Factors Affecting On-Time Graduation of Engineering and Construction Management Undergraduates at a Minority Serving Institution

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Abstract

Graduation rates, degree completion, and time to degree are of utmost importance to academia. Although the bachelor's degree is traditionally a four-year degree, the time for its completion has increased significantly in the United States (U.S.) over the past two decades. According to the National Center for Education Statistics (NCES) only 44 percent of students completed their bachelor's degree within four years. This translates to more than half of undergraduate students failing to complete their degrees on time, thus becoming extender students. Despite these concerning statistics, there is not much research published that addresses why students struggle and fail to complete their degree within four years, or even abandon their education. The goal of this study is to identify some of the main reasons why undergraduate STEM students, particularly in Engineering and Construction Management programs, take longer to complete their degree, or fail to graduate, and propose initiatives to support minority students in completing their degree on time. To achieve these goals, this study: (a) identified the main factors contributing to this paramount problem from previous literature; (b) gathered and assessed data regarding students' graduation rates from Florida International University (FIU), one of the largest minority serving institutions (MSI) in the U.S.; (c) administered a survey to 75 Construction Management students at FIU, which helped analyze degree completion, the factors contributing to delays in undergraduate program completion, as well as the motivators and resources to finish their degree within four years; and (d) proposed strategies that could be implemented at educational institutions to aid students in completing their degree on time. The data collected regarding graduation rates surprisingly confirmed that (a) less than 50 percent of Engineering and Construction Management students graduated in four years while 60 percent graduated in six years; and (b) approximately 40 percent of students did not graduate after six years. The results of this research showed that several academic, financial, and social factors play a significant role in students' failure to complete their degree within four years. This research proposed several strategies including an inclusive educational experience that embraces peer-to-peer mentoring and tutoring, equitable financial aid mechanism, and establishing a clear educational curriculum path that can be implemented at institutions to enhance learning experiences while incentivizing minority students to graduate within four years. The findings of this study serve educational institutions and education stakeholders by paving the way to address graduation concerns and contribute to the academic success and timely graduation of students.

Keywords: Academic Success, Extender Students, Graduation, Graduation Rates, Time to Degree

Introduction

Degree completion is considered a crucial indicator of institutional quality [1]. Over the past two decades, time-to-degree for United States (U.S.) bachelor's degree recipients has noticeably increased, resulting in higher education institutions becoming particularly concerned about

completion or graduation rates [2]. Traditionally, the bachelor's degree is a four-year degree. However, more than 50 percent of bachelor's students fail to complete their degree on time, thus becoming extender students. This term refers to students who take longer than four years to complete a bachelor's degree [3], [4]. Given that most undergraduate Science, Technology, Engineering, and Mathematics (STEM) students take longer to graduate, the four-year degree has transformed into a six-year degree, raising governance problems and concerns among education stakeholders about graduation [5]. According to the National Center for Education Statistics (NCES) in 2017, only 44 percent of students completed their bachelor's degree within four years, 20 percent graduated within four and five years, 10 percent within five and six years, 13 percent within six and ten years, and 12 percent in more than ten years [6]. Despite these concerning statistics, there is not much research published that addresses why students struggle and fail to complete their degree within four years, or even abandon their education [4], [7].

Several academic and non-academic factors contribute to why undergraduate STEM students take longer than four years to graduate. The main contributing factors are: (a) having to work to cover tuition and expenses and not being able to take more than 12 credit hours per semester on a regular basis; (b) changing of majors; (c) having difficulty in completing all major prerequisite/core courses due to them not being offered every semester, when they needed to take them, or due to scheduling conflicts; (d) long commuting time, which took away time from studying or working; and (e) dropping courses due to dissatisfaction with the professors [4].

Given the importance of graduation rates, degree completion, and time to degree to academia and the little research on these topics [1], [2], [4], [7], this study investigated current graduation rates and the factors hindering on-time graduation. To achieve these goals, this study (1) gathered and analyzed graduation data from Accountability [8], an intranet site created by Florida International University's Office of Analysis and Information Management that contains raw data from all students at the academic institution; and (2) surveyed 75 students from Florida International University (FIU), one of the largest minority serving institution (MSI) in the U.S., to understand the factors contributing to delays in program completion as well as the motivators and resources that can help them achieve their graduation goals. Furthermore, this research proposed several strategies that could potentially help students graduate on time. The findings of this study serve educational institutions and education stakeholders by paving the way to address graduation concerns and contribute to the academic success and timely graduation of students.

Methodology

This study is guided by two research questions focused on identifying: (1) what are the main contributing factors hindering minority students from completing their STEM bachelor's degree in 4 years, and (2) how can the educational institution help undergraduate students complete their degree on time? This paper addresses these two questions through: (a) reviewing the existing literature on time-to-degree completion and the factors contributing to this paramount issue affecting tertiary education; (b) reviewing and analyzing the data obtained from Accountability [8], FIU's Office of Analysis and Information Management's intranet site, regarding first time in college (FTIC) student graduation rates; (c) conducting 75 surveys to undergraduate students at FIU, one of the largest MSIs in the U.S., to assess degree completion, students' motivation to complete their degree on time, and the academic resources that could help them achieve this

goal; and (d) proposing strategies that could be implemented at educational institutions to help students complete their degree within four years.

