Summer Bridge Inventory: A Mixed-Methods Approach to Evaluating First-Year Student Adjustment and Program Activities

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This study used a mixed methods approach to investigate various adjustment issues of participants in a summer bridge program for engineering students at a predominantly White institution (PWI) in the mid-southeastern region of the United States. Specifically, the academic, social, personal-emotional, and goal commitment and institutional attachment subscales of the Student Adaptation to College Questionnaire (SACQ) were utilized for this purpose. The Summer Bridge Inventory (SBI) that was employed in this research revealed the summer bridge participants' opinions about the strengths and weaknesses of the program and its related activities.

American colleges and universities are being challenged to educate and graduate a generation of "Echo Boomers," a term used to define the children born to Baby Boomers (Oblinger, 2003). Also known as Generation Y or the Millennial Generation, these young adults are entering college in significant numbers and with a different set of skills than their parents (Lowery, 2001). Although dependent on a number of socioeconomic factors, the Millennial Generation tends to be technologically savvy and digitally connected (Jayson, 2006). This generation of students is also decidedly diverse with respect to race and ethnicity—no longer is the American college classroom "one size fits all" model (Sweeney, 2006). Additionally, these students have been introduced to many different types of teaching and learning techniques throughout their K–12 years, and they enter college with similar or higher expectations with respect to the types of learning environments they will encounter.

Experts agree that for the U.S. to remain competitive in a global environment, it is vital to keep the higher education pipeline filled with students who are equipped for success in challenging and essential disciplines, such as engineering (Wadhwa et al., 2007). These are the graduates who will be expected to keep the U.S. at the forefront of discovery and innovation. As such, it is vital to understand how millennial students learn, as well as how they can be motivated to complete their undergraduate degrees for entry into the workforce or into advanced degree programs (Leyden & Teixeira, 2009). For this reason, college administrators and

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program planners are committed to finding out how these "millennials" learn both inside and outside the classroom. Educators are also especially concerned with how to prepare new engineering students for the anticipated rigors of their chosen field.

One suggested way for improving the success rates of first-year engineering students is through the use of summer bridge programs. These 6–8 week programs are designed to facilitate a student's transition and adjustment to university life, which in turn can enhance that individual's academic performance and persistence rates. These programs can also help underrepresented and low-income students adjust and adapt to university life and become members of the campus community. Despite the fact that summer bridge programs have assisted entering freshmen for decades, very little empirical evidence exists on their effectiveness. Therefore, a greater understanding of the way millennial students learn and adjust—combined with an increased awareness of how summer bridge programs can be used to increase academic success—will strengthen the foundation for better college performance, particularly in engineering and related disciplines. In keeping with these goals, this study used a mixed methods approach to understand student perspectives in addressing the following research question: *What are the benefits and/or drawbacks of participating in a summer bridge program from the student perspective?*

Literature Review

Higher education administrators and faculty are aware of the increasing numbers of millennial students on college campuses across the country (Howe & Strauss, 2003). To set the context for understanding their growing numbers, these Echo Boomers (i.e., the children of millions of post-war baby boomers) were born roughly between 1978 and 2000 (Madland & Teixeira, 2009; Sweeney, 2006). Other researchers define the Millennial Generation as those born between 1982 and 2004. Regardless of when this time period began and ended, the millennial population represents the second largest in the U.S. history. This population is also considered to be the nation's largest ethnically and racially diverse group. For example, Keeter and Taylor (2009) provided the following ethnic breakdown of millennials ages 13–29: 18.5% are Hispanic; 14.2% are Black; 4.3% are Asian; 3.2% are mixed race or other; and 59.8% are White, which represents a record low for this group (p. 1).

Millennial students are categorized according to certain behaviors that are distinctive to their age cohort, and these behaviors can either impede or enhance their adjustment in college. Some of these behaviors include the following:

1. They learn by doing.
2. They are good at multitasking.
3. They are flexible with their time commitments in order to take advantage of various available options.
4. They have products that can be personalized as their needs and interests change.

5. They are impatient and prefer "instant gratification" over delayed rewards.
6. They are quick to adapt to computing and Internet services.
7. They are accustomed to being tested, to receiving feedback, and to achieving goals.
8. They may not be spontaneous or introspective due to their extensive participation in planned activities and lack of experience with unplanned time (Jayson, 2006).

Therefore, as suggested by Carlson (2005), if universities make a concerted effort to develop institutional priorities and related programs with these behaviors and characteristics in mind, millennial students will be more likely to be committed to their academic institution of choice and ultimately persist to graduation.

Research confirms that college students have a difficult time adjusting to various aspects of college. For example, Parker, Summerfeldt, Hogan, and Majeski (2004) indicated that about 50% of students withdraw from college without obtaining a degree. In an earlier study, Consolvo (2002) stated that 30–40% of college students withdraw without ever returning to complete their degrees due to the transitional issues they faced in college. Despite the fact that millennials tend to be hard-working and were raised to strive for success by their sometimes "helicoptering" parents, adjustment issues continue to be an issue for the current generation of college students—as indicated by persistence rates noted above.

