

Easing Students' Transitions to University Via a Summer Bridge and Outdoor Experience Program

Dr. Noah Salzman, Boise State University

Noah Salzman is an Assistant Professor at Boise State University, where he is a member of the Electrical and Computer Engineering Department and IDoTeach, a pre-service STEM teacher preparation program. His work focuses on the transition from pre-college to university engineering programs, how exposure to engineering prior to matriculation affects the experiences of engineering students, and engineering in the K-12 classroom. He has worked as a high school science, mathematics, and engineering and technology teacher, as well as several years of electrical and mechanical engineering design experience as a practicing engineer. He received his Bachelor of Science degree in Engineering from Swarthmore College, his Master's of Education degree from the University of Massachusetts, and a Master's of Science in Mechanical Engineering and Doctorate in Engineering Education from Purdue University.

Ms. Ann Delaney, Boise State University

Ann Delaney is the Program Director of the SAGE Scholars scholarship program at Boise State University, which is part of the Redshirting in Engineering Consortium. As part of this program, she collaborates with the Institute for STEM and Diversity Initiatives at Boise State to organize the RAISE summer program (Recreation and Academics In a Summer Experience) for incoming first-year STEM students. She also teaches a service-learning Introduction to Engineering course at Boise State. Ann graduated with her Masters in Materials Science & Engineering with an interdisciplinary emphasis in Public Policy and Administration from Boise State University. In the Spring of 2016, Ann was recognized as part of the first cohort of University Innovation Fellows at Boise State. As a Fellow, she has worked on issues around diversity and makerspace culture, and has facilitated Design Thinking workshops for the J.A. and Kathryn Albertson Family Foundation, Boise State, and the University Innovation Fellows organization (now part of the Hasso Plattner Institute of Design at Stanford, a.k.a. the d.school).

Mrs. Catherine Rose Bates, Institute for STEM & Diversity Initiatives

Catherine Bates received a bachelor's degree in Women's Studies and Creative Writing from Florida State University and a Master of Fine Arts in Creative Writing with an emphasis in fiction from Arizona State University. She serves as the Program Director for the NIH Southwest Bridges to Baccalaureate program and the Program Coordinator for the NSF Louis Stokes Alliance for Minority Participation program. In her current role at the Institute for STEM & Diversity Initiatives, Catherine is dedicated to expanding research and experiential learning opportunities for students traditionally underrepresented in STEM fields.

Dr. Donna C. Llewellyn, Boise State University

Donna Crystal Llewellyn received her BA (major in Mathematics and minor in Economics) with High Honors from Swarthmore College in 1980. She went on to earn an MS in Operations Research from Stanford University in 1981 and a Ph.D. in Operations Research from Cornell University in 1984. After 30 years at Georgia Tech in a variety of roles, Donna became the Executive Director of the new Institute for STEM and Diversity Initiatives at Boise State University in January 2015. Donna's current interests center around education issues in general, and in particular on increasing access and success of those traditionally under-represented and/or under-served in STEM higher education.

Easing Students' Transitions to University Via a Summer Bridge and Outdoor Experience Program

In this Complete Evidence-based Practice paper, we describe the development and evolution of a combined academic summer bridge program and outdoors experience program designed to support the academic success and development of incoming STEM majors at Boise State University. First-time, first-year students' transitions to university can be challenging for a wide variety of reasons, including increased independence, leaving behind parents and friends while simultaneously struggling to form new peer groups, and adapting to more rigorous coursework with less externally imposed structure than prior learning experiences. These challenges, especially those related to students' sense of belonging and connection to other students, can be particularly pronounced for women, non-traditional students, first generation students, students with high levels of financial need (such as those who are pell-eligible), and members of underrepresented minority groups.

To address these challenges, we first developed a multi-day summer outdoors experience, designed to strengthen relationships, build community, and increase participants' sense of belonging in STEM disciplines through camping, rafting, hiking, and exploring STEM activities in the outdoors. This outdoors experience program was originally supported by grant funding. As the program evolved and the grant funding was reaching an end, the outdoors experience program was combined with the need by several grant-funded academic programs at Boise State University for an on-campus academic summer bridge program. Such a bridge program had already taken place for one year in the form of a one-day on-campus "bridge day" for students participating in the NSF-funded LSAMP (Louis Stokes Alliance for Minority Participation) program. The added on-campus bridge portion of the program immediately preceding the outdoor experience focused on relationship-building among STEM students, skills and resources for academic success, structured interactions with faculty, and social events designed to promote connection and academic success at the university. We also added a new focus on support of underrepresented racial and ethnic minority, low socioeconomic status, rural, and/or female students through strategic recruiting and cohort building. Inspired by other universities' efforts to attract and retain promising students with reduced mathematics preparation, we have integrated support for these students in the program as well. Through these activities, students transition to their first semester at Boise State University with relationships with peers, faculty, and staff that can support the students' successful transition from high school to college and persistence in their STEM degree program.

