

Examining Timely Positive Interventions Utilized by First-Year Students to Improve their Course Grades in Science and Engineering

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Examining Timely Positive Interventions Utilized by First-Year Students to Improve their Course Grades in Science and Engineering

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Abstract

This Complete Research paper will address the timely interventions the first-year science and engineering students used at Loyola Marymount University (LMU) to reverse their initial struggles, measured by an early alert and/or midterm deficiency, to improved course grades. First-year undergraduate students in Science, Technology, Engineering, and Mathematics (STEM) disciplines face many challenges, including (1) transition and adjustment from high school to college, (2) time management skills with academic, personal, and social responsibilities, and (3) addressing different levels of preparation for their STEM classes. To address the struggles that the students face, the First-Year Advising Committee (FYAC) at LMU conducted a qualitative study to better understand the strategies used by students who were able to reverse their initial struggles. A total of 19 students were interviewed to identify the first-year students' struggles and to examine their strategies to overcome those struggles. The majority of students ($n = 14$) were those who initially struggled (measured by an early alert and/or midterm deficiency) but later improved their academic performance within their first semester in fall, 2021. Their responses were supplemented by five students who did not struggle (measured by a lack of early alert and/or midterm deficiency) but rather thrived throughout the entire semester. Semi-structured one-on-one interviews were conducted, and the transcribed contents were analyzed to identify themes and sub-themes, to show similarities and differences among the students' responses. The themes identified through these interviews provide insights for university stakeholders of student success, especially in a post-pandemic return to college.

Acknowledgement

FYAC's Data Driven Insights subcommittee would like to thank LMU's Diversity, Equity, and Inclusion (DEI)'s Inclusive Excellence Grant, which allowed the authors to study timely positive interventions utilized by first-year students, to improve their course grades.

Introduction

Loyola Marymount University (LMU) is a private, Catholic university located in Los Angeles, California. It is comprised of seven different schools and colleges including the Frank R. Seaver College of Science and Engineering. Seaver College offers 15 undergraduate majors in the traditional sciences, Computer Science, Environmental Science, Health and Human Science, Mathematics, and three Engineering degrees (Civil, Electrical, and Mechanical). Each year, approximately 300 first-year students enroll in Seaver College. As of fall 2021 Seaver students' enrollment consisted of 35.5% white, 24.4% Hispanic, 13.4% Asian, 7.8% Black or African American, with the balance composed of other ethnic minorities. Females comprise 47.5% of Seaver students, though this percentage is smaller for Engineering majors [1]. LMU has been ranked as No. 14 for 'Best Undergraduate Teaching' among national universities by U.S. News and World Report [2] and incoming students were typically very successful high school students. Nonetheless, many Seaver students struggle during their first-year with the transition from high school to college.

In 2008, Seaver College formed the First-Year Advising Committee (FYAC) composed of faculty from each STEM major, to address the struggles that first-year students face. The charge of the FYAC is to help incoming first-year students successfully make their transitions to college. Much of the work of FYAC is centered around identifying struggling students and giving them academic support. Struggling students are typically identified at two different points in the semester, to provide timely advising and interventions. After the fourth week of the 15-week semester, students who have struggled (C- or lower) on their initial 'high-stakes' assignments or exhibited other academic warning signs are placed on an 'early alert list.' Following the seventh week of the semester, instructors submit formal midterm deficiency grades for all students receiving a C- grade or lower. Members of the FYAC are responsible for making sure that students on the early alert or midterm lists receive support by directing them to their academic advisors, instructors, and other campus academic resources.

The FYAC has been able to amass a large amount of data over many years regarding struggling students, including intervention steps and 'recovery rates' (how many students successfully pass a class after receiving an early alert or mid-term deficiency). Additionally, the committee has given surveys to select Seaver students in the past to identify how struggling students were able to improve academically within the course of a semester. Despite this work, there remains a lack of understanding when it comes to what type of strategies students use to reverse their initial struggles. In part to address this, in 2020 an FYAC sub-committee called Data Driven Insights was formed and this work was conducted, so that better interventions can be created to help more students in the future.

Background

Successfully transitioning into the first year of college, while succeeding academically in rigorous math and science courses, remains an area of high concern, as most students who leave STEM majors do so in the first two years of college [3]. According to National Center for Education Statistics, across the United States, 48% of bachelor's degree students who entered STEM fields between 2003-2009 had left these fields by spring 2009. Nearly half of these

students switched their majors to a non-STEM field, while the other half withdrew from college before earning a degree [4]. Indeed, dropout rates are significantly higher among STEM majors compared to other majors [3].