Summer Bridge Programs

Summer bridge programs (SBPs) were initiated by college and university administrators more than 50 years ago to increase the retention and graduation rates of at-risk students by engaging them both academically and socially (Pascarella & Terenzini, 2005). In fact, SBPs—which typically are offered prior to a freshman's fall term—are among the oldest strategies used to improve college retention rates (Garcia, 1991). Students who take part in these programs are "pre-exposed" to campus life, have a chance to learn about the resources available to them to balance the academic rigors and the many social opportunities they will encounter, and are able to establish supportive networks that persist beyond the summer. While SBPs are widely acknowledged by both students and program administrators to be beneficial, there is little empirical evidence assessing their effectiveness (Ackerman,1991; Garcia, 1991; Kluepfel, 1994; Pascarella & Terenzini, 1991; Rita & Bacote,1997; Strayhorn, 2010; Walpole et al., 2008).

This article describes the creation of a Summer Bridge Inventory (SBI), which was used to assess the academic, social, personal emotional, and goal commitment adjustment of freshman engineering college students. This mixed-methods approach focused on evaluating the students' perceptions about their involvement in a summer bridge program and its various activities. This article provides a brief overview of the conceptual framework for this research, after which the creation of the SBI is described. The study's results are then detailed, followed by a discussion

of the study's implications and recommendations.

Conceptual Framework

The conceptual framework developed for this study focused on the academic, social, personal emotional, and goal commitment adjustment of college engineering students. These factors are believed to be directly related to a student's ability to integrate both academically and socially to the university environment, which in turn can affect a student's personal and physiological involvement. These factors are also positively correlated with a student's interactions with peers and faculty. The following four theoretical frameworks and assessment instruments were used in developing this study's guidelines and methodology for examining the utility of a summer bridge program for first-year engineering students: Tinto's Model Student Retention (1987), Astin's Student Involvement Theory (1993), Pascarella's Student-Faculty Informal Contact and College Outcomes (1980), and Baker and Siryk's Student Adaptation to College Questionnaire (SACQ) (1999).

Methodology

A mixed methods approach was developed to analyze and interpret the perceptions of engineering students regarding the SBP activities engaged in prior to their freshman year in college. Specifically, the researcher developed and utilized the Summer Bridge Inventory (SBI) survey to collect data from summer bridge participants during their first semester of college at an R1 (designating a top research university) predominantly White institution (R1-PWI) in the mid-southeastern region of the United States. Conducting qualitative research enabled the investigator to illuminate the individual differences between the study's subjects, as well as to create a more detailed portrait of the findings (Merriam, 1995). To enhance the qualitative findings, the quantitative portion of the instrument was able to provide more generalizable data.

Sample Population

The study's participants (each of whom had been solicited via e-mail) included 42 first-year engineering students who had taken part in a summer bridge program at the same R1-PWI prior to their freshman year. Prospective respondents were informed that their participation involved completing a questionnaire, and all students who completed the survey were entered into a raffle for several incentive prizes.

Survey

Of the 42 first-year engineering students with SBP experience who completed the written portion of the SBI survey, 22 were male (52%) and 20 were female

(48%). Additionally, 12 of the 42 (29%) also served as focus group members. The participants were required to define their racial background according to majority or minority. A total of 27 participants (64%) identified themselves as Caucasian; while the remaining 15 minority participants (36%) were represented by 2 Asian/Pacific Islanders (5%), 10 African Americans (24%), and 3 Hispanics (7%).

Focus Groups

Two focus groups were held involving the 12 participants who agreed to take part in the qualitative portion. Each session lasted 60 minutes. The researcher used a list of structured questions for the focus groups which were developed as part of the SBI packet. The researcher audio-taped both focus group sessions and had them transcribed verbatim. The transcripts were then sent to the participants for an accuracy check and for any needed corrections. Table 1 lists the 12 focus group participants according to a given pseudonym, as well as their race, gender, college major, and overall fall term grade point average.

TABLE 1

Focus Group Participants and Characteristics

Pseudonym	Race	Gender	College Major	Fall 2007 GPA
Carlos	African American	Male	General Engineering	3.53
Jerel	African American	Male	Aerospace Engineering	3.43
Tarius	African American	Male	Mechanical Engineering	3.04
Amy	African American	Female	Mechanical Engineering	2.22
Tim	Caucasian	Male	Materials Science Engineering	3.49
Mark	Caucasian	Male	Wood Science	2.28
Micah	Caucasian	Male	Computer Science	1.76
Martha	Caucasian	Female	Engineering Science Mechanics	3.74
Cori	Caucasian	Female	Mechanical Engineering	3.50
Lucy	Caucasian	Female	Mechanical Engineering	2.28
Yael	Hispanic	Female	Mechanical Engineering	3.48
Kim	Pacific Islander	Female	Electrical Engineering	3.58

SBI Instrumentation Development

The SBI was comprised of two parts: the quantitative inventory instrument and the qualitative focus groups and interview. The inventory consisted of the 29

activities associated with the summer bridge program (see Table 2).