This study utilized a mixed-methods sequential explanatory design to collect and analyze both quantitative and qualitative data from students. The administered survey included a demographic section and a total of five questions. The first two questions were intended to identify if students plan to graduate on time and how they are anticipating to achieving this goal. The following three questions aimed to identify the factors that affected on-time graduation as well as the students' motivations to completing their degrees, and the resources that could help them achieve their graduation goals. Subsequently, the collected data obtained from the surveys and Accountability [8] were then used to propose strategies for implementation at educational institutions to help students complete their degree within four years. Figure 1 illustrates the research overview.

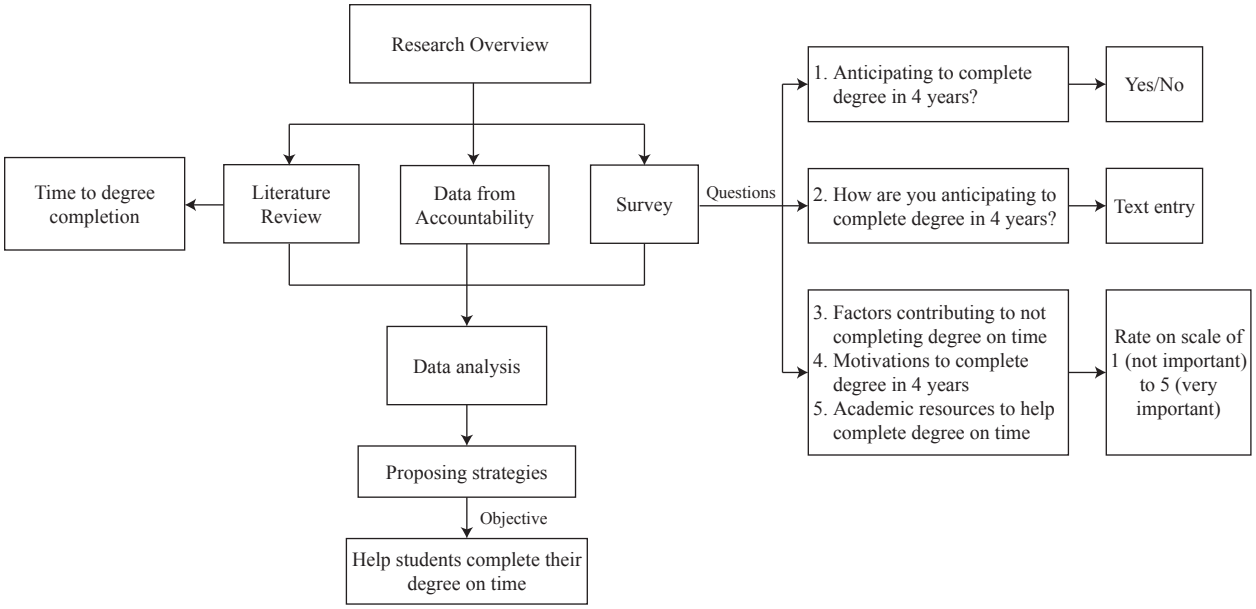

Figure 1: Research Overview

Results and Discussion

Data from Accountability

This research collected graduation data reports from Accountability [8], an intranet site created by FIU's Office of Analysis and Information Management. This site contains raw data related to graduation, retention, and attrition rates for the entire student population of the academic institution. This study gathered data from FTIC STEM, Engineering, and Construction Management students in order to analyze the graduation rates for FIU's entire student population. Transfer students were excluded since FTIC and transfer students are not comparable because transfer students had already studied for some time before entering the academic institution. Consequently, analyzing graduation rates from FTIC students in conjunction with

transfer students may skew and misrepresent the graduation rates, since they would appear to graduate on time. Needless to add, combining such groups results in noticeable improvements in those rates. As a result, only FTIC data was gathered from Accountability [8] to remove the distortion and bias.

The data collected from Accountability [8] showed that when it comes to graduation rates of FTIC STEM students, (a) between 13 and 18 percent of students that started their program between 2008 and 2012 graduated in four years, between 24 and 35 percent of students that started their programs between 2013 and 2015 graduated on time, and between 45 and 56 percent of students that started their programs on the following years graduated in four years; (b) between 47 and 70 percent of students graduated in six years; (c) between 55 and 70 percent of students graduated in eight years; (d) between 40 and 53 percent of students that started their program between 2008 and 2014 did not graduate in six years, and between 28 and 34 percent of students that started their program in the following years did not graduate in six years; and (e) between 28 and 45 percent of students did not graduate after eight years. This data is presented in Figure 2.