The programs described in this paper have existed in different forms since 2011, beginning with a pilot program involving four participants and at one time including as many as 33. To measure the lasting effects of these programs, we surveyed the participants and tracked their academic progress over several years. Results of these assessment efforts suggest that the program supported students' success at Boise

State University through the development of lasting relationships with peers, faculty, and staff, and overall was a positive experience with lasting effects on the participants.

In addition to the evolution and outcomes of this program, we also describe how the funding model for this program has changed over the years, beginning with an NSF-funded scholarship program and transitioning to being institutionalized and supported through the university budget and private foundation support.

Literature Review

Importance of Belonging and Peer Networks

When students come to college, they are entering a new learning environment and may also be moving away from friends, family, and familiar surroundings at the same time. One factor that can make a difference during a transition where students are in an unfamiliar setting is having a sense of belonging. Strayhorn describes this as “a basic human need and motivation” that includes “students' perceived social support on campus, a feeling or sensation of connectedness, the experience of mattering or feeling cared about, accepted, respected, valued by, and important to the group or others on campus” [1]. The impact of belonging for engineering students has been explored by several authors [2]–[4], who generally concluded that belonging and identifying as part of a group (such a department or engineering discipline) is important in retention for students in engineering majors. Strayhorn examined belonging relative to the summer bridge program that he studied and while his survey results did not show a statistically significant change in belonging, interview data indicated that several aspects of the program design were noted by students as having increased their sense of belonging. These included an elaborate opening ceremony with high-level university administrators welcoming students to the program and the university, as well as highly attentive faculty who were willing to help students and share personal experiences [1].

While forming connections with faculty and feeling recognized by administrators has been shown to be helpful in building belonging in the context of a summer bridge program, there is also a large body of work exploring the impacts of peer interactions and mentoring on student success in general and in engineering, specifically. Parker et al. discuss how ideas of peer influence came out of the field of psychology and how interactions with knowledgeable peers can be impactful in coaching and experiential learning [5]. Two examples of the demonstrated impact of peer mentoring on student success in engineering include a program at University of Arkansas that showed significantly higher fall-to-spring student retention and higher average GPA among students who were part of a freshman peer mentoring program [6], as well as Marra et al.'s study of students who participated in a peer mentoring program and their subsequent feelings of belonging and intentions to persist in engineering [7].

Summer Bridge Programs

It is well established that summer bridge programs work. Summer bridge programs have been implemented at many universities in an attempt to combat the high rates of attrition observed in STEM majors, especially in students from underrepresented backgrounds in STEM [8]. Bridge programs take many forms, with some focusing substantially on increasing math readiness [9]–[11] and on the development of study skills and general college readiness [12]–[14]. Others support students as they take summer courses before the start of their first academic year [15], [16], while many summer bridge programs run by colleges of engineering include a design challenge or other design/build experiences as part of their programs [17]. Some programs also target their support to specific groups, including students who are less prepared for college math than their peers, first generation and low income students, underrepresented minority students, and women [18]–[21]. The programs range in length from a few days to several weeks, with most including living on campus as part of the program. In addition to focusing on mathematics and engineering, most residential summer bridge programs also include structured social programming, both as a way for participants to relax and to build informal connections and relationships with their peers.

Outdoor Experiences

While substantial literature exists around summer bridge programs for STEM students, few of the papers describe a substantial outdoor component to the program. A review of literature on outdoor recreation by Andre et al. presented evidence that outdoor programs that take place prior to students' first semester at a university can bond students together through intense experiences and create supportive relationships that can help incoming students, as well as reinforcing group and teamwork skills [22].

Program Background and Origins

Recreation and Academics In a Summer Experience (RAISE) is a summer program for incoming first-year STEM students at Boise State University. While the program is open to all incoming first-year STEM students, the program is primarily designed to support students who are first-generation college students, underrepresented minorities, women, and/or have high levels of financial need.

The RAISE program is the fusion of two existing summer student-support programs: STEM Summer Adventure and Bridge to Boise State (formerly the LSAMP Bridge Day). We believe that the combination of these two programs provides an experience that is impactful for students and uniquely showcases the on- and off-campus experiences that the university has to offer STEM students.

The STEM Summer Adventure started in 2012 as part of the STEM Talent Expansion Program (STEP), an NSF-funded effort to increase the retention of first-time, full-time STEM students at Boise State University. The program has always consisted of a water activity such as rafting or canoeing as a means of bonding incoming first-year STEM students, plus opportunities for mentorship from STEM faculty and/or staff, prior to the start of their first semester of college. In recent years, this has consisted of

whitewater rafting (led by the University Outdoor Program, also referred to as the “OP”), as well as camping and hiking in the mountains north of Boise.