TABLE 2

The 29 Activities Associated with the Summer Bridge Program

1. Engineering Class
2. Math Class
3. Chemistry Lab Class
4. Chemistry Class
5. Registration & Class Sign-Up and information for fall term
6. Ropes Course
7. Fourth of July Cook-out
8. Campus Tour
9. Updating Your Resume
10. Etiquette Dinner
11. Evening Out-Bowling
12. Orientation Meetings with Associate Dean of Engineering
13. Introduction Meeting
14. Skating
15. Student ID Pickup
16. Lab Tours
17. Trip to Mall
18. Summer Bridge Program Schedule Overview
19. Floor Meeting
20. Closing Ceremony
21. Individual and Group Pictures
22. Friday Seminars
23. Fortune 500 Company Teambuilding Activities
24. Move-out Meeting
25. Student Panel
26. Seminar Sponsored by Fortune 500 Company
27. Move-Out Day
28. University Freshman Orientation
29. Online Survey

After completing the required demographic survey, the participants were asked to assess their experiences with the 29 SBP activities by ranking the dominant subscale for each activity (described below). The rating was between 1 ("does not relate well to me") and 5 ("relates well") for the four adjustment categories of the SBI.

The first section of the SBI pertained to Academic Adjustment, and included four clusters under which the participants could rank the 29 activities: motivation, application, performance, and academic environment. The second section of the SBI pertained to Social Adjustment, with the following four clusters: general, other people, nostalgia and social environment. The third section of the SBI pertained to Personal-Emotional Adjustment, which included two clusters: psychological and physical. The fourth section of the SBI pertained to Goal Commitment and Institutional Adjustment, which featured two clusters: general and this college. The fifth section of the SBI required participants to identify the dominant subscale for each activity. The subscales were assigned a number, as follows: 1) Academic Adjustment, 2) Social Adjustment, 3) Personal-Emotional Adjustment, and 4) Goal Commitment and Institutional Adjustment. The participants could assign only one number to each activity.

The remaining portion of the SBI was represented by the focus group session

interviews. It should be noted that during the pilot study phase, the researcher conducted a focus group with prior summer bridge program participants to make sure the structured questions were clear and concise. Suggestions and feedback from pilot study participants were implemented in the full study described herein.

Results of Study

As noted earlier, this study used a mixed methods approach to address the question: What are the benefits and/or drawbacks of participating in a Summer Bridge Program from the student perspective? To answer this research question, the researcher designed the SBI to explore participants' perceptions of the various activities and their academic, social, personal-emotional, and goal commitment and institutional adjustment in a summer bridge program. This research was done in two phases.

Phase One

During Phase One, the researcher obtained quantitative results from administering the SBI questionnaire to the 42 participants, which involved using simple descriptive statistics to analyze the majority of the data. After rankings and mean scores were obtained, the data were arranged into appropriate groupings (see Tables 5 through 17). Because the 29 items measured by the SBI were not expected to be reliable variables by themselves, a list of appropriate subscales and related clusters was developed. Therefore, to understand the beneficial aspects of the SBP, the researcher reviewed these 29 programmatic activities in relation to the SBI subscales and clusters. A Cronbach's alpha was then conducted with each subscale for evidence of reliability (see Table 3).

TABLE 3

Cronbach's Alpha for Summer Bridge Inventory Subscales

SBI Academic Adjustment	.95
SBI Academic Motivation	.88
SBI Academic Application	.81
SBI Academic Performance	.90
SBI Academic Environment	.89
SBI Social Adjustment	.95
SBI Social General	.88
SBI Social Other People	.85
SBI Social Nostalgia	.93
SBI Social Environment	.80
SBI Personal-Emotional Adjustment	.96
SBI Personal Psychological	.92
SBI Personal Psychical	.94
SBI Goal Commitment/Institutional Adjustment	.94
SBI General Other	.91
SBI General This College	.89

For each subscale, the higher the score for the activity, the more it related to the student; conversely, a lower activity score indicated that it did not relate well to the student. The scores were grouped according to the following scale from low ("does not relate well) to high ("relates well").

Low—does not relate at all	1 through 2.49
Medium—neutral	2.5 through 3.49
High—relates well	3.5 to 5

The respondents' experiences were rated using the four SBI subscales, which the researcher developed using Baker and Siryk's (1999) Student Adaptation to College Questionnaire (SACQ) instrument, as shown below.