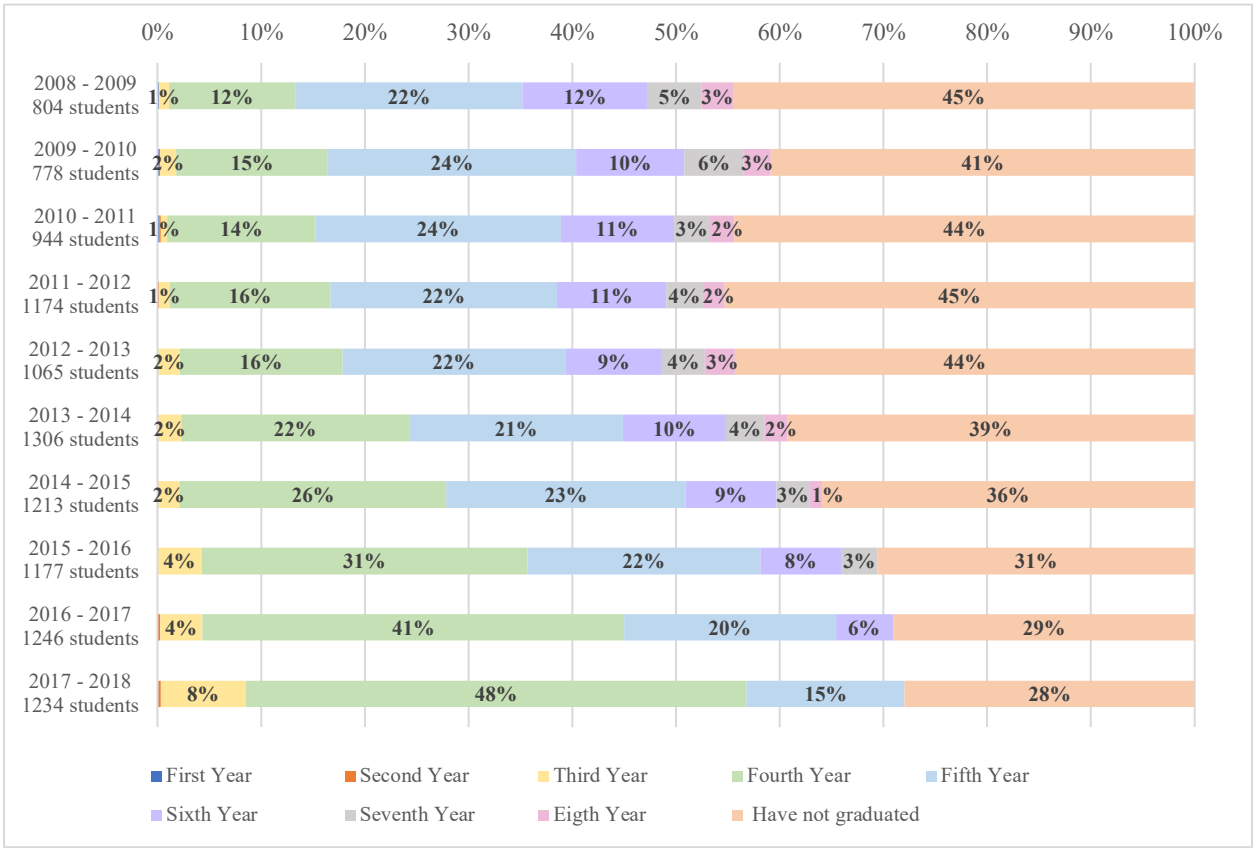

Figure 2: FTIC STEM Students Graduation Rates

The numbers are comparable for Engineering and Computing (EC) students. According to the data collected from Accountability [8], (a) between 7 and 17 percent of FTIC students that started their program between 2008 and 2014 graduated in four years, while between 24 and 51

percent of students that started their program on the following years graduated on time; (b) between 38 and 54 percent of students that started their program between 2008 and 2014 graduated in six years, while between 64 and 72 percent of students that started on the following years graduated in six years; (c) between 50 and 61 percent of students graduated in eight years; (d) between 45 and 61 percent of students that started their program between 2008 and 2014 did not graduate in six years, and between 28 and 36 percent of engineering and computing students that started their program on the following years did not graduate in six years; and (e) between 28 and 52 percent of students did not graduate after eight years. This data is represented in Figure 3.