The Bridge to Boise State program originated from a regional NSF LSAMP Alliance as a method to increase retention among prospective first-year underrepresented minority STEM students. The one-day Bridge program aimed to increase student belonging among first-year LSAMP students. The university LSAMP program is housed in the Institute for STEM & Diversity Initiatives (ISDI). The LSAMP program has been on campus at Boise State University since 2011 and moved to ISDI in 2015. This organizational shift has helped leverage funding and collaboration for LSAMP’s Bridge component, and helped the program evolve into a multiple day Bridge experience. The program is now co-organized by LSAMP and an NSF-funded S-STEM scholarship program, SAGE Scholars, which follows the Redshirt in Engineering model [23]–[25].

Program Activities

While the program activities of Bridge to Boise State and STEM Summer Adventure (now merged into one program under the title, RAISE) have evolved over the years, common elements have remained important components of the program over time. These include peer mentoring, opportunities to connect with STEM faculty, team and community building activities, and sessions that focus on building mindsets and habits linked to academic success, such as a growth mindset. The following is a summary of the program activities from the most recent year of the RAISE program, which are reflective of, if not identical to, the program activities from previous years of the Bridge to Boise State and STEM Summer Adventure programs.

Peer Mentoring

Feedback from previous years of Bridge to Boise State and the LSAMP Bridge Day suggest that one of the most impactful aspects of the program was the opportunity to interact with students already pursuing STEM degrees. Peer mentoring provides the opportunity for community-building with students already at the university who they may see around campus after the program, as well as opportunities to hear stories how these students have overcome challenges in their majors (and in life in general). While messages delivered by faculty and staff can be helpful, hearing stories of overcoming challenges and advice about study skills and campus resources from peers reaches students in a relatable way that can sometimes be more memorable than hearing the same information from a university staff or faculty member.

Since we realize the importance of peer mentors to the program, we devoted time before the start of the program for a half-day training with the peer mentors. This served not only to convey logistical details to them about their role in the program, but also to help them understand the importance of their role and equip them with some methods and tools to deal with situations that they might encounter during the program. We also provided leadership opportunities for the peer mentors by empowering them to facilitate one of the sessions of the Bridge program (a session on the importance of communication) and

assigning them each a “family group” during the Bridge program so that they each had a small group of students who they got to know and interact with more closely.

On-Campus Programming (Bridge to Boise State)

The on-campus “Bridge” portion of the RAISE program is designed to introduce students to the campus and familiarize them with resources that are available to help them be successful as STEM majors. A detailed schedule of events for the on-campus portion of the RAISE program is available in Appendix 1.

Connection with Orientation

In 2018, the RAISE program was connected to a previously scheduled New Student Orientation hosted by Boise State. This connection allowed Bridge programming to tie into content that was covered in orientation sessions to reinforce points and connect with what they had already heard from other campus programs during Orientation about campus resources and strategies for success in college. In 2017, the program occurred directly before the beginning of the semester, but this presented numerous logistical challenges, so we moved the program to the middle of the summer and added the partnership with orientation to decrease the travel burden for individuals who might otherwise have had to make a separate trip in order to attend the program, which could be a financial hardship.

Welcome Dinner

The Bridge activities kicked off on the evening of July 10 with a welcome dinner to transition from orientation into the RAISE program. RAISE participants were welcomed by the program staff as well as the peer mentors, and included an invited talk from the Director for Student Diversity and Inclusion at Boise State. As part of the dinner, participants and peer mentors also did two icebreakers - one where they co-created a shared made-up memory with another person and a whole-group icebreaker which highlighted similarities in interests, hobbies, and life-experiences among the participants. After the welcome dinner, students settled into the dorm together and watched a movie.



Team Building

The first full day of the Bridge program started on the morning of July 11 with a half-day of team building activities facilitated by staff from the Boise State Outdoor Program (OP). These activities addressed ideas around communication, trust, and teamwork. Students participated in the team building activities with their “family groups” (the groups of students assigned to each peer mentor) alongside the peer mentors, which

further served to cement bonds between the students in each group.

The staff who facilitated the team building were also the same student and professional staff from the OP who led the Outdoor Experience later in the week, so these activities provided a nice way to tie together the RAISE program. Also, since a few students were not able to participate in the Outdoor Experience due to prior conflicts, they still got to experience these outdoor team-building activities and develop trust and rapport with other students through them. This is one way in which we have been working to more fully integrate the on-campus and outdoor portions of the RAISE program, and it seemed quite successful.