SBI aligned with SACQ Subscales and Definitions	SBI aligned with SACQ Clusters and Definitions
Academic Adjustment (AA) - associated with higher education learning experiences	• ***Motivation*** - a student's feelings concerning educational goal setting and being in college • ***Application*** - the initiative that a student takes in achieving academic goals • ***Performance*** - effectiveness of a student's academic performance • ***Academic Environment*** - the institutional environment in which a student performs and what that environment has to offer the student
Social Adjustment (SA) - the social aspects of a higher education environment	• ***General*** - the ease with which students engage in social activities • ***Other People*** - whether or not students develop relationships with other individuals within the university setting • ***Nostalgia*** - the social rearrangement of a student's surroundings and how well he or she adjusts to being away from home • ***Social Environment*** - the fulfillment a student feels with the college experience
Personal-Emotional Adjustment (PEA) - the psychological and physical aspects of students	• ***Psychological*** - signifies the student's welfare and comfort or degree of distress • ***Physical*** - corresponds to bodily responses
Goal Commitment/Institutional Adjustment (GCIA) - corresponds to a student's dedication to his/her educational goals and connection to the institution	• ***General*** - overall satisfaction of being in college • ***This College*** - emotions that students have about the college they are attending

The researcher then examined the clusters to better understand the implications of participant responses. The top ten rated scores for each subscale are reported in Tables 6 through 17.

The SBI academic adjustment (AA) subscale contained four clusters: motivation, application, performance and academic environment. When examining the mean ranges of the summer bridge activities by cluster, several commonalities were noted. The "motivation" cluster scores ranged from 4.64 to 2.05. The "application" cluster scores ranged from 4.64 to 1.59. The "performance" cluster scores ranged from 4.66 to 1.39. The final cluster scores pertaining to "academic environment" ranged from 4.48 to 1.64. The various summer bridge activities—in this case, classes—that related highly on these clusters were as follows: chemistry class, chemistry lab class, engineering class, and math class in all SBI academic subscales.

The SBI social adjustment (SA) subscale also contained four clusters: general, other people, nostalgia, and social environment. Mean range scores for the summer bridge activities by cluster revealed a number of commonalities. The "general" cluster scores ranged from 4.93 to 1.49. Scores for the second cluster, "other people," ranged from 4.81 to 1.48. The third cluster was "nostalgia" with a corresponding range of from 4.48 to 1.71. The final cluster pertained to "social environment," with scores ranging from 4.38 to 1.86. The following summer bridge activities related highly on these clusters: Fourth of July cookout, bowling, skating, ropes course, etiquette dinner, and the trip to the mall.

Unlike the former two clusters, the SBI-PEA (Personal-Emotional Adjustment) subscale contained only two clusters: psychological and physical. As before, several commonalities were observed when examining the mean range scores of the summer bridge activities by cluster. The "psychological" cluster scores ranged from 4.10 to 2.48, while the "physical" cluster scores ranged from 4.17 to 1.52. The summer bridge activities that related highly on these clusters were the Fourth of July cookout, bowling, skating, and ropes course.

The SBI-GCIA (Goal Commitment/Institutional Adjustment) subscale also contained two clusters: other and college. A number of commonalities were recorded with respect to the mean range scores for the summer bridge activities by cluster. The "other" cluster scores ranged from 4.24 to 1.81, while the "college" cluster scores ranged from 4.51 to 2.02. The following summer bridge activities related highly on these clusters: engineering class, chemistry class, math class, chemistry lab class, Fourth of July cookout, registration, ID pickup, and campus tour.

Participants were also asked to rank the activities from highest to lowest (29 to 1). The rankings ranged from 25.40 to 4.57 (see Table 4). In order of importance, the top six activities were the following: (1) engineering class, (2) math class, (3) chemistry lab class, (4) chemistry class, (5) registration, and (6) ropes course.

TABLE 4

Mean and Standard Deviations for Rankings for the 29 Activities of the SBI

Activities	N	Mean	SD
Engineering Class	42	25.40	4.72
Math Class	42	22.93	5.54
Chemistry Lab Class	42	22.21	6.25
Chemistry Class	42	22.00	6.81
Registration & Class Sign-Up and information for fall term	42	21.19	5.64
Ropes Course	42	20.38	7.81
4th of July Cook-out	42	18.71	7.11
Campus Tour	42	17.90	6.35
Updating Your Resume	42	17.38	6.25
Etiquette Dinner	42	17.33	7.59
Evening Out-Bowling	42	17.02	6.64
Orientation Meetings with Associate Dean of Engineering	42	16.98	5.95
Introduction Meeting	42	16.26	6.68
Skating	42	15.90	7.75
Student ID Pickup	42	14.81	7.56
Lab Tours	42	14.40	6.94
Trip to Mall	42	13.76	8.30
Summer Bridge Program Schedule Overview	42	13.31	6.23
Floor Meeting	41	13.20	6.44
Closing Ceremony	42	13.14	8.53
Individual and Group Pictures	42	12.36	7.72
Friday Seminars	42	11.64	6.33
Fortune 500 Company Teambuilding Activities	42	11.60	6.75
Move-out Meeting	42	11.14	6.91
Student Panel	42	10.50	6.82
Seminar Sponsored by Fortune 500 Company	42	7.48	4.94
Move-Out Day	42	7.17	5.13
University Freshman Orientation	42	5.19	6.33
Online Survey	42	4.57	3.34

Phase Two

For the qualitative portion of the SBI (Phase Two), focus group sessions enabled 12 participants to discuss the specific SBP activities that assisted them in their overall academic, social, personal-emotional, and goal commitment and institutional adjustment during their first semester/term in college. Additionally, the researcher asked the focus group members a number of general questions to examine strengths and weakness of the program. The responses from the focus groups were coded and sorted in appropriate tables based on Patton (2002).