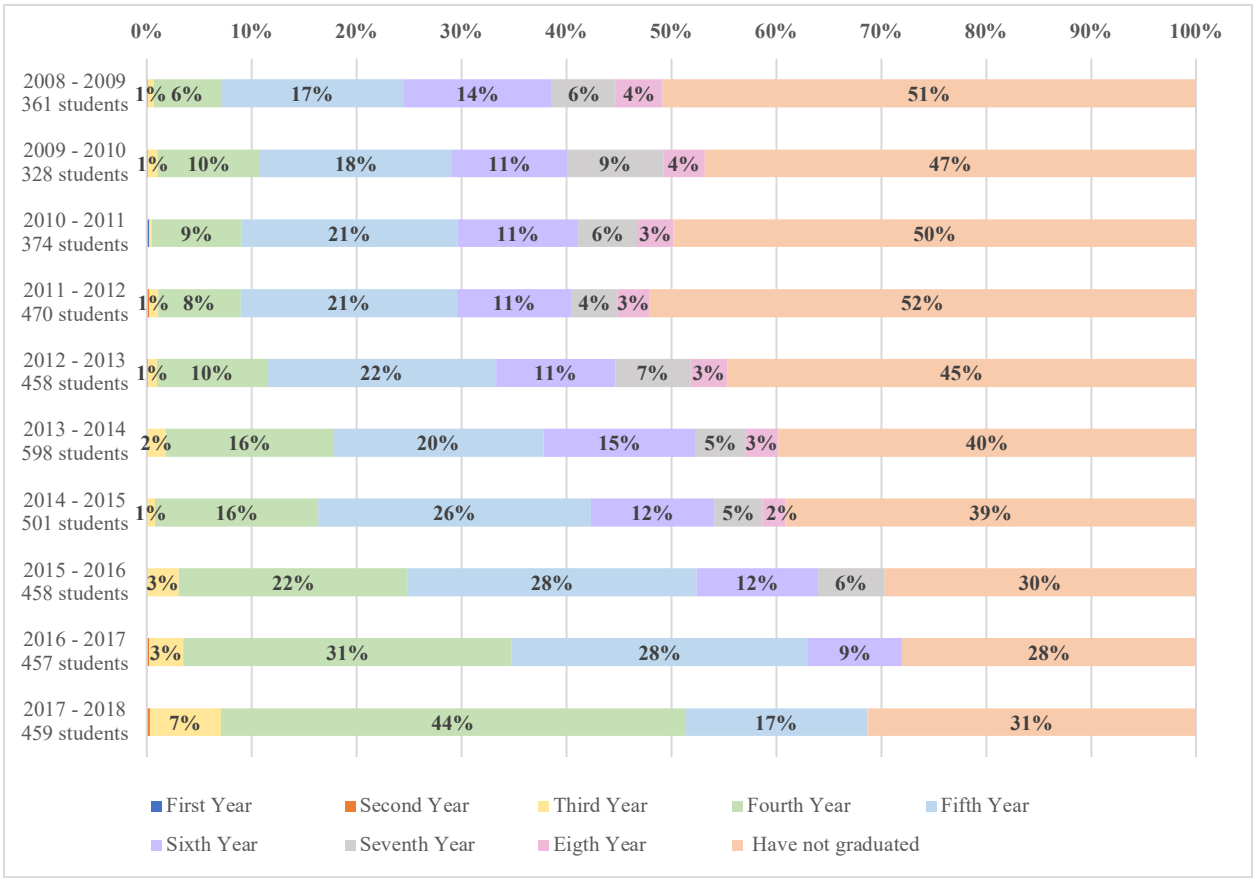

Figure 3: FTIC College of Engineering and Computing Students Graduation Rates

The number of FTIC STEM and EC students who graduate on time at FIU has been increasing over the past eight years as presented in Figures 2 and 3. This reflects an encouraging shift towards more students graduating in four to five years and fewer students not graduating and/or abandoning the institution before graduating. However, still 50 percent or more students do not graduate on time and around 30 percent do not graduate after six years or not finish at all and abandon their education.

Finally, the data collected from Accountability [8] showed that when it comes to graduation rates of FTIC Construction Management students, (a) between 0 and 15 percent of FTIC students that started their program between 2008 and 2015 graduated in four years, while between 29 and 50

percent of students that started their program on the following years graduated on time; (b) 13 percent of students that started their program in 2008 graduated in six years, the two students that started their program in 2009 graduated in five years, between 23 and 47 percent of students that started between 2010 and 2013 graduated in six years, and between 55 and 62 percent of students that started on the following years graduated in six years; (c) 27 percent of students that started their program in 2008 graduated in eight years, and between 46 and 65 percent of students that started their program between 2010 and 2015 graduated in eight years; (d) between 53 and 86 percent of students that started their program between 2008 and 2013 did not graduate in six years, and between 37 and 45 percent of construction management students that started their program on the following years did not graduate in six years; and (e) between 25 and 46 percent of students did not graduate after eight years. This data is presented in Figure 4.