Faculty Networking

After lunch, participants had a chance to interact with faculty invited for a networking session with the students. Our main goal for this activity was to show faculty as approachable and relatable, as well as to give faculty a chance to impart some advice to the incoming students. We did this via a round-robin “speed networking” format where students and faculty drew questions from bowls in the center of the tables to discuss, then students cycled between tables to get a chance to talk with all (or at least most) of the faculty in attendance. Some of the questions were more personal, covering topics such as interests and family traditions, while others were more school focused, such as asking faculty to describe what they think makes students successful in the course(s) that they teach. Since many of the RAISE participants were students entering the SAGE Scholars program, we invited the SAGE faculty mentors to participate in this session to give them an early chance to meet the incoming cohort of students.



Design Thinking Challenge

As part of the RAISE program, students participated in a two-day design challenge centered around the design of a simple flashlight. This was tied into the outdoor portion of the program, with the intent that students would design a “light-emitting device” (a handheld flashlight, headlamp, or

something else that emitted light - the prompt was very open-ended) that would suit the individual needs of their partners. This activity was spread over two days. On the first day, they received the materials and were taken through a facilitated design thinking activity where they interviewed their partners and generated a statement of needs based on the interviews, then generated a series of ideas and created a prototype based on feedback from their partners. They were then given the chance to test their prototypes overnight and receive feedback to improve their designs from their partners the next day.

The first portion of the design thinking activity (on 7/11) was conducted at the downtown Computer Science building, giving students a chance to see the new building and take advantage of the flexible

classroom space there. This also conveniently positioned the group downtown on an evening when a free concert series was going on, giving students a chance to experience live music, explore downtown on their own in the evening and walk or take the shuttle back to campus at their leisure.

Growth Mindset Presentation/Activity

Another part of the program that we believe is very important to prepare incoming STEM students for success in college is an introduction to the concept of Growth and Fixed Mindsets [26]. As part of this session on the second day, we had an introduction to the MakerLab (the campus makerspace, located in the Library), then had a presentation from the Advising and Academic Success Center about the growth mindset and how this can be helpful in overcoming obstacles and failures that occur in college. Part of this presentation involved students filling out a “growth mindset inventory” where they answered questions which allowed them to get a sense of where they currently fall on the spectrum from fixed to growth mindset.

We partnered with the MakerLab on this session, allowing students to create custom stickers or buttons that represented their RAISE experience and/or could help them remember to keep a growth mindset. Making is an important tie-in to the growth mindset, since it often involves learning new skills (such as sewing or 3D printing) and can be a great way to develop a growth mindset through low-stakes opportunities to fail and improved skills by learning from these failures.

This growth mindset is especially transferable to first-year math and other STEM courses, as this is often a place where people encounter failure (real or perceived) in their first year. Students with a fixed mindset may take these failures as a sign that they do not have the inherent traits required to be successful in a STEM major, while those with a growth mindset are more likely to see such a failure as an obstacle which can be overcome by practice and learning.

Students presented their buttons or stickers to each other, which served as a wrap-up of the second full day of the on-campus program and of the on-campus program as a whole.

Overcoming Challenges and Asking for Help

A couple other major takeaways we wanted students to come away with from the RAISE program were a sense of community and identifying campus resources that could aid in their success during their first year and beyond. To this end, we had another presentation from the Advising and Academic Support Center, about asking for help.

We also had presentations throughout the week from the peer mentors, who told stories of how they had struggled and overcome challenges during their time at the university. Since many of the peer mentors were students who had just completed their first year of college themselves, they had very relatable stories about a diverse array of challenges, from mental and physical health issues to academic struggles and challenges with balancing athletics or other extracurricular activities with academics. These stories,

told at strategic points throughout the Bridge program, were one of the most important contributions of the peer mentors, and something that we asked them to come up with during the training.

Community Building

We provided evening activities throughout the program to help build community, such as a movie on the first night, the opportunity to explore downtown and a concert on the second night, and a variety of on-campus activities on the third night (lawn games, a water-slide event that was going on at the residence hall we were staying in, and free access to the Student Union Game Center). However, we have also observed that students organically organize activities with each other, so we leave the evening activities more unstructured. One unplanned, but successful, evening activity that was organized by the peer mentors was a group of students who walked or cycled downtown on the first night after the movie to get ice cream. We observed that linking the RAISE program with orientation also helped with community building, as some students seemed to have formed social relationships during orientation which endured and strengthened through the course of the RAISE program.

As mentioned above, we also grouped students into “family groups” which were assigned to 1-2 peer mentors. Through team-building with the staff of the OP and other activities that were done in these groups (including walking between locations on campus), students had sustained interaction with a smaller group of students than the entire group of program participants, which in turn fostered developing closer relationships with a subset of their peers with the goal of increasing the likelihood of students maintaining these relationships beyond the conclusion of the program.

