ADDRESSING DISPARITIES IN STEM DEGREE ATTAINMENT FOR UNDERREPRESENTED MINORITY STUDENTS

by

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ABSTRACT

This paper synthesizes insights from two scholarly articles focused on the critical issue of STEM degree attainment among underrepresented minority students. The first scholarly article was a case study titled “Disparity in STEM Degree Attainment for Underrepresented Minority Students,” that explored the overarching challenges faced by one racially minoritized female student while pursuing a STEM degree at a predominantly white institution. Second was an empirical case study titled “Disparity in STEM Degree Attainment for Underrepresented Minority Students: How One Community College is Working to Increase Participation and Persistence for Degree-Seeking Underrepresented Minority Students.” This study provided a detailed examination of the strategies implemented by a community college to address this disparity, along with an overview of the current landscape and potential pathways for improvement. Through a review of documents provided by the college, secondary data from focus group interviews with students, and a factual interview with a faculty member, five themes emerged that may be instrumental in shaping a program’s successful implementation: faculty support, family support, teaching style, learning approach, and inclusivity. The findings aim to inform educators, policymakers, and stakeholders interested in advancing initiatives that promote diversity and success in STEM fields.

Keywords: underrepresented minority, STEM, disparity, persistence, racism

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Disparity in STEM Degree Attainment for Underrepresented Minority Students

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Abstract

Charlie graduated from a high school in Texas where the minority population was large, and Charlie was part of that minority group. Upon entering college in Mississippi, where the minority population was small, Charlie faced resistance, racism, and discrimination as she pursued a degree in the STEM field. From the administrative staff and faculty at the college to Charlie's parents, support was minimal. This case study explores the early college years of Charlie, a racially minoritized female student pursuing a degree in the STEM discipline while enduring a hostile learning environment.

Keywords: racism, equality, STEM disparity

Disparity in STEM Degree Attainment for Underrepresented Minority Students

For many years, disparities in the degree completion rates in science, technology, engineering, and mathematics (STEM) have been a topic of growing concern amongst policymakers, higher education leaders, and the scientific community as a whole (Ghazzawi et al., 2021). Globally, disparities in STEM achievement have led to a multitude of education reforms to combat the achievement gaps and eliminate performance deficiencies. While there has been forward progress in this area, national data continues to show that the disparity in STEM degree completion for underrepresented minority (URM) students (i.e., African American, Hispanic/Latino, American Indian, and Alaska Natives) increases at each level compared to white and Asian students (Estrada et al., 2016). Data from the National Center of Education Statistics (2018) noted that in the 2018/2019 academic year, 59% of bachelor's degrees in STEM were awarded to white students, 15 % were awarded to Hispanic students, while only 9% were awarded to African American students. This case study details the challenges racially minoritized students experience while pursuing STEM degrees at predominately white institutions.

Setting

The year had finally arrived. It was 1996 when Charlie entered her final semester as a senior in high school at Spring Creek High School in Houston, Texas. Nestled in the heart of Houston, Spring Creek High School serves approximately 2,165 students in grades 9-12. Over half the student population is Hispanic, 85.4%, with whites making up 7.6% and blacks 4.5% of the student population, with Charlie being part of that 4.5%.

Charlie was faced with many decisions as the end of the school year was approaching. As a star track athlete for her school and in the top 10% of her graduating class, questions were asked daily about her college plans. From her school principal, Ms. Espinosa, to her track coach, Ms. Johnson, both were pushing for Charlie to accept a track scholarship to attend college and study physical education or kinesiology to one day become a sports coach. Charlie had no desire to become a sports coach; her dream was to become a cardiology doctor. By the end of the school year, Charlie accepted a full track scholarship to the University of Southern Mississippi with the plan to major in biology with a pre-med emphasis. The University of Southern Mississippi is a public research university located in Hattiesburg, Mississippi. The university has a total enrollment of approximately 14,133 students, with whites making up 66.3% of the student population and blacks making up 12.2% of the student population.