Content analysis and NUD*IST (qualitative research software designed to help organize and analyze data) were used to interpret the data.

The qualitative summary below includes direct quotes that capture a number of respondents' unique viewpoints and experiences. These narratives are presented according to the four SBI subscales (i.e., AA, SA, PEA, and GCIA). The data were then grouped into the following comment categories: (1) comments about pre-college characteristics, (2) comments about involvement, and (3) comments about the benefits of a SBP.

For the second phase of this study, the researcher also asked participants to discuss the benefits and drawbacks of the SBP based on their personal experiences. Only data from the dominant themes are presented herein, which should not detract from the importance of the other themes. In other words, a snapshot of the data is provided below.

Benefits of Participating in SBP

Academic Adjustment

Preparation was the most consistent theme expressed by participants with respect to the academic adjustment question—especially with respect to their pre-college experiences. For every participant, this theme translated to being geared up and ready to face college challenges. Kim, a female, minority student, stated the following about preparation:

> It showed you how big attention to detail is [be]cause there's a lot of things that you probably knew [and] studied back in high school, but you forgot. When you went to take a test, it was on that test and really showed that you had to go back and look at everything that you learned … to be prepared for the test.

Social Adjustment

Again, preparation was the most consistent theme expressed by participants with respect to the social adjustment question—especially when examining the comments about the benefits of the SBP. From a Caucasian males perspective, Tim indicated the following about preparation:

> I think we can all pretty much say that … being able to meet people and make friends and all that before we even started college has definitely helped [be]cause you know you have a support group with you already when you are starting college.

Personal Emotional Adjustment

Networking, which refers to the process of using one contact to gain additional contacts, was the most consistent theme expressed by participants with respect

to the personal emotional adjustment question. This theme was often voiced in connection with the benefits of an SBP. Networking enabled the individual to create a supportive system through which alliances could be formed. From the perspective of an African American male, Carlos stated the following about networking:

> In high school, I didn't have a lot of positive friends. And coming to [the summer bridge program] showed me that there were positive people out there. I realize when you are around positive people, you tend to be more positive. You are a product of your environment. I think without [the summer bridge program], I might have gravitated toward the wrong type of people or the wrong crowd when I got here to college, and that is what I got out of it personally.

Goal Commitment and Institutional Adjustment

Motivation was the most consistent theme expressed by participants with respect to the goal commitment and institutional adjustment question—especially when examining the comments about involvement. For this study, this theme corresponds to a driving force that initiates and directs behavior. It is the internal and external energy that propels an individual to do something. From the perspective of an African American male, Carlos stated the following about motivation:

> Before [the summer bridge program], I didn't have any set goals. I didn't study; I didn't do anything. [It's] like you better get on your game because without [the summer bridge program], I probably would have been on academic probation or something like that. I feel like because of [the summer bridge program] and other programs like it [engineering theme housing], it is the reason why I made the Dean's list.

Difficulties with Participating in SBP

Student skills and abilities was the most consistent theme expressed by the participants with respect to difficulties—especially when examining the comments about involvement. Skills and abilities refer to the aptitude to identify and execute a task, to be proficient at a task, or to have an innate talent for said task. From the perspective of an African American male, Tarius stated the following about skills and abilities:

> [Many students] have been taking years of [math]. [It was my] first time seeing [some of the material]. [The class] was so far ahead of where I was [during the SBP]. I did well, but everybody who did [math for SBP] for the first time did just either average or below average. I had to take calculus [after the program].

Discussion

The findings described herein are consistent with previous research indicating that good academic performance facilitates adjustment in college (Robbins & Smith, 1993). In this study, students reported that they found it helpful to take core classes in advance of their freshman year in college. This was particularly evident on the SBI-AA and SBI-GCIA ratings, as well as by the way they ranked programmatic activities. One White female participant stated:

> I thought the chemistry classes were helpful because in the fall, I had a chemistry teacher who couldn't really teach anyway, and so I could take my [summer bridge program] notes and use them to study. I also thought the math class was a little helpful because the last time I had [geometry] was ninth grade, so it was a nice review for the fall.

The findings for SBI-SA and SBI-PEA subscales demonstrated that the interacting and developing relationships with others are important in the college adjustment process. One White male student stated, "I am pretty sure that if it wasn't for the people I have met in [SBP], by now I would have dropped out of engineering and switched to another major or school." This finding supports the work of Tinto (1987) and Astin (1996), who argued that engagement in academic and social activities connects college students to the university.