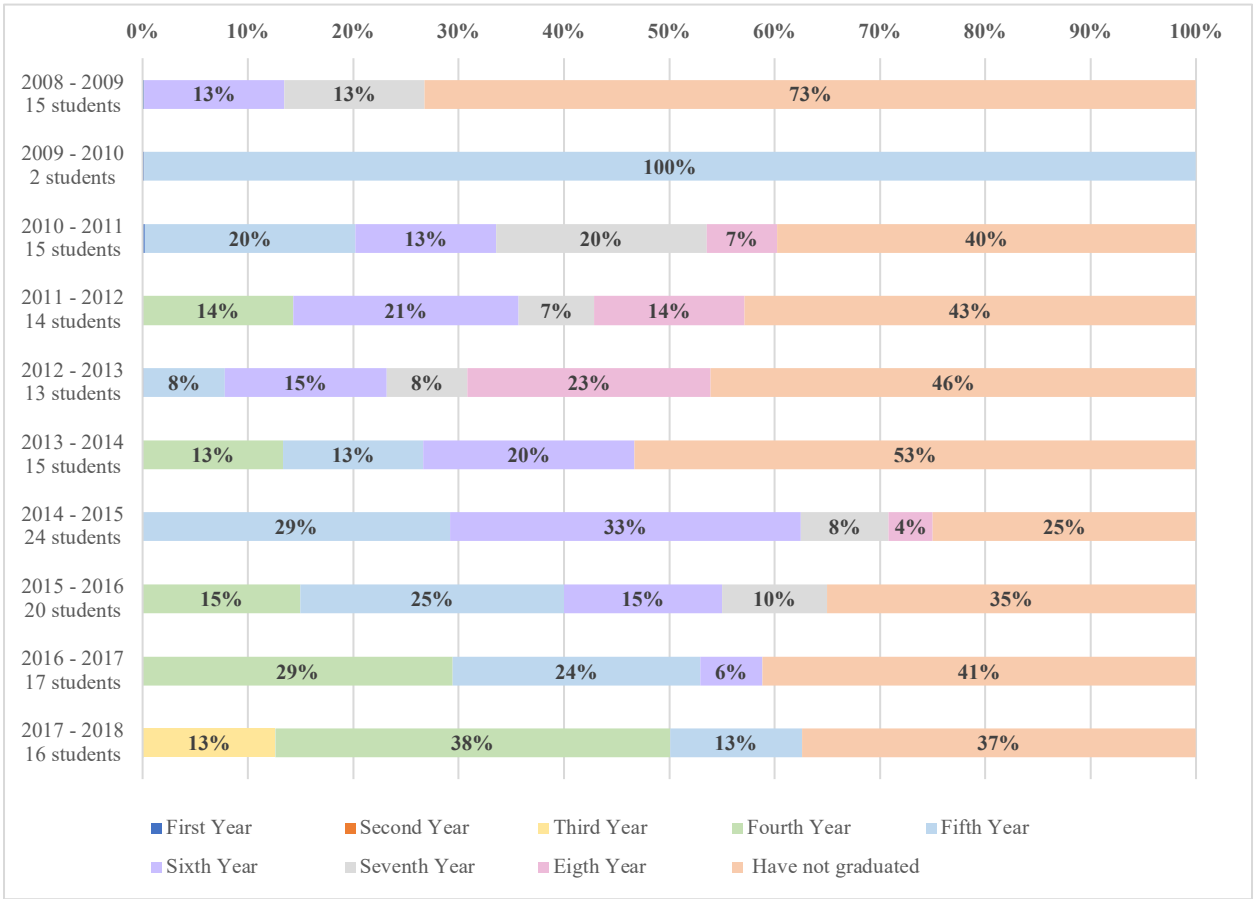

Figure 4: FTIC Construction Management Students Graduation Rates

Although the number of Construction Management students who graduate on time at FIU has been increasing over the past eight years, still 50 percent or more of FTIC students do not graduate on time. Furthermore, more than 30 percent do not graduate after six years or not finish at all, abandoning their education.

Survey Results

This section presents the results associated with 75 Construction Management students' survey responses. The survey aimed to analyze degree completion, the factors contributing to delays in undergraduate program completion, as well as the motivators and resources to finish their degree within four years. To achieve these goals, this study utilized a mixed-methods sequential explanatory design to collect and analyze both quantitative and qualitative data from students. The survey included responses from FTIC, transfer, and international students. It did not differentiate between them, except to assess time to graduation, since the factors hindering timely graduation as well as the motivators and resources that can help them achieve their graduation goals and academic success are comparable among all students.

The recorded data included a diverse group of students as shown in Figure 4, which included (a) 58 males, 16 females, and one student that preferred not to answer; (b) 3 freshmen, 8 sophomores, 38 juniors, and 26 seniors; (c) students from multiple races, including African American, White, Asian, among others; and (d) Hispanic and non-Hispanic students. The demographics are presented in Figure 5.

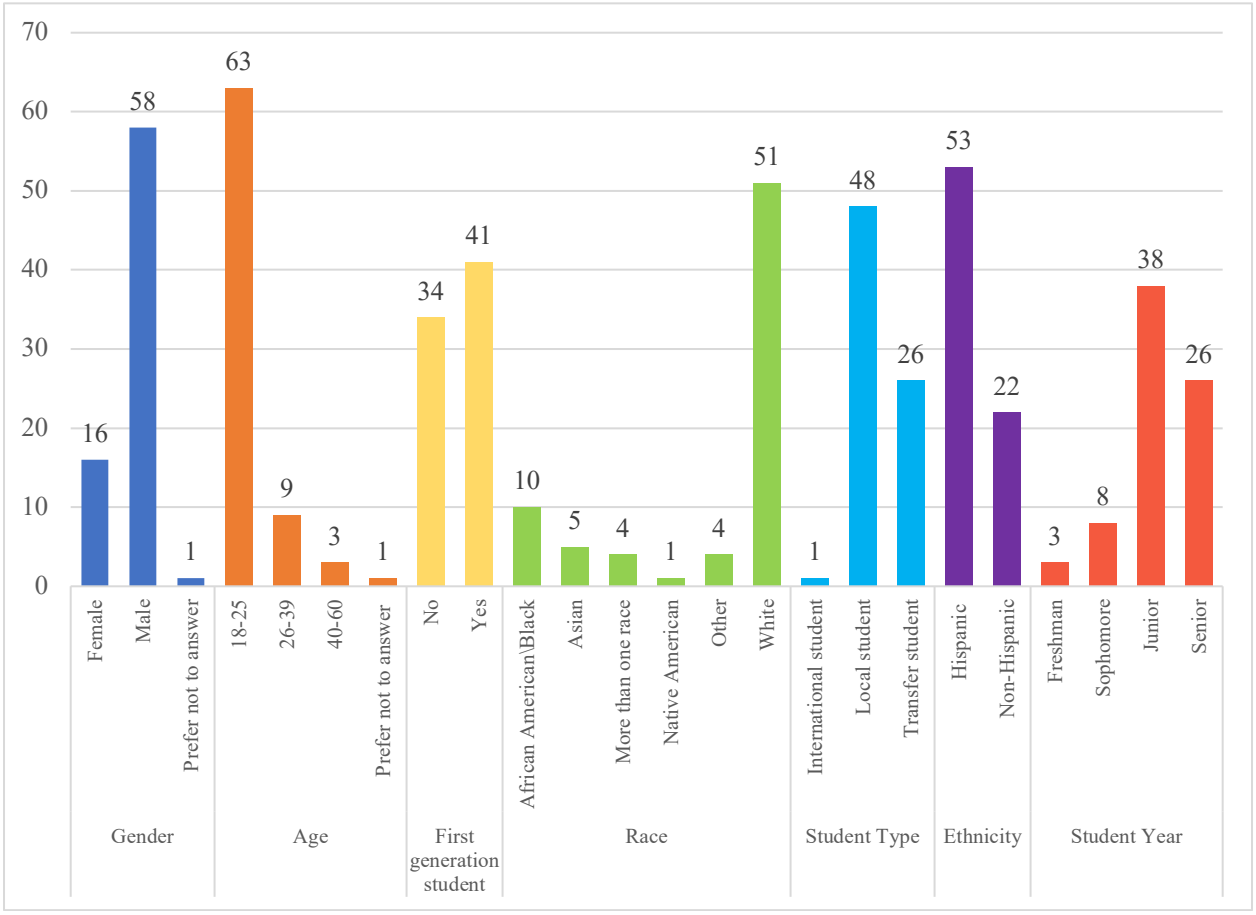

Figure 5: Students' Socio-demographic Background, n=75

The results from the survey indicate that 25 out of the 75 surveyed students, which is around 33 percent, do not expect to graduate on time, as depicted in Figure 6. Only considering local FTIC students, the results indicate that 18 out of 48 students do not expect to graduate on time. These results are presented in Figure 7. However, according to Accountability [8], less than 50 percent of students graduate within 4 years. This illustrates that many students are planning to graduate on time but are not achieving their graduation goals due to several factors which may include academic, financial, and social factors.