Moreover, the substantial dropout rate by the end of the first year has also been well documented [5-7], as well as the risk factors for poor academic performance or leaving the STEM fields [8]. However, as culture and priorities of individuals shift over time, it is of high importance to continually monitor the students' changing challenges and struggles. This will also allow for better implementation of interventions, especially in a post-pandemic return to college.

Methods

The authors led the semi-structured interviews and recruited a total of 19 students to participate in the study. A total of 87 students were contacted, who initially received an early alert and/or midterm deficiency, but later improved their academic performance in fall 2021, through their final grade. During the fall 2021 semester, the participating students' courses were all held in-person. However, many students entered college after having an entirely online senior year in high school. Out of these students, 14 students were recruited. Student participants were asked to share information about their experiences as a first-year student in Seaver College, including their challenges and struggles. Their techniques and strategies to overcome those challenges and struggles were supplemented with the results from students who were not struggling or did not receive midterm deficiency grades ($n = 5$) but rather thrived throughout the semester. For these five student participants, the authors received recommendations from professors. The semi-structured interviews were conducted in spring 2022, ranged from 9 to 36 minutes ($M = 21.8$, $SD = 7.5$), and were recorded and later transcribed using a third-party transcription service provider. This project is Institutional Review Board (IRB) approved (LMU IRB 2019 FA 03-R). The student participants received Experimental Subjects Bill of Rights, signed an Informed Consent, and filled out a demographics survey. The student participants received a \$50 gift card as compensation for their time.

A qualitative analysis was conducted by LMU's Grant Evaluation and Statistical Support (GESS). A content analysis was first conducted on the transcribed interviews using grounded theory [9-11]. The grounded theory allows the team to make fewer assumptions about the outcomes and allow theories to be generated from the collected data. This collected data were analyzed with NVivo 12 Pro, a qualitative method software program [12], to look for categories or themes and sub-themes, which would establish similarities and differences among the students' responses.

Student Participants

The student participants came from diverse backgrounds. Based on the demographics survey, there were 8 males and 11 females with ages ranging from 18 to 22 years old. There were 16 local and 3 international students. Their races and ethnicities included white, Asian, Black, Hispanic/Latino, Native Hawaiian or other Pacific Islander, and multi-racial. There was representation across various majors that included Health and Human Sciences, Biology, Computer Science, Mechanical Engineering, Electrical and Computer Engineering,

Biochemistry, Environmental Science, and Science Undeclared and Environmental Studies. Among these students, 6 students were engineering majors and 13 students were science majors.

Themes & Sub-Themes

Based on the semi-structured interviews, the main themes that were aligned with the pre-determined questions were: (1) Type of challenges or struggles students faced, (2) Changes students made, (3) Type of help received, (4) Motivation to seek help, (5) Advice to other students, (6) High school preparation, (7) Inspiration to pursue STEM, and (8) Information the students wished to have known before coming to college. Within the three themes (1) Challenges or struggles students faced, (2) Changes students made, and (5) Advice to other students, three sub-themes emerged as academic, personal, and social. The main themes, sub-themes, and corresponding topics listed in order of frequency are shown in Table 1. The details and examples are provided in the next Results section.

Table 1. Main Themes, Sub-Themes, and Topics from Students' Responses

| No. | Themes | Sub-Themes | Topics |
|-----|------------------------------|--------------------|---|
| 1 | Type of challenges/struggles | Academic struggles | College is different from high school ($n = 6$) Online learning ($n = 3$) Fast-paced teaching with prior knowledge expected ($n = 2$) |
| | | Personal struggles | Time management ($n = 8$) Transitioning to college ($n = 5$) Commuting ($n = 3$) |
| | | Social struggles | Difficulties in finding time to socialize ($n = 2$) Too much socializing ($n = 1$) |
| 2 | Changes students made | Academic changes | Study group ($n = 8$) Take more time to review materials ($n = 5$) Practice problems ($n = 4$) |
| | | Personal changes | Time management ($n = 9$) Sleep schedule ($n = 3$) Limit social media and cellphone use ($n = 1$) |
| | | Social changes | Make friends in STEM and non-STEM ($n = 1$) Join clubs on campus ($n = 1$) |
| 3 | Type of help received | | Meet with professors during office hours ($n = 13$) Peer tutoring ($n = 7$) YouTube and Internet ($n = 5$) Academic advisors ($n = 5$) TAs ($n = 3$) Off-campus tutors ($n = 2$) |
| 4 | Motivation to seek help | | Low grades and not wanting to fail classes ($n = 4$) Family's sacrifice ($n = 4$) Wanting to learn ($n = 2$) |
| 5 | Advice to other students | Academic advice | Meet with professors during office hours ($n = 9$) Peer tutoring and TAs ($n = 4$) Early preparation ($n = 2$) |
| | | Personal advice | Time management with a planner ($n = 9$) Sleep schedule ($n = 3$) Mindset ($n = 2$) |