Limitations

Despite the obvious advantages of acquiring rich personal data from focus group sessions, there are three important limitations associated with this method of data collection. The first one deals with bias. For example, an interviewee can be biased due to his or her relationship to the interviewer (Patton, 2002). Second, an interviewee can be biased to the study if and when the subject feels the need to tell the interviewer what he/she wants to hear. The final limitation deals with the tendency of participants to identify with each other and parrot group responses rather than promulgate a response that could be in opposition to other focus group members.

Implications

Program managers, administrators, and others who work with first-year engineering students could use the findings of this study to evaluate the needs of engineering students in summer bridge programs so that programmatic activities can be designed to meet those needs and prepare students for freshman-level courses. Another implication of this study is that according to the quantitative data, students did not rank any of the activities relating to goal commitment and institutional adjustment as being particularly relevant. Therefore, the researcher would suggest an exploratory study of SBP participants' views toward goal

commitment and institutional adjustment, as well as how that information could impact programmatic planning. As described herein, the adjustment experiences of first-year engineering students were studied. Other researchers might examine the experiences and persistence of college students beyond their first year.

Recommendations

This study is important due to declining enrollment and increasing attrition rates in engineering programs throughout the world—but particularly in the U.S. Astin (1993), for example, noted that only 44% of engineering students will graduate with an engineering degree. Based on this study's findings with respect to effectiveness of summer bridge programs, the following recommendations are suggested:

1. Explain the relevance of SBP activities (supported by available statistical data) to participants throughout the duration of the program to reinforce the importance of full participation.
2. Advise SBP students to enroll in a moderate course load during their first semester.
3. Develop remedial tutorial programs during the first semester for SBP participants.
4. Assign faculty mentors to SBP participants during the program, as well as during their first semester in college.
5. Maintain long-term contact with SBP participants after the program to assure that students continue to experience a positive adjustment throughout college life.

These recommendations can serve as basic guidelines for college administrators and summer bridge program planners. They should, of course, be tailored to the institution and its available resources (e.g., infrastructure, personnel, and monetary resources). SBPs can be an important venue for helping at-risk students in their adjustment to the rigors of college, particularly those in academically challenging programs such as engineering.

Conclusions

Felder (1987) relayed that educational psychologists have assisted educators, faculty, and administrators in the field of engineering by elucidating how millennial students learn best. In fact, a number of practical studies have appeared in the educational and cognitive psychology literature that describe the kinds of programmatic components that could enhance learning for today's college engineering students. These programmatic components include using technology over strictly text-based materials, implementing competitive tasks, and ensuring that programs are time structured and well defined. These reports have provided an important methodological foundation for engineering pedagogy in the 21st century.

In terms of structuring summer bridge program activities, active, deductive, and inductive learning mechanisms have been found to be successful (Fedler & Brent, 2001) and should be taken into account by program planners and administrators. Because millennial students come to the table with certain skills and expectations, SBPs need to be structured so that participants can engage in real-world applications and cooperative learning in order to meet their needs and build on existing competencies. Moreover, based on the work of Schon (1983), students should have ample opportunities to learn by doing, which educators agree is an effective way of embedding knowledge. Thus, SBPs are particularly effective because they give millennial students additional time to practice what they have learned before becoming fully immersed into the academic and social environments of college.

The quantitative findings revealed that the four core SBP classes (engineering, math, chemistry lab, and chemistry lab class) related well to students on the SBI-AA and GCIA subscales. The social activities (Fourth of July cookout, bowling, skating, ropes course) related well to students on the SBI-SA and PEA subscales. This study also revealed that participants ranked the four summer bridge courses as being highly relevant to their adjustment process. In addition, the data revealed that the majority of the activities were considered social, and that none of the activities equated with the goals commitment / institutional adjustment subscale.

For the qualitative component, the researcher gathered in-depth data on the experiences of 12 participants. Overall, the participants believed that the summer bridge courses assisted them their academic adjustment. In terms of their social adjustment, students reported that having had an opportunity to make friends prior to beginning their freshman year was important to their social adjustment. Moreover, the data for personal and emotional adjustment revealed that networking was critical in identifying the various support systems at college. The findings for goal commitment and institutional adjustment demonstrated that students were motivated to set goals. In terms of drawbacks, participants reported that the most difficult aspect of the SBP had to do with their skills and abilities. Students also commented that they were not able to recall prior knowledge in order to do some of the tasks in the SBP courses.

These results support the effectiveness of summer bridge program activities (particularly academic courses in comparison to social pursuits) in helping students adjust to the freshman year in college. At the same time, the researcher cautions SBP administrators to carefully monitor the academic, social, personal-emotional, and goal commitment and institutional adjustment of participants. Administrators are encouraged to utilize summer bridge programs and seek the necessary funding so as to support the young engineering students who will benefit from these programs.