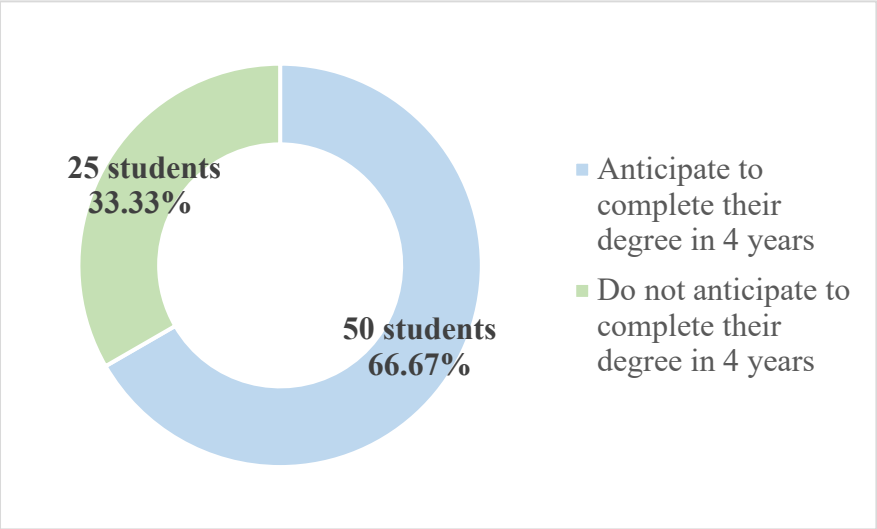

Figure 6: Students who anticipate graduating on time

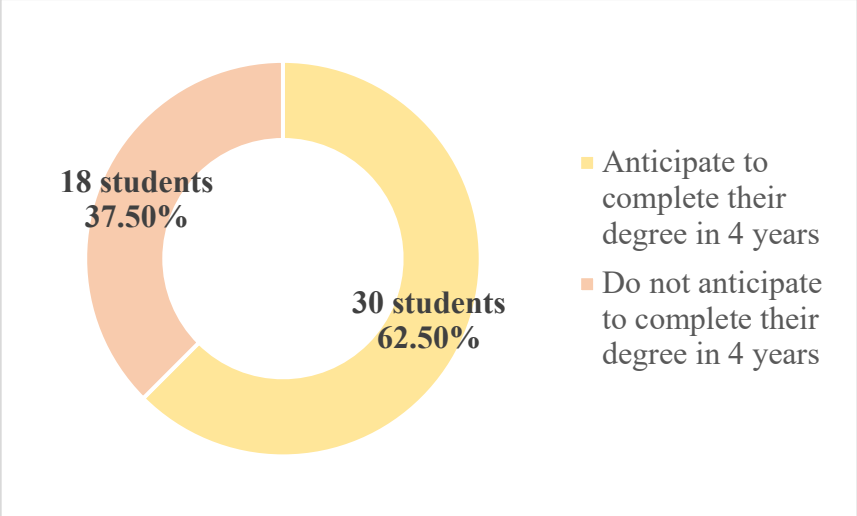

Figure 7: FTIC students who anticipate graduating on time

The students that anticipated to complete their degree on time reported that they would accomplish that goal by (a) studying hard, passing their classes, and working hard; (b) taking as

many courses every semester as possible, such as 4 courses per a regular semester and 3 in summer, and not skipping semesters; (c) following their undergraduate major map and completing the required curriculum; (d) planning and managing their time efficiently; and (e) working with an advisor to create a career path and following the roadmap the advisor provides.

As previously mentioned, several academic, financial, and social factors affect on-time graduation. The results from the 75 conducted surveys indicated that the main contributing factors to students failing to complete their degree within 4 years are unforeseen life circumstances, taking courses that do not count towards their degree, and courses being challenging thus not being able to register for full course load. These results are shown in Figure 8. Additionally, students reported the lack of academic advising, having to work to cover tuition and expenses, and changing majors and/or being unsure of what degree to pursue were also important factors contributing to delaying their degree completion.