Case Narrative

When Charlie arrived on the University of Southern Mississippi campus in August of 1996, it was like a dream come true, especially being the first person in her family to attend college; but she quickly felt out of place and unsupported. During the first week on campus, Charlie met with her academic advisor, Mr. Clinton, and told him she wanted to major in Biology and asked for guidance on what classes to take as she wanted to be on a path to later go to medical school. Mr. Clinton, a middle-aged white male, did not seem interested in what Charlie wanted to study and told Charlie she should probably stick to a general studies major as the curriculum would be easier to follow. Charlie sat in Mr. Clinton's office feeling perplexed and confused as to why she would be steered towards an *easier* curriculum. She graduated in the top percentile of her high

school class and achieved higher than average scores on her SAT, so why should she not be in the science major of her choice? As Charlie sat thinking, Mr. Clinton proceeded to type up Charlie's degree plan with all the courses geared towards a major in general studies. Charlie looked the degree plan over and politely told Mr. Clinton she did not accept the plan and she wanted to major in biology. Mr. Clinton seemed taken aback by Charlie's persistence and very bluntly told Charlie she was only at the university because of her athletic abilities, and her scholarship and standing on the team would be contingent upon her maintaining a 2.0 and above grade point average. Charlie maintained her composure and reiterated her high school standing to which Mr. Clinton wrote off as being the result of Charlie attending a high school where the majority of the school population were minorities. Charlie was accustomed to things such as this, so she stood her ground, and at the end of the meeting, she had a degree plan for a major in biological science with an emphasis in pre-med, followed up with a caution of potential failure from Mr. Clinton.

Charlie decided to talk to her parents about what happened with Mr. Clinton, and to her surprise, both her father and mother asked her why she wanted to study science to be a doctor because it would be much more difficult. Charlie's mother told her that she would be more suited to be a teacher or counselor because there are more female teachers than female doctors. Charlie's father felt that she should teach and coach track because that is her specialty and what she does well. Both of Charlie's parents ended the conversation by telling Charlie that it was her decision, but she should really think about it because if she lost her track scholarship due to grades, they would not be able to afford her continued education. At that moment, Charlie began to question her decision and

wondered if she was making a mistake; should she become a teacher, would it be easier, could she not make it through a science program? Charlie had many questions and felt the weight of the world on her shoulders, but she stayed the course and kept her major in biological science.

During Charlie's first few semesters of college, she took courses in biology, chemistry, physics, and math. In each of these classes, Charlie was one of about three minorities in each class of 40-50 students. Although Charlie was on the Dean's list for her first two years of school, she still had feelings of isolation, not belonging, and the negative interactions with the faculty continued. Charlie performed well in most of her science and math classes, but she struggled tremendously in physics. Often, Charlie would stay after class to try and get help from her professor, but he never assisted, and she was shunned by the study groups made up of her white classmates. By the time Charlie entered her junior year, she had many thoughts of dropping out of school and moving back home, but she could not fathom the idea of being a dropout and failure.

It was the dreaded time again for Charlie to meet with her academic advisor Mr. Clinton. She entered his office, and to her surprise, behind the desk was not Mr. Clinton; it was her newly appointed advisor, Ms. Walden. Ms. Walden was an older white female, and Charley immediately thought, "here we go again, let's get this over." Ms. Walden looked up from behind her computer and offered a pleasant greeting. As they began talking, the time seemed to pass before Charlie realized this was the first amiable conversation she had had with any staff other than her track coaches since her time at the school. Ms. Walden proceeded to applaud Charlie on her progress through the program and commended her on a job well done thus far. Ms. Walden also took notice of how

well Charlie was performing not only in her science classes but also in her math classes and recommended a couple of math courses with a particular professor, Mr. McKnight, who she thought Charlie could benefit from and enjoy learning with. Charlie felt this was different than her previous experiences, so she agreed with Ms. Walden and thanked her for a great meeting.

From Charlie's first week in Mr. Walton's class, Charlie noticed a tremendous difference in the learning environment. Mr. Walton was an older white man who continuously promoted equality in his classroom, and he valued all students' perspectives. He had a level of racial consciousness that Charlie needed and appreciated. He was tough but fair, and he pushed Charlie beyond what she thought she was capable of doing. One day Mr. Walton asked Charlie if she ever thought about majoring in math because he felt she would do great in an applied mathematics field. They went on to have a great discussion (some may call it a debate of science vs. math) about this, but Charlie had to let Mr. Walton in on a secret; she did not really like math. They had a good laugh about this, and Mr. Walton let Charlie know that he respected her decision and would continue to support her because she was a good fit for the program, whether science or math.

Although Charlie gained acceptance from some of her professors and peers, she continued to be discriminated against and felt like an outsider. Charlie was left feeling frustrated, alone, and depressed throughout her college journey. What could she do? What should she do? Was Mr. Clinton right? Was Charlie in the wrong program? Should she take a different path?