| No. | Themes | Sub-Themes | Topics |
|-----|--------------------------------------|---------------|--|
| | | Social advice | Set aside time to make friends and build connections ($n = 3$) Not join too many clubs at the beginning ($n = 1$) |
| 6 | High school preparation | | Take STEM classes ($n = 7$) Experiences, activities, and opportunities ($n = 5$) Similar structure and online tools ($n = 4$) |
| 7 | Inspiration to pursue STEM | | Preferences and/or interests ($n = 9$) Family members ($n = 4$) Career path ($n = 3$) |
| 8 | Information before coming to college | | College preparation course ($n = 3$) Confidence in choosing a major ($n = 2$) Short videos regarding important topics and resources in college ($n = 1$) |

Results and Discussion

(1) Challenges/Struggles

When students were asked to identify personal challenges and struggles they faced in the first half of the fall semester, students discussed academic, personal, and social struggles.

Academic Struggles

Students revealed their academic struggles, such as studying the wrong topics, falling behind, and receiving low grades on assignments, thus, resulting in a risk of failing and/or withdrawing from classes. There were three common challenges that were identified from students' responses – transitioning from high school to college, online learning, and meeting professors' expectation of prior knowledge and understanding. To start, students acknowledged that college is different from high school in that they must exercise their independence and reach out to professors ($n = 6$). In high school, teachers provided study guides and reached out to students, which were different from college. Furthermore, in college, students needed a firm understanding of conceptual application instead of relying solely on memorization to be confident in creating their own study guide. The following quote was an example of how they experienced the differences between college and high school.

“Throughout high school... a lot of teachers provided study guides and whatnot. They're questions to work off of, like what to study. It's different now in college. Rarely will teachers ever give like a full fleshed out study guide. Now it's just more of like... from this day to this day, study like that material in between. So, that was a struggle for me not having something given to me.”

Second, some students struggled with online learning due to COVID-19 leading up to their freshman year at LMU and also had trouble navigating online learning platforms, such as Brightspace ($n = 3$). One student who did well also had a problem with an online gradebook. Students commented that they could not find their current grades, how grades were calculated, and that grades were not updated on time which brought concerns. Third, students struggled with

meeting professors' expectations of what was deemed foundational knowledge ($n = 2$). In such situations, students said professors would rush through materials with the assumption that the students had a firm grasp on the material.

Personal Struggles

The top three personal struggles affecting academic struggles were: time management ($n = 8$), transitioning to college ($n = 5$), and commuting ($n = 3$). Time management, especially coupled with transitioning, was a main issue in the beginning of the semester. Specifically, students struggled with balancing responsibilities in their lives (e.g., spreading out assignments and readings instead of waiting until the last minute, study life versus work life, exercise, sleep and waking up schedule). Being commuters affected academic performance and health. Due to a long commute, sometimes students came to classes late, missing critical class information. This impacted their understanding of the subject matter, and it was reflected in their low grades. Similarly, after a long commute back home, they only had limited hours of sleep. This led to sleep deprivation, which also impacted their academic performance.

Social Struggles

Two common social struggles were finding time to make friends or spending too much time socializing which took away time from studying. For two students who did well academically were struggling to find time to make friends, and other students mentioned that they did not know anyone and that they lacked connection. This was difficult for them in their first year.

(2) Changes Students Made

When students were asked to identify interventions they utilized for a positive outcome, students discussed academic, personal, and social changes.

Academic Changes

Students formed new study habits and experimented with what worked for them. Furthermore, they sought help in new ways. Several students commented on having participated in a study group that was shown to be effective ($n = 8$). Students explained that they liked testing each other's knowledge as well as having the opportunity to teach one another. Some students stated that they discovered other effective ways to study, such as taking time to review materials and to rewrite notes, rereading textbooks and lecture slides, and rewatching lectures ($n = 5$). Furthermore, they also solved more practice problems ($n = 4$). Another change that students shared is having a designated study place such as the library, study room, or dorm room.