Outdoor Experience

The Outdoor Experience portion of the RAISE program is designed to provide an opportunity for bonding between students, as well as with STEM faculty and staff, while experiencing the unique (and easily accessible) wonders of the local outdoors. During the Outdoor Experience, students experience whitewater rafting on Class I-III (Easy to Intermediate) rapids, hiking in and around wilderness areas, camping and cooking together, and several STEM-focused outdoors activities. This trip is led by Boise

State’s Outdoor Program, and is primarily staffed by student employees of this program. For many participants, this trip represented their first overnight outdoors experience, a source of excitement and some apprehension. A detailed summary of program activities for the Outdoor Experience portion of the RAISE program is available in Appendix 2.



This aspect of the program provides numerous opportunities for students to develop teamwork, leadership, and relationship skills through the context of outdoor activities. These include

working together to set up their campsites and take care of common camp tasks like cooking and cleaning up after meals, and eating meals together and participating in games and other activities at the campsite. Whitewater rafting requires good listening skills and working together to maneuver the boat, and the excitement of this activity further contributed to student bonding. Hiking provided a more contemplative outdoors experience, and further contributed to team building as the participants worked together to determine how far and how quickly they wanted to hike. Many years we have also included some much needed quiet reflection time as part of this activity as a contrast to busyness and near constant peer engagement characterized by most of the rest of this trip.

In addition to the camping and other outdoors-focused activities, participants engaged in a variety of STEM-focused activities as well. These included drift-netting, where participants used large nets to collect and identify macroinvertebrates found in the river near the campground, and a Rube Goldberg activity where teams of participants built and demonstrated chain reaction machines that they build from materials that they found around the campsite. In some years, guest STEM professionals and professors spoke to the participants on topics such as water quality, hydrodynamics, and local flora and fauna.

Program Assessment

Methods

To assess the lasting results of participating in the STEM Bridge and Outdoors Experience programs, we developed a survey consisting of a series of open-response questions and questions about the respondents' demographics. The open response questions focused on students' perceptions of how participating in the programs influenced their transition to the university, the development of long term personal and professional relationships, and effects on their confidence in being successful at Boise State University. We distributed the survey via the Qualtrics online survey package to all students who had participated in the program in the preceding four years. Of the 97 program participants who received an invitation to complete the survey, 29 responded for an overall response rate of approximately 30%. Data from the qualtrics survey were exported and subsequently coded and analyzed using Microsoft Excel to identify common themes in the responses [27].

In addition to the data obtained from the survey, we obtained information on the participants including demographic information and current major from university records. We present these quantitative data and the result of our thematic analysis in the following sections.



Survey Results

Participant Demographics

Tables 1 through 6 show the composition of the population of students who participated in the program and who responded to the survey.

Table 1: Participants by Year

| | Total | Respondents |
|------|--------------|--------------------|
| 2015 | 34 | 7 |
| 2016 | 26 | 6 |
| 2017 | 16 | 3 |
| 2018 | 21 | 12 |

Table 2: Participants by Sex*

| | Total | Respondents |
|--------|--------------|--------------------|
| Female | 45 | 9 |
| Male | 52 | 13 |

*An “other/prefer not to respond” option was provided, but not selected by any respondents

Table 3: Participants by Race/Ethnicity

| | Total | Respondents |
|------------------------------------|--------------|--------------------|
| American Indian / Alaska Native | 1 | 1 |
| Asian | 3 | 1 |
| Black /African American | 1 | 1 |
| Hispanics of any race | 25 | 6 |
| Two or more races | 6 | 2 |
| White | 61 | 19 |

Table 4: Participants by Hometown

| | Total | Respondents |
|--------------------|--------------|--------------------|
| Greater Metro Area | 39 | 7 |
| Elsewhere in State | 26 | 8 |
| Out of State | 36 | 7 |

Table 5: Participants by Major

| | Total | Respondents |
|--------------------------|--------------|--------------------|
| Mechanical Engineering | 21 | 5 |
| Civil Engineering | 12 | 3 |
| Materials Science & Engr | 8 | 3 |
| Electrical Engineering | 6 | 2 |
| Other Engineering | 3 | 0 |
| Computer Science | 20 | 4 |
| Mathematics | 3 | 0 |
| Biology | 6 | 3 |
| Chemistry | 1 | 0 |
| Geosciences | 3 | 0 |
| Physics | 2 | 0 |
| Environmental Studies | 1 | 1 |
| Health Sciences | 9 | 1 |
| Construction Management | 2 | 0 |
| Other Non-STEM | 5 | 2 |
| Left university | 9 | N/A |

Qualitative Results

Most of the respondents indicated that participation in the programs positively influenced their transition to being a student at the university. Many participants appreciated having a group of friends or people who they knew or recognized in their classes, with one student writing:

I didn't know anyone coming to Boise State. The program allowed me to make fast friends so that when school started, I knew people in my classes and had people to eat with. Although not all of them remained long term friends, the trip really helped kick start my social experience as a BSU student.