Teaching Notes

The United States' "inability to achieve workforce diversity goals in STEM has been attributed to the failure of the academic pipeline to maintain a steady flow of underrepresented minority (URM) students" (Estrada et al., 2016. p. 1). The growth in the minority population in the United States, coupled with the failure of higher education leaders to produce a diverse STEM student body that translates into a diverse STEM workforce, has critical implications on the country's economic development (Ghazzawi et al., 2021).

Koledoye et al. (2011) conducted a study of degree attainment for black and Hispanic students in STEM at eighty-two, 4-year colleges in Texas from 2008 to 2009. Texas has a sizable minority population, and the study showed that while enrollment increased over the specified period, the number of students graduating in the STEM discipline decreased for both groups, respectively (Koledoye et al., 2011). The specific problem is that URM students plan to undertake STEM majors in higher education at the same rate as white students, but they do not graduate with STEM degrees at the same rate (Estrada et al., 2016; Hurtado et al., 2009).

Historically, race has been a determining factor for who can access education and what kind of education they receive. Teachers and students bring racial identities to the classroom, which impacts how they relate to each other, the school community, and the curriculum (Michael, 2012). There remains a disparity in the number of minorities completing STEM degrees, and the nation's colleges and universities must be aware and make efforts to retain minority students as this group is underrepresented and has great

potential to influence change in the scientific workforce (Hurtado et al., 2009). Racial consciousness is a necessity to foster a STEM environment that reflects a more expansive view of equality (Haynes & Patton, 2019).

Discussion Questions

1. What barriers could be removed to lift URM students' interests, commitment, and ability to persist in STEM fields?
2. Does institutional racism contribute to the disparity of URM persistence in STEM fields?
3. Should Charlie go to the Dean of Students or Provost about the discrimination she experienced?
4. What would be the potential blow back for Charlie if she tells the Dean about the treatment she received from her professors and advisor?
5. Was Charlie's issue more so one of race or the fact she is a female? Or both?
6. Are HBCUs more likely to provide emotional support to minoritiy students compared to white colleges and universities?
7. In what ways might minority students attempt to cope with the oppressive environments in which they try to earn STEM degrees, which may also eliminate the feelings of self-doubt?

Teaching Activities

1. Divide the class into three sections and assign each section to take on the role of Charlie and discuss the pros and cons of the following: (a) Charlie following the path to a General Studies degree and becoming a teacher/coach, (b) Charlie

following the path to a degree in science and becoming a doctor, and (c) Charlie following a path in which she drops out of school and transfers to an HBCU.

2. Separate the class into two groups and have them debate following: minority women in STEM; is there a need for more minority women in the STEM field?
3. Divide the class in half and assign group one take on the role of the Dean of Students and group two to take on the role of Charlie. During this assignment, students from group one should discuss a plan for the Dean of Students in response to Charlie stepping forward and filing a complaint regarding the disparate treatment she received at the university. Students should draft a plan in which the Dean addresses the issue, and a plan in which the dean sweeps the issue under the rug. Students from group two should draft a response for each path the dean could take.

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Disparity in STEM Degree Attainment for Underrepresented Minority Students: How One Community College is Working to Increase Participation and Persistence for Degree-Seeking URM Students

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Abstract

Purpose: Attrition remains high for underrepresented minorities in the STEM disciplines. To learn more, we conducted a case study to investigate the development and initial steps of the Science First Success Center (Sci Fi Center) Project, aiming to enhance STEM education and student support. **Research Methods:** An exploratory single case study design was used and involved a one-on-one interview with the Dean of Health Sciences at LSC-T to explore the grant's inception, team formation, and adoption of evidence-based models. Additionally, secondary data from focus group interviews with eight students were used. These interviews were recorded, transcribed, and analyzed to uncover patterns in the data. **Findings:** The Sci Fi Center Project was informed by a review of past projects, exploration of college campuses with wrap-around services, and the adoption of the What Works Clearing House ASAP model. An interview with the Dean revealed a low number of students pursuing associate of science degrees, and identified a need for career counseling, early STEM outreach, and family involvement, with an emphasis on inspiring underrepresented minority students. Five themes were identified through thematic analysis of the focus group interviews with students: faculty support, family support, teaching style, learning approach, and inclusivity. **Conclusion:** The development of the Sci Fi Center Project was driven by a proactive and faculty-driven approach, informed by evidence-based models, and collaborative team efforts. Furthermore, the focus group interviews revealed five pivotal themes that emphasized the significance of faculty and family support, tailored teaching and learning approaches, and inclusivity in shaping a program's successful implementation.