Personal Changes

In identifying personal changes, nine students commented on time management. Specifically, students learned to start studying or doing homework earlier on, to spread out homework, and to work on tasks step by step. Students discovered that having a planner to plan and to organize their schedule strategically was very helpful. Furthermore, adequate amount of sleep, allowing

time for self-care, and limiting social media and cellphone use by placing it out of reach, were crucial in helping to study more effectively.

Social Changes

Student interviewees acknowledged the social changes they implemented to aid their success. First, they started forming new relationships with their fellow students in STEM. Beyond that, students said they broadened their networks by joining clubs on campus, which supported the formation of new relationships outside of STEM. In doing so, students said they were able to have friends that they were able to discuss both STEM and non-STEM topics with. Unfortunately, some negative experiences were reported from high performing students as well. One student mentioned that friends always asked him/her questions related to course content all the time, and that this student felt the need to stop talking to these friends.

(3) Type of Help Received

The students were asked about the types of help they sought (any from FYAC, advisor, tutoring, etc). From the aggregated responses, students mentioned six different types of help. The most common type of help was meeting with professors during office hours ($n = 13$ or 93%). Second, students sought peer tutoring ($n = 7$ or 50%), third, students sought help from YouTube and Internet ($n = 5$ or 36%). Fourth, students consulted with their academic advisors ($n = 5$ or 36%), and fifth, students asked their teaching assistants (TAs) for help ($n = 3$ or 21%). Lastly, they sought help from off-campus tutors ($n = 2$ or 14%). Five out of 13 students (38%) said that they were initially afraid or anxious to go to office hours because they did not have specific questions, did not know what office hours were for, or that they did not want to be judged. One student said,

“I can’t formulate what I have to ask them, if that makes sense. I’ll be struggling with a certain concept, but I just don’t know what to specifically ask them. But by going to office hours, I realize that you don’t need to go in with one specific question in mind. Professors are there to help out no matter what. They know the material better than students do so they can help out in any way. And no matter if you have an actual question or you just want to get a refresher on the material or just need some extra support. Sometimes, I worried that I doubt myself a lot. So, I guess that was also a thing I’d be doubting my abilities and my skills... I’d get anxious going to office hours.”

One student mentioned that getting himself/herself to office hours was the most difficult part but once they started going to office hours, it was very helpful and started going more frequently. For peer tutoring and TAs, two students felt comfortable asking them questions because tutors and undergraduate TAs speak in a way that is easier for the students to understand. They also received study tips from TAs, such as how to memorize. Interestingly, YouTube has become more popular to students these days, where students can find supplemental study information. In addition, one student also went to Byte and Nibble Program (LMU’s peer mentorship program) to ask questions. One student who was not struggling went to ask the TAs at LMU’s Computer Science Keck Lab (student workspace), which provided a great community and support.

(4) Motivation to Seek Help

The students were asked about their motivation to seek out help. The top reason for students' motivation to seek help was to prevent low grades; they did not want to fail classes nor have to wait a full year to retake that class ($n = 4$ or 29%). Also, some classes are prerequisites for other classes, so they did not want to be behind. One student said they did not want to lose their scholarship by having a low GPA. Thus, seeing their midterm exam scores and receiving a midterm deficiency seemed to serve as a helpful warning to improve their academic performance. Other than preventing low grades, four students referred to their families as their motivation, as their families have done so much for them to receive education. They wanted to show hard work in reciprocity. One of them was a first-generation student attending college. Two students reminded themselves that they wanted to learn, as education was their main motivation.

(5) Advice to Other Students

When students were asked to give advice to incoming first-year students, students provided academic, personal, and social advice.

Academic Advice

The top advice was meeting with professors during office hours ($n = 9$). Students were typically scared at first, but after utilizing the office hours and meeting with the professor(s), students found this time very valuable. Students also suggested peer tutoring sessions ($n = 4$). Next, going to TAs ($n = 2$) were considered essential, especially for labs. Students mentioned that the peer tutors and TAs explained clearly and plainly with simple language that was easy to understand. Students also mentioned that college was faster paced and that there are a lot of assignments that take longer to complete, compared to high school.

