remain "strong" in the face of adversity.

The mentoring benefitted faculty as well. It was reported that there was an increase in empathy towards environmental factors and situations associated with nontraditional underrepresented students. This increased empathy has the potential to impact teaching approaches and transform institutional recruitment and retention strategies in an effort to increase student success for nontraditional underrepresented students.

5. Conclusions

5.1 Summary

Increasing representation in engineering has many benefits. First, in the United States, population demographics are shifting dramatically. Thus, optimizing engineering curriculum to fit the learning styles and preferences of a maximum amount of learners is a must to remain competitive in efforts towards research and development. Second, diversity drives innovation in that diverse individuals and groups are typically smarter and more creative than homogeneous groups, throughout the engineering design and innovation process.

This paper makes several contributions. First, it provides an example of how to apply photovoice and photo-elicitation to engineering education as an active learning approach to increase communication skills and improve student success for non-traditional underrepresented students. Second, the findings provide evidence for increased student learning outcomes and improved student satisfaction. The results from this work provide insight into the impact and implications resulting from active learning applied to engineering education through the non-traditional pedagogical approach of photovoice and photo-elicitation.

5.2 Future research

To gather even richer data, future mentoring-focused participatory action research should consider the following additional prompts. These would provide increased understanding towards students' reasoning for enrolling, persisting, and finishing an engineering program, aiding institutions in developing strategies for increased effectiveness related to recruitment, retention, and completion for URM students.

- It's the beginning [or middle or end] of the semester. Reflect back over the last few weeks and take pictures to identify (a) two challenges or barriers that negatively impact your educational experience and (b) two successes or motivations that positively impact your educational experience.
- For many students across all universities, understanding and navigating education and career choices can be difficult. Reflect back on education and career advice you have received over the years. Take pictures to identify (a) two pieces of advice received that you perceived to be lacking usefulness or not helpful and (b) two pieces of advice received that you perceived to be particularly useful in navigating education and career choices.
- After completing the associate's degree in pre-engineering, likely next steps are to get a job and/or transfer to a 4-year school to get a bachelor's degree. In whatever your decision may be, (a) take two pictures identifying challenges or barriers that may negatively impact your choices, and (b) take two pictures identifying successes and motivations that may positively impact your choices.
- There are many challenges/barriers and success/motivations that influence your ability to perform well as a student. Take 4 pictures suggesting where institutional change could/should be made to increase your success towards persisting and completing the degree. How can we (as an institution) do things better?

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