Other respondents appreciated being around peers with similar goals of earning a degree in a STEM field, which in turn boosted their confidence and increasing their sense of belonging at the university. Several respondents described feeling more confident talking to other people, and this confidence extended to communicating with other students in their classes. One participant wrote:

After a weeklong adventure of talking to kids from different majors than my own, I felt confident speaking up in more social settings, and talking to kids in my classes. Overall it helped me be more outgoing when it came to speaking to my peers.

Although less common, several students also felt more confident talking to professors and other professional staff:

I came into college having a small friend group who I knew I could go to with questions throughout the semester. I felt more comfortable navigating campus, as well as talking to professors and other professional persons on the campus.

While most of the respondents indicated that participation in the program had a positive impact on their transition to the university, several students indicated that they felt that they did not derive much benefit from participating in the programs. One participant indicated that they were not able to maintain the relationships that they developed during the program, because they were at a different point in their academic career than most of their peers. This person wrote:

There was only one friendship that lasted. The rest I was able to connect with at first, but, because I had more credits going into my freshman year than most of the other students, we had greatly varying schedules. This helped result in a lack of communication and a lack of continued friendship.

Other respondents felt that the program was primarily designed for students who were living on campus in the dorms, and was more focused on social success than academic success. One respondent felt that "the event only showed how fun Boise State was but not really anything on how to do actual work.", while another wrote "It really had nothing to do with my transition. It only showed places to have fun if you stayed in the dorms. I didn't stay in the dorms so I was at Boise State only for the school work." This suggests the importance of explicitly explaining to students the need for and value in developing robust social networks as part of their undergraduate university experience.

Finally, while one of the goals of the program was to help participants be more comfortable developing professional relationships and communicating with faculty, many of the participants did not feel like the program was very successful at achieving this goal. This was due to the respondents either feeling like they already had strong communication skills, limited interactions with professors as part of the program, or not having classes with any of the professors or instructors who participated in either the on-campus or outdoor adventure aspects of the program.

Conclusion

Overall, the summer program described here works well and accomplishes the goal of preparing students for their transition to the university environment by establishing a lasting peer group prior to the start of the semester. The program helped some students to feel more connected to one or more faculty members and more confident talking to faculty and staff. These programs were also successful at serving a higher proportion of URM and Female students than their overall levels of representation in the College of Engineering at Boise State University.

The Outdoor Experience especially promotes bonding and a lasting shared experience that serves as a foundation for future friendships and contributes to participants' sense of belonging at Boise State University. Anecdotally, we have observed that students who participated in both parts of the program (on-campus and outdoor) seem to have a much closer bond and are more likely to remain friends after

the program, though this effect is definitely influenced by the fact that many students who participated in both halves of the program did so as part of the SAGE Scholars scholarship program, whose activities extended into the school year and beyond.

While no questions in the survey explicitly addressed the impact of peer mentoring and peer mentors were not mentioned in any of the survey responses, again anecdotally and through informal surveying of students at the end of the program, peer mentors do seem to be a high-impact part of the program, at least for some students. Peer mentoring, including seeing students in leadership roles (both as on-campus peer mentors and as trip leaders on the outdoor portion of the program) and being able to have informal conversations with upper-class students seemed to provide value to participants. We intend to explore the effects of peer mentoring in future research on the outcomes of this program.