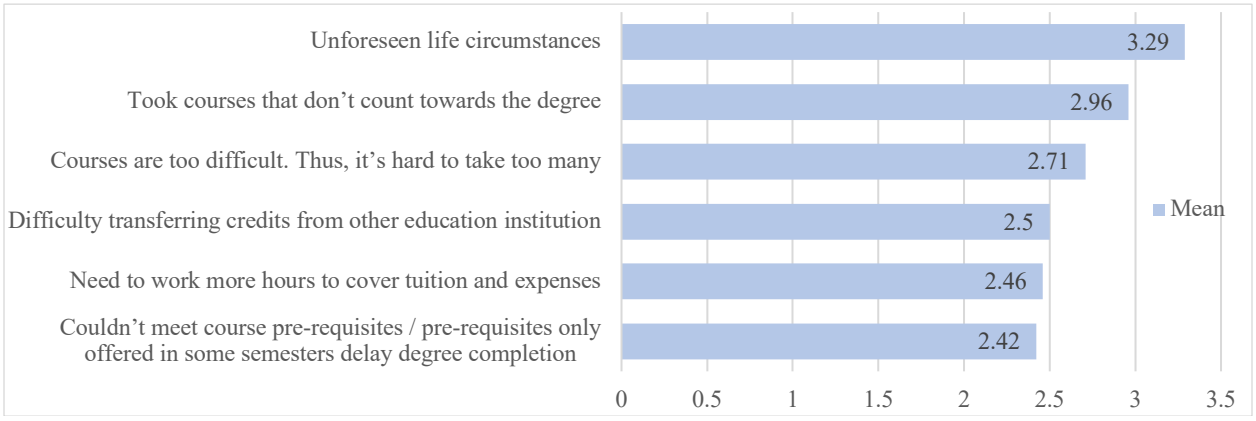

Figure 8: Factors that students think contribute to not completing their degree in 4 years

Finally, according to the survey results, several motivators, shown in Figure 9, drive students to complete their degree in four years and several resources, shown in Figure 10, could help them achieve their graduation goal. The motivators that encourage students to graduating within four years include professional development, high enthusiasm to start professional career, improve their economic status and start earning more money, prestige, and not being able to pay tuition and expenses for more than four years. Additionally, students reported other motivators such as being the first-generation student in their family and wanting to help them financially, applying to graduate school, working full time, becoming independent, and having financial freedom. On the other hand, the academic resources that could help students graduate on time include (a) working with an advisor to establish a clear roadmap; (b) offering mandatory pre-requisites every semester; (c) scholarships; (d) restructuring course schedules to allow them to work more hours and earn more money to meet financial obligations; and (e) tutoring to help with courses. Figure 10 shows the importance of each of these resources to students. Additionally, students reported that having a better curriculum structure that they could follow to complete their degree would aid them in graduating on time.