Furthermore, students advised that they need to dedicate more time to study materials on their own. So, even though self-teaching is important, collaborating with classmates is also helpful. In other words, for those who preferred studying alone, going to study groups a few times would be helpful. When studying, they suggested finding study habits or learning styles that work for them and use different learning styles for different classes.

For students who were not struggling, two students emphasized that early preparation was important. One student provided the following advice on how excel in college:

“There’s no cheating your way around college at all, like you have to understand everything you do, take notes, and apply that to your work.”

Personal Advice

Mirroring personal struggles and changes, time management ($n = 9$) was the top advice. They emphasized that prioritization and time allotments were crucial. Having a planner ($n = 3$) helped organize and prioritize deadlines. Students emphasized working on assignments as soon as

possible and to spread out the assignments. They suggested being disciplined, and to not procrastinate and wait until the last minute. This includes going to bed early and setting a sleep schedule to get enough sleep and to wake up early. One student summarized,

“Just a lot of discipline. I think that’s the biggest thing. You’re going to be tempted to do college things, but you have to realize why you’re here. It’s to get education and you obviously chose your sport and you’re going to have to accept those sacrifices. So, just realize that the outcomes of your sports can be greater than anything that maybe some social life can offer you. So, I know in the moment it sucks because you’re like, “Oh, I really want to have fun.” But in the end, you’ll feel better about yourself and you’ll end up being more successful, both in the classroom and wherever your sport is.”

They also advised students to have the right mindset about what they have already accomplished and that they are capable of tackling difficult tasks.

“It has to be a mental thing that says, I’m going to have to give this 15-minute presentation for a first-year seminar class. My first year, scary. But it’s just something that you have to do. And once you finish it, I’s not only an accomplishment, but then it makes it easier for the subsequent classes.”

Social Advice

The top social advice was to make sure that students have enough time to make friends, get to know people, and to build connections ($n = 3$). Some students suggested connecting with new friends through social media platforms before coming to LMU, as LMU is a small university, and those friends might be in the same classes. The students mentioned that it might be worthwhile to adjust to the university campus first and get to know people in the department before moving in, which could be helpful in the transition process. Students mentioned that making friends within their major was useful because they shared a similar course schedule. Furthermore, making friends in the same classes and labs were also helpful because you might see each other for four years. Another way to build community was to engage in extracurricular activities (joining a club), but students advised that they should not join too many of them in the beginning. To receive emotional support, students recommended communicating with friends or family when struggling.

(6) High School Preparation

Students were asked about how high schools can prepare students well for STEM majors or STEM major selections. For 7 out of 14 students, taking STEM classes such as Anatomy, AP Environmental Science, Chemistry, Engineering Design in high school was considered very helpful to prepare them for STEM majors in college. In comparison, all 5 students who did not struggle throughout the semester noted that they took STEM classes in high school. Taking advantage of experiences or opportunities related to STEM in high school, such as taking sports and injuries class, meeting parent’s friend who is a psychologist to gain more insight about the profession, building and fixing computers for friends ($n = 5$), also helped prepare them for STEM majors in college. Furthermore, attending a high school that had a similar structure to

college (e.g., taking four classes per semester similar to college, learning at an accelerated pace, receiving a lot of assignments) and receiving online tools to college ($n = 4$) helped familiarize students to college life.

Unfortunately, poor high school preparation (e.g., taking low-quality AP classes, focusing solely on memorization as a study habit, attending an art-oriented high school without STEM classes, online STEM classes due to COVID-19), led to academic struggles ($n = 4$).

(7) Inspiration to Pursue STEM

When the students were asked about their high school experiences that prepared them for STEM majors or inspired them to pursue one, nine out of 14 (64%) students who were struggling (compared to all five students who were not struggling) chose to pursue STEM based on their preferences and/or interests. Other inspirations included having family working in STEM related fields as well as their family's encouragement ($n = 4$ or 29%). Furthermore, STEM career paths inspired the students because they saw that there was potential for continuous advancement ($n = 3$ or 21%).

(8) Information the Students Wished to Have Known Before Coming to College

Lastly, students were asked if there was anything they wish they had known about the summer before starting college. The top information that the students wished they had known was understanding that the nature of college is different from high school. College is fast paced with a lot of individual work outside of class. Students must reach out to professors to receive help, in contrast to high schools where teachers usually reached out to them if they were struggling. Consequently, they felt overwhelmed and shocked in the beginning. Therefore, they wished they had received a college preparation course that would cover topics such as study skills, note taking skills, and time management to prepare them for college ($n = 3$).