TABLE 5

Mean Ranks for Activities Based on SBI Scales

(1 = Academic, 2 = Social, 3= Personal-Emotional, and 4 = Goal Commitment and Institutional Adjustment)

Activities	N	Subscale Mean	SBI Scale
Engineering Class	42	1.07	Academic
Math Class	42	1.07	Academic
Chemistry Lab Class	42	1.07	Academic
Chemistry Class	42	1.07	Academic
4th of July Cook-out	42	2.04	Social
Skating	42	2.04	Social
Evening Out-Bowling	42	2.07	Social
Trip to Mall	42	2.19	Social
Individual and Group Pictures	42	2.35	Social
Registration & Class Sign-Up and information for fall term	42	2.40	Social
Etiquette Dinner	42	2.40	Social
Student Panel	42	2.42	Social
Friday Seminars	42	2.50	Social
Floor Meeting	42	2.52	Social
Introduction Meeting	42	2.54	Social
Updating Your Resume	42	2.69	Social
Closing Ceremony	42	2.73	Social
Ropes Course	42	2.76	Social
Orientation Meetings with Associate Dean of Engineering	42	2.78	Social
Seminar Sponsored by Fortune 500 Company	42	2.83	Social
Move-Out Day	42	2.85	Social
University Freshman Orientation	42	2.90	Social
Summer Bridge Program Schedule Overview	42	2.92	Social
Fortune 500 Company Teambuilding Activities	42	2.92	Social
Move-out Meeting	42	2.95	Social
Lab Tours	42	3.04	Personal Emotional
Student ID Pickup	42	3.23	Personal Emotional
Campus Tour	42	3.40	Personal Emotional
Online Survey	42	3.42	Personal Emotional

Note: Participants were asked to rank each activity as a 1 = Academic, 2 = Social, 3= Personal-Emotional, and 4 = Goal Commitment and Institutional Adjustment. The range is as follows: 1-1.99 (Academic), 2.0-2.99 (Social), 3.0-3.99 (Personal-Emotional), and 4.0-4.99 (Goal Commitment/Institutional). The mean range for Goal Commitment/Institutional was not demonstrated for this section of the SBI.

TABLE 6

Activity Means and Standard Deviation from the Summer Bridge Inventory for Academic Adjustment: Motivation Subscale

Activity	N	Mean	SD
Engineering Class	42	4.64	0.66
Registration & Class Sign-Up and information for fall term	42	4.60	0.89
Math Class	42	4.45	0.92
Orientation Meetings with Associate Dean of Engineering	42	4.45	0.92
Chemistry Class	42	4.43	0.89
Chemistry Lab Class	42	4.40	0.91
Updating Your Resume	42	4.10	1.16
Lab Tours	41	3.76	1.43
Campus Tour	42	3.64	1.38
Fortune 500 Company Teambuilding Activities	42	3.26	1.43

Note: Top ten rated scores are reported. The range was 1("doesn't relate well to me") and 5 ("relates well").

TABLE 7

Activity Means and Standard Deviation from the Summer Bridge Inventory for Academic Adjustment: Application Subscale

Activities	N	Mean	SD
Engineering Class	42	4.64	0.62
Chemistry Lab Class	42	4.52	0.74
Chemistry Class	42	4.45	0.89
Math Class	42	4.33	1.03
Registration & Class Sign-Up and information for fall term	42	4.14	1.24
Meetings with Associate Dean of Engineering	42	4.02	1.20
Updating Your Resume	42	3.98	1.33
Lab Tours	41	3.20	1.29
Friday Seminars	42	2.93	1.40
Fortune 500 Company Teambuilding Activities	42	2.90	1.43

Note: Top ten rated scores are reported. The range was 1("doesn't relate well to me") and 5 ("relates well").

TABLE 8

Activity Means and Standard Deviation from the Summer Bridge Inventory for Academic Adjustment: Performance Subscale

Activities	N	Mean	SD
Chemistry Lab Class	41	4.66	0.66
Engineering Class	41	4.59	0.59
Chemistry Class	41	4.56	0.67
Math Class	41	4.46	0.87
Meetings with Associate Dean of Engineering	41	3.85	1.33
Registration & Class Sign Up and information for fall term	41	3.46	1.66
Updating Your Resume	41	3.44	1.43
Fortune 500 Company Teambuilding Activities	41	3.00	1.48
Move-out Meeting	41	2.80	1.42
Lab Tours	40	2.80	1.44

TABLE 9

Activity Means and Standard Deviation from the Summer Bridge Inventory for Academic Adjustment: Academic Environment Subscale

Activities	N	Mean	SD
Chemistry Class	42	4.48	0.92
Chemistry Lab Class	42	4.43	1.02
Engineering Class	42	4.38	0.94
Math Class	42	4.31	1.05
Campus Tour	42	3.95	1.25
Meetings with Associate Dean of Engineering	42	3.90	1.30
Registration & Class Sign Up and information for fall term	42	3.64	1.54
Updating Your Resume	42	3.43	1.52
Lab Tours	42	3.43	1.40
Introduction Meeting	42	3.19	1.35

TABLE 10

Activity Means and Standard Deviation from the Summer Bridge Inventory for Social Adjustment: General Subscale