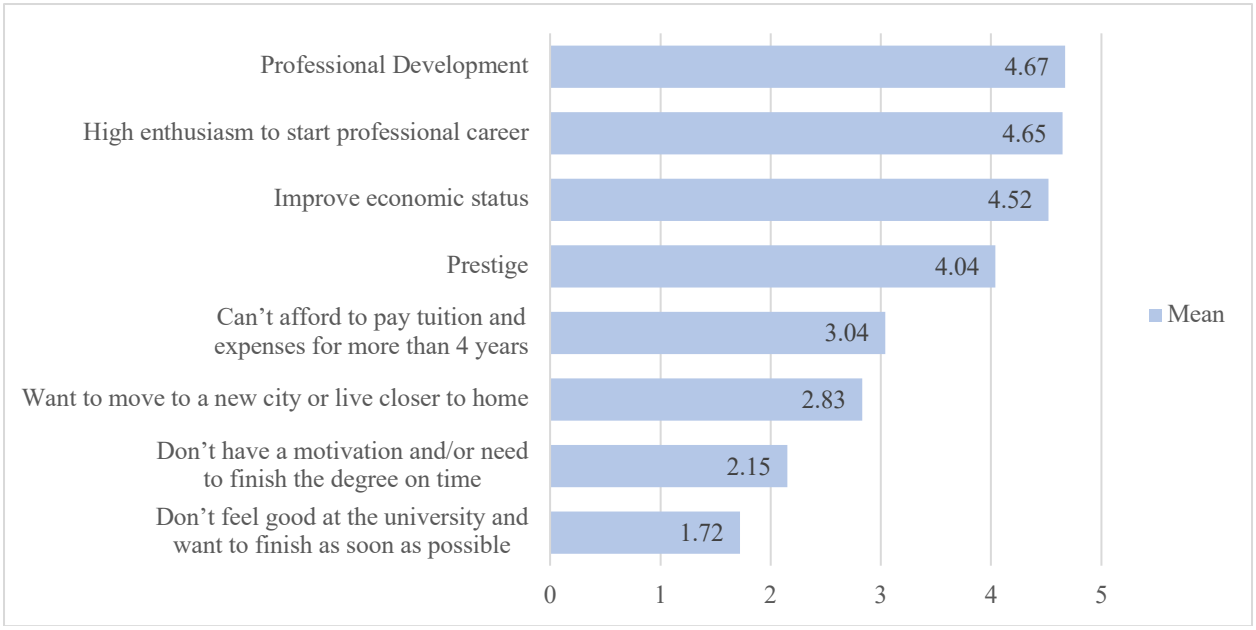

Figure 9: Motivators to finish the degree on time

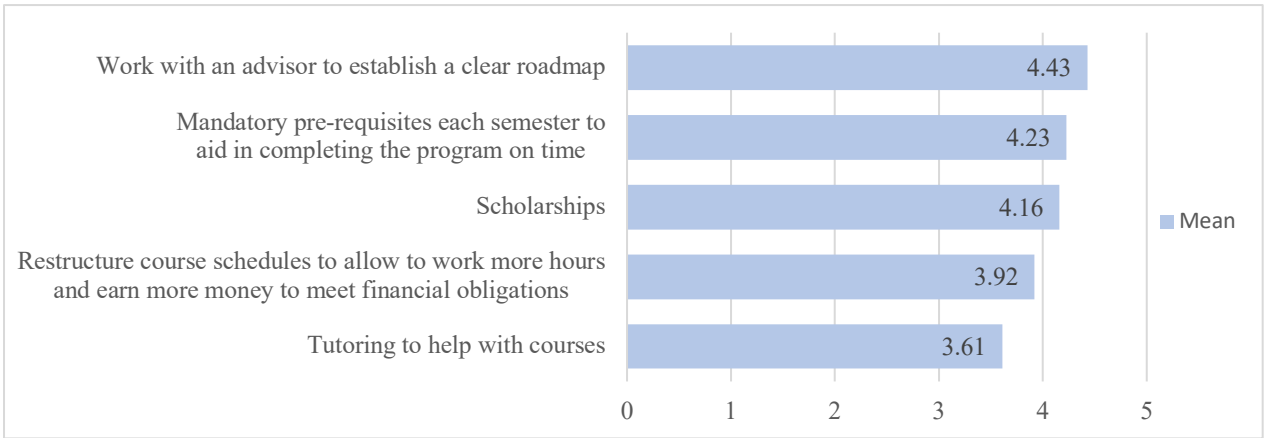

Figure 10: Resources to help students completing their degree on time

Limitations and Future Work

The results of this study highlighted the paramount problems that educational institutions face as well as the factors hindering on time graduation. However, this research acknowledges some limitations. The data gathered from Accountability [8] analyzed only FTIC students from one MSI. Future work could integrate this study for transfer students. Additionally, the survey responses might be subjective to self-assessment and biases and only included data from one academic institution as well. Future studies could focus on investigating the research in several educational institutions. However, FIU is one of the leading and largest MSIs in the U.S., thus rendering and reflecting the sample to be a representative for the minority population under

survey. Recommendations are preliminary and future work could study other populations to refine them in order to support a larger population of students across educational institutions.

Furthermore, higher education institutions encounter a paramount problem of undergraduate student retention and attrition. This problem is especially acute within the STEM fields [9]. Based on the NCES, 48 percent of bachelor's degree students who began STEM programs between 2003 and 2009 had left them by spring 2009, 28 percent switched to a non-STEM major, and 20 percent left the program and exited the educational institution without earning a degree [10]. In the engineering field, graduation rates have hovered steadily around 50 percent for the past 60 years. This means that almost half of the students do not complete their degree and leave their educational institution prior to graduation [11], [12]. Future work will study students' retention and attrition, and the factors contributing to these paramount problems in the academic community.

Conclusions and Recommendations

The results of this study revealed that several academic factors contribute to minority students not completing their STEM degree in four years. Based on the students' responses, several strategies that could help students in achieving their graduation goals are proposed below:

1. **Establish a clear roadmap for students** – Graduating on time requires students to complete mandatory, elective, and pre-requisite courses in an appropriate sequence [13], [14]. Many students struggle to stay on track and/or unintentionally take courses that do not count towards their degree, as they reported in this study. Moreover, not all courses and/or pre-requisites are offered every semester and class capacity may be limited, which further contributes to them not completing their degrees on time. A clear roadmap that considers not only course requirements, but also optimal combination of courses to enhance academic performance and achievement can significantly contribute to on-time graduation [13], [14]. Adequate guidance and advising by advisors and/or peer mentors that help students with the selection of appropriate courses in an adequate combination and sequence can be fundamental for having them remain on track and succeed in achieving their graduation goals.
2. **Mandatory pre-requisites offered every semester** – As previously mentioned, timely graduation require students to not only complete mandatory and elective courses, but also courses' pre-requisites [14]. According to this study, not being able to meet courses' pre-requisites and/or offering these courses only in some semesters are contributing factors to students not completing their degree in four years. Further, the results of this study showed that students consider offering mandatory pre-requisites every semester the second most important resource to help them achieve their graduation goals. Thus, increasing course accessibility, offering mandatory pre-requisites every semester or as often as possible, and/or helping students schedule these pre-requisites in a timely manner will significantly contribute to graduating in four years.
3. **Financial aid, scholarships, and budgeting workshops** – The results of this study showed that the lack of financial health as well as financial difficulties resulting in students having to work more hours to cover their tuition and expenses, were the main contributors to not completing their degree on time. However, many students are unfamiliar with budgeting or

overall management practices and do not know how to adequately manage their financials [15], further exacerbating financial hardships. Furthermore, many students are not aware of all the available financial resources accessible to them, including financial aid, scholarships, loans, grants, funding from companies, and federal work-study. Financial aid, scholarships, and budgeting workshops can help students discover all the available financial resources, as well as educate them on management practices, such as budgeting, in order to improve their financial health.

4. **Peer tutoring and/or mentoring programs** – Several students reported that courses are too difficult and thus they cannot take many courses during each term. In fact, this is the third main cause of students not completing their degree on time according to this study's results. Additionally, several students reported that tutoring can aid them in completing their degrees on time. Peer tutoring and/or mentoring programs, where higher-grade students help lower-grade students, can help them improve their academic success and graduate on time through (a) assisting them in understanding the courses better; (b) teaching them not only the course materials but also important academic skills, such as how to improve their study habits [16]. Improving study habits greatly contribute to the students' development of knowledge and thus to their academic success [17]; (c) creating a support system where the tutors and/or mentors give students support and encouragement and uplift them [16]; and (d) advising students and assist them in choosing their courses not only to fulfill program requirements and curriculum, but also to help them not choose courses that will not count towards their degrees. This is one of the main factors contributing to students not graduating in 4 years according to this study. Also, an added benefit of this proposed program is developing a network of friends and support systems. This also contributes to the well-being of students, which influences and impacts all aspects of their daily lives, including their academics [18].

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