References

- [1] T. L. Strayhorn, *College students' sense of belonging: A key to educational success for all students*. Routledge, 2012.
- [2] A. Godbole, B. Miller, M. K. Bothwell, D. Montfort, and S. C. Davis, "Engineering Students' Perceptions of Belonging through the Lens of Social Identity," presented at the 2018 CoNECD - The Collaborative Network for Engineering and Computing Diversity Conference, 2018.
- [3] J. A. Leydens, T. K. K. B. M. CPEng, and J. C. Lucena, "Mechanisms by Which Indigenous Students Achieved a Sense of Belonging and Identity in Engineering Education," presented at the 2017 ASEE Annual Conference & Exposition, 2017.
- [4] B. S. Benedict, D. Verdín, R. A. Baker, A. Godwin, and T. Milton, "Uncovering Latent Diversity: Steps Towards Understanding 'What Counts' and 'Who Belongs' in Engineering Culture," presented at the 2018 ASEE Annual Conference & Exposition, 2018.
- [5] P. Parker, D. T. Hall, and K. E. Kram, "Peer Coaching: A Relational Process for Accelerating Career Learning," *Acad. Manag. Learn. Educ.*, vol. 7, no. 4, pp. 487–503, Dec. 2008.
- [6] C. Gattis, B. Hill, and A. Lachowsky, "A Successful Engineering Peer Mentoring Program," presented at the 2007 Annual Conference & Exposition, 2007, pp. 12.133.1-12.133.17.
- [7] R. Marra, W. Edmister, B. Watford, B. Bogue, C.-L. Tsai, and F. Gooden, "Peer Mentoring: Impact On Mentees And Comparison With Non Participants," presented at the 2010 Annual Conference & Exposition, 2010, pp. 15.945.1-15.945.16.
- [8] "Report - Science & Engineering Indicators 2018," NSF - National Science Foundation.
- [9] L. Cançado, J. R. Reisel, and C. M. Walker, "Impacts of a Summer Bridge Program in Engineering on Student Retention and Graduation," *J. STEM Educ. Innov. Res.*, vol. 19, no. 2, pp. 26–31, Apr. 2018.
- [10] R. Kowalchuk, T. Green, R. Ricks, and J. Nicklow, "Evaluation Of A Summer Bridge Program On Engineering Students' Persistence And Success," presented at the 2010 Annual Conference & Exposition, 2010, pp. 15.536.1-15.536.16.
- [11] P. R. Mawasha, K. Yelamarthi, and P. Lam, "Building A Bridge For Students To Transition From High School To College," presented at the 2006 Annual Conference & Exposition, 2006, pp.

11.293.1-11.293.13.

- [12] T. Huziak-Clark, T. Sondergeld, M. Staaden, C. Knaggs, and A. Bullerjahn, "Assessing the Impact of a Research-Based STEM Program on STEM Majors' Attitudes and Beliefs," *Sch. Sci. Math.*, vol. 115, no. 5, pp. 226–236, May 2015.
- [13] O. Brown, R. A. M. H. Ed.D, M. L. Morris, and J. Dygert, "An Integrated Supplemental Program to Enhance the First-year Engineering Experience," presented at the 2018 ASEE Annual Conference & Exposition, 2018.
- [14] K. T. Marosi and B. Steinhurst, "Lights, Camera, Action! Increasing First-Year Engineering Student Academic Performance via an Innovative Pre-Orientation Program," presented at the 2013 ASEE Annual Conference & Exposition, 2013, pp. 23.868.1-23.868.10.
- [15] S. Liu, "Entering the STEM Pipeline: Exploring the Impacts of a Summer Bridge Program on Students' Readiness," *J. Coll. Stud. Dev.*, vol. 59, no. 5, pp. 635–640, Sep. 2018.
- [16] S. Wood, S. Hsia, P. Johnson, K. Boykin, L. Bowen, and K. Whitaker, "Integrated Engineering Math Based Summer Bridge Program For Student Retention," presented at the 2007 Annual Conference & Exposition, 2007, pp. 12.907.1-12.907.16.
- [17] S. H. Gleixner, K. Casey, J. T. Tuberty, S. Latic, P. R. Backer, and E. L. Allen, "EXCEED: Excellence in Your Engineering Education Summer Transition Program," presented at the 2013 ASEE Annual Conference & Exposition, 2013, pp. 23.564.1-23.564.21.
- [18] R. Harris and B. Maheswaran, "Summer Bridge: A Step Into The Engineering Gap," presented at the 2009 Annual Conference & Exposition, 2009, pp. 14.1095.1-14.1095.14.
- [19] D. King and L. Masterson, "Summer Bridge Program: A Jumpstart for Engineering Students," presented at the 2011 ASEE Annual Conference & Exposition, 2011, pp. 22.1353.1-22.1353.17.
- [20] L. Bottomley, K. Titus-Becker, and H. Smolensky-Lewis, "Escape To Engineering: A Summer Bridge Program For Women In Engineering," presented at the 2009 Annual Conference & Exposition, 2009, pp. 14.583.1-14.583.12.
- [21] A. C. Verdell, J. M. Keith, J. Warnock, and V. M. White, "Best Practices for Underrepresented Minority Students in an Engineering Summer Bridge Program," presented at the 2016 ASEE Annual Conference & Exposition, 2016.
- [22] E. K. Andre, N. Williams, F. Schwartz, and C. Bullard, "Benefits of Campus Outdoor Recreation Programs: A Review of the Literature," *J. Outdoor Recreat. Educ. Leadersh.*, vol. 9, no. 1, pp. 15–25, 2017.
- [23] B. A. Myers *et al.*, "Redshirt in Engineering: A Model for Improving Equity and Inclusion," presented at the 2018 CoNECD - The Collaborative Network for Engineering and Computing Diversity Conference, 2018.
- [24] E. Knaphus-Soran *et al.*, "Work in Progress: Institutional Context and the Implementation of the Redshirt in Engineering Model at Six Universities," presented at the 2018 ASEE Annual Conference & Exposition, 2018.
- [25] E. A. Riskin *et al.*, "Board 105: The Redshirt in Engineering Consortium: Progress and Early Insights," presented at the 2018 ASEE Annual Conference & Exposition, 2018.
- [26] C. S. Dweck, *Mindset: The New Psychology of Success*. Ballantine Books, 2008.
- [27] M. B. Miles and A. M. Huberman, *Qualitative data analysis : an expanded sourcebook*. Thousand Oaks: Sage Publications, 1994.