Second, they wished that they had more guidance in choosing a major ($n = 2$). They did not know that they had some time to decide their majors while they were taking prerequisite classes. Thus, the students wished that they had taken their time to look through a vast number of majors available at LMU prior to selecting their majors.

Lastly, the students wished that they had known about the resources that were available to them at LMU from the beginning (e.g., study groups, tutors). They mentioned that short college preparation videos regarding important topics (e.g., how to excel in college, improve study habits, writing skills, social life, get involved in clubs) would've been greatly helpful. In addition to college preparation videos, they suggested a summer course on STEM topics, as well as an opportunity to sit in a real LMU STEM class before coming to college so that they would see how professors teach and how students interact. These opportunities would be beneficial to students who did not have sufficient STEM knowledge from high school.

Conclusions

A total of 19 students were interviewed to identify the first-year students' struggles and their strategies to overcome those struggles. Based on the semi-structured interviews, the main themes that were aligned with the pre-determined questions were: (1) Type of challenges or struggles students faced, (2) Changes students made, (3) Type of help received, (4) Motivation to seek help, (5) Advice to other students, (6) High school preparation, (7) Inspiration to pursue STEM, and (8) Information the students wished to have known before coming to college.

For theme (1) Type of challenges or struggles students faced, the students reported three main struggles. In the beginning of their first year, the transition and adjustment from high school to college was the main challenge. In addition to this adjustment, students then stated that time management was the most challenging. After students learned how to balance time within academic, personal, and social responsibilities, their academic performances improved. In improving their academic performances, the students reported that their top strategy was to meet individually with professors during their office hours, something that they were afraid of doing in the beginning of the semester. Lastly, students who received an early alert and/or a midterm deficiency reported that they had not adequately prepared for each class period (e.g., completed pre-reading assignments and activities), while those students who did well throughout the semester prepared for each class period.

There were differences in the responses between students who struggled versus those who did not. All five students who did not struggle did not mention the differences between college and high school, while six out of 14 students who were struggling mentioned this during the interview. Also, there were differences between the two groups of students in preparation before classes. Two out of five students who were not struggling prepared before their classes from the beginning of the semester, whereas one out of 14 students who were struggling prepared before their classes only after receiving a midterm deficiency.

For theme (8) Information the students wished to have known before coming to college, students suggested that a college preparation course in the summer before college starts would have been beneficial, especially for those who felt that they did not have sufficient STEM knowledge from high school. Students suggested that a preparation course could include topics such as basic foundations in STEM and Mathematics, study skills (e.g., note taking, reading), and time management. A short tutorial video regarding resources (e.g., how to excel in college, improve study habits and writing skills, navigate social life, get involved in extra-curricular activities) would also be a great idea to help prepare students to be ready for college-level studies.

For the role of professors teaching first-year students in STEM, giving extra efforts such as reaching out to students, explaining office hours in detail, emphasizing resources available to students, preparing study guides would tremendously help students while they are transitioning during the first semester. As YouTube has become a more popular resource for students who are struggling, professors should explore creating supplemental content, and guide them on what to watch, as not all channels might be helpful. Lastly, students are grateful to their professors who are passionate about what they do, and it translates to students; this made the students want to be more passionate about their studies as well. They appreciated that the atmosphere of the university was very welcoming, which felt like a home away from home.

Future Work

As the current work involved identifying the first-year students' initial struggles and their interventions and strategies used to receive a positive outcome at LMU. In the future, this study can be replicated different types of universities (large public universities, community colleges, etc.) to validate the results of this study, and to leverage the findings of this study to implement evidence-based interventions for students' retention and success.

At Seaver College, future work will involve (1) utilizing existing programs to meet first-year students' needs and (2) discussing a new implementation plan. One of the existing first-year programs include ACCESS program (A Community Committed to Excellence in Scientific Scholarship) which helps build a community and prepare students for academic success through a 3-week collaborative engagement in engineering and scientific scholarship. A new implementation plan will include providing a college preparation course in the summer before college with short video orientations that will provide resources on how to prepare for college. The video orientations will cover topics such as how to excel in college, improve study habits and writing skills, navigating social life, and how to get involved in extra-curricular activities. This will help prepare students to get ready for college and help increase first-year STEM students' retention and success. Evidence-based interventions, such as Martin et al. [13] will be reviewed to ensure success of the interventions.

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