Activities	N	Mean	SD
Fourth of July Cook-out	42	4.93	0.26
Evening Out-Bowling	42	4.76	0.58
Skating	42	4.71	0.71
Ropes Course	42	4.71	0.74
Etiquette Dinner	42	4.38	0.94
Trip to Mall	40	4.38	1.23
Floor Meeting	42	3.90	1.08
Introduction Meeting	42	3.86	1.28
Individual and Group Pictures	42	3.79	1.18
Fortune 500 Company Teambuilding Activities	42	3.57	1.36

TABLE 11

Activity Means and Standard Deviation from the Summer Bridge Inventory for Social Adjustment: Other People Subscale

Activities	N	Mean	SD
Fourth of July Cook-out	42	4.81	0.67
Skating	42	4.81	0.45
Evening Out-Bowling	42	4.79	0.52
Ropes Course	42	4.69	0.60
Trip to Mall	40	4.43	1.13
Etiquette Dinner	42	4.24	1.10
Floor Meeting	42	3.83	1.27
Introduction Meeting	42	3.74	1.29
Engineering Class	42	3.67	1.24
Individual and Group Pictures	42	3.50	1.38

TABLE 12

Activity Means and Standard Deviation from the Summer Bridge Inventory for Social Adjustment: Nostalgia Subscale

Activities	N	Mean	SD
Fourth of July Cook-out	42	4.48	1.19
Evening Out-Bowling	42	4.43	0.99
Skating	42	4.38	1.13
Ropes Course	42	4.33	1.26
Trip to Mall	40	4.18	1.43
Introduction Meeting	42	3.79	1.18
Floor Meeting	42	3.71	1.31
Etiquette Dinner	42	3.67	1.34
Campus Tour	42	3.48	1.49
Individual and Group Pictures	42	3.43	1.68

TABLE 13

Activity Means and Standard Deviation from the Summer Bridge Inventory for Social Adjustment: Social Environment Subscale

Activities	N	Mean	SD
Fourth of July Cook-out	42	4.48	1.15
Evening Out-Bowling	42	4.36	1.10
Skating	42	4.31	1.16
Ropes Course	42	4.21	1.44
Trip to Mall	40	3.95	1.54
Chemistry Lab Class	42	3.83	1.27
Engineering Class	42	3.83	1.27
Chemistry Class	42	3.81	1.29
Math Class	42	3.76	1.30
Floor Meeting	42	3.74	1.25

TABLE 14

Activity Means and Standard Deviation from the Summer Bridge Inventory for Personal-Emotional Adjustment: Psychological Subscale

Activities	N	Mean	SD
Ropes Course	42	4.10	1.27
Chemistry Lab Class	42	3.79	1.12
Engineering Class	42	3.71	1.17
Math Class	42	3.71	1.13
4th of July Cook-out	42	3.67	1.54
Skating	42	3.64	1.48
Chemistry Class	42	3.62	1.08
Introduction Meeting	42	3.57	1.29
Evening Out-Bowling	42	3.57	1.52
Trip to Mall	40	3.45	1.55

TABLE 15

Activity Means and Standard Deviation from the Summer Bridge Inventory for Personal-Emotional Adjustment: Physical Subscale

Activities	N	Mean	SD
Ropes Course	42	4.17	1.34
Fourth of July Cook-out	42	3.83	1.25
Evening Out-Bowling	42	3.83	1.31
Skating	42	3.79	1.35
Trip to Mall	40	3.58	1.39
Campus Tour	42	3.24	1.59
Chemistry Class	42	3.05	1.53
Chemistry Lab Class	42	2.81	1.47
Move-Out Day	42	2.76	1.54
Etiquette Dinner	42	2.67	1.39

TABLE 16

Activity Means and Standard Deviation from the Summer Bridge Inventory for Goal Commitment/Institutional Adjustment: General Subscale

Activities	N	Mean	SD
Engineering Class	42	4.24	1.03
Math Class	42	4.19	0.99
Chemistry Class	42	4.10	1.03
Chemistry Lab Class	42	4.00	1.10
Registration & Class Sign-Up and information for fall term	42	3.86	1.47
Fourth of July Cook-out	42	3.76	1.27
Orientation Meetings with Associate Dean of Engineering	42	3.74	1.31
Campus Tour	42	3.67	1.26
Ropes Course	42	3.57	1.48
Student ID Pickup	42	3.57	1.36

TABLE 17

Activity Means and Standard Deviation from the Summer Bridge Inventory for Goal Commitment/Institutional Adjustment: This College Subscale

Activities	N	Mean	SD
Engineering Class	42	4.43	0.94
Chemistry Class	42	4.33	0.90
Math Class	42	4.26	1.06
Chemistry Lab Class	42	4.17	1.10
Registration & Class Sign-Up and information for fall term	42	4.14	1.30
Student ID Pickup	42	4.10	1.30
Campus Tour	42	4.07	1.31
Orientation Meetings with Associate Dean of Engineering	42	4.02	0.95
Fourth of July Cook-out	42	3.76	1.32
Skating	42	3.64	1.28

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