Appendix 1

RAISE Schedule: On-Campus Programming

| Day 1 | |
|-------------------|--|
| Time | Activity |
| 3:30 to 4:30 PM | Move in to residence hall |
| 4:30 to 5:00 pm | Check In: pick up welcome packet! |
| 5:00 to 7:00 pm | Welcome Dinner |
| 8:00 to 10:00 pm | Optional Movie |
| Day 2 | |
| 8:15 to 9:00 am | Breakfast & Announcements |
| 9:00 to 11:45 am | Team Building hosted by Outdoor Program |
| 12:00 to 1:00 pm | Lunch |
| 1:00 to 2:00 pm | Faculty Networking Round Robin Event |
| 2:10 to 2:30 pm | Shuttle to downtown Computer Science building |
| 2:30 to 4:30 pm | Design Thinking Flashlight Activity |
| 5:00 to 6:00 pm | Dinner - Pizza delivery |
| 6:00 to 8:00 pm | Outdoor concert in downtown Boise and self-directed time to explore downtown |
| Day 3 | |
| 8:15 to 9:00 am | Breakfast |
| 9:00 to 9:15 am | Walk to Student Union Building |
| 9:15 to 10:45 am | Success Stories: Facilitated by Advising & Academic Success Center |
| 10:45 to 11:30 am | Communication Activity (led by RAISE peer mentor team) |
| 11:30 to 11:45 am | Group Photo |
| Noon to 1:15 pm | Lunch |
| 1:15 to 1:30 | Walk to College of Innovation & Design space in the campus library |

| | |
|-----------------|--|
| 1:30 to 2:00 pm | MakerLab tour + continuation of Design Thinking activity |
| 2:00 to 3:00 pm | Growth Mindset Presentation |
| 3:00 to 3:15 pm | Break |
| 3:15 to 4:00 pm | Maker Activity |
| 4:00 to 4:30 pm | Culminating Activity & Presentations of Items Made During Maker Activity |
| 5:30 - 6:30 | BBQ Picnic |
| 7:00 to 9:00 pm | Lawn Games or Game Center in the Student Union Building |
| Day 4 | |
| 7:00 to 8:15 am | Breakfast |
| 8:15 to 8:30 am | Checkout from residence hall |
| 9:00 am | Walk to Outdoor Program to leave for rafting trip |

Appendix 2

Summary of Activities - RAISE Outdoor Experience

Day 4 (of the entire RAISE program)

1. Breakfast
2. Check out of residence hall
3. Assemble at Outdoor Program office to Leave for Trip
4. Icebreakers/introductions to student & staff trip leaders, name game
5. Divided into two “teams” (Red and Purple)
6. Load vans and drive to starting point for rafting (Banks, ID)
7. Raft the Main Fork of the Payette river (ate lunch on the river)
8. Loaded rafts onto trailer, drove to Hot Springs campground (near Garden Valley, ID)
9. Set up camp (tents, kitchen area, unloaded trailer)
10. Participants cooked dinner in teams
11. Cleaned dishes
12. Evening campfire circle/debrief of the day (included an activity of having all participants put where they were from on a map)

Day 5

1. Participants cooked breakfast in teams
2. Loaded vans and drove to Grandjean, ID
3. Made lunches at trailhead
4. Hike in the Sawtooth Wilderness (approximately 6 miles in total), stopped and ate lunch near one of the headwaters of the South Fork of the Payette River
5. Returned to camp
6. Drift-netting activity (capturing and identifying macroinvertebrates found in the river)
7. Cooked and ate dinner in teams

8. Evening campfire circle/debrief of the day

Day 6

1. Cooked breakfast in teams and prepared lunch for later
2. Packed up the campsite
3. Loaded vans and drove to the rafting put-in at Banks, ID
4. Rafted the Main Fork of the Payette - this time with some participants in inflatable kayaks and some in rafts
5. Loaded rafts and drove back to Boise State
6. All participants helped clean and put away boats and gear
7. Closing barbeque with ice cream, including activity where each participant shared a favorite memory from the RAISE program/trip
8. Students who needed lodging that night stayed in the residence hall