Keywords: underrepresented minority, historically excluded minority, STEM, othering, persistence, community college

Disparity in STEM Degree Attainment for Underrepresented Minority Students: How One Community College is Working to Increase Participation and Persistence for Degree-Seeking URM Students

For many years, disparities in the degree completion rates in science, technology, engineering, and mathematics (STEM) have been a topic of growing concern among policymakers, higher education leaders, and the scientific community as a whole (Ghazzawi et al., 2021). Globally, disparities in STEM achievement have led to a multitude of education reforms to combat the achievement gaps and eliminate performance deficiencies among women and underrepresented minority (URM) students alike. These efforts can be traced back to the Civil Rights Act of 1974, that forbade discrimination based on race, color, and national origin, and Title IX of the Education Amendment Act of 1972, that prohibited discrimination based on sex (including sexual orientation, gender identity, and pregnancy) in any educational program or institution receiving federal funds (National Center for Education Statistics [NCES], 2000). The Women's Educational Equity Act of 1974 was another federal program developed exclusively to fund projects to improve the quality and scope of education for girls and women (NCES, 2000). Implementing these programs has narrowed the gap, but the underrepresentation of women and minorities in the STEM discipline still poses a severe challenge for policymakers and educators. While many institutions effectively attract and enroll URM students in STEM, many continue to fall short in retaining and graduating URM students in this discipline.

With the changing demographics of the nation, maintaining global competitiveness is becoming increasingly imperative. As the United States population

becomes more racially and ethnically diverse, the success of minority students in higher education is vital (Montenegro & Jankowski, 2015). The U.S. Census Bureau (2015) estimated that by the year 2020, approximately 43% of the total U.S. population would be comprised of minority populations, rising to 57% by the year 2050. With the nation's increasing diversity also comes the need to increase diversity within higher education institutions. The U.S. has made great strides in improving minority access to postsecondary education. Only half one million African Americans were enrolled in post-secondary education in the U.S. in 1970, rising to nearly two million three decades later (Anderson & Kim, 2006). In 1980, less than half one million Hispanics were enrolled in post-secondary education; today, almost three times that number are enrolled in higher education institutions nationwide (Anderson & Kim, 2006).

Statement of the Problem

While there has been forward progress in enrollment, national data continues to show that the disparity in STEM degree completion for underrepresented minority students increases at each level of education compared to White and Asian students (Estrada et al., 2016). The specific problem is that URM students plan to undertake STEM majors in higher education at the same rate as White students, but they do not graduate with STEM degrees at the same rate (Arcidiacono et al., 2016; Estrada et al., 2016; Hurtado et al., 2009). Data from the National Center for Science and Engineering Statistics (2018) noted that in the 2018/2019 academic year, 59% of baccalaureate degrees in STEM were awarded to White students, 15 % to Hispanic students, and only 9% were awarded to African American students. If the nation’s colleges and universities seek to graduate the next generation of research scientists, they must be aware of the

number of racial/ethnic minorities in the science pipeline and make concentrated efforts to retain these students, as this diverse group has great potential to influence change in the scientific workforce (Hurtado et al., 2009).

Historically, there has been a strong link between increasing educational attainment in the United States with the growth and global leadership of the economy (National Academy of Sciences, 2011). As competition from abroad increases, one of the overarching goals of higher education in the U.S. is to train and educate the next generation of competitive students. According to Anderson and Kim (2006), competitive countries such as China and India produce more trained people in the STEM disciplines. Statistics suggest that for every bachelor's degree in engineering conferred by a U.S. higher education institution to an American student, China awards five such degrees, with approximately 200,000 degrees compared to 70,000 degrees (Anderson & Kim, 2006). The growing population of minority students in the United States, along with the increasing racial disparities in STEM degree attainment, shows cause for concern as to the country's ability to maintain its prominence in STEM (Ghazzawi et al., 2021).

The progress of the nation is in a critical state. The United States' "inability to achieve workforce diversity goals in STEM has been attributed to the failure of the academic pipeline to maintain a steady flow of underrepresented minority (URM) students" (Estrada et al., 2016, p. 1). The growth in the minority population of the United States, coupled with the failure of higher education leaders to produce a diverse STEM student body that translates into a diverse STEM workforce, has critical implications for the country's economic development (Ghazzawi et al., 2021). Niu (2017) examined the college enrollment statistics in STEM majors and found that the current enrollment level

is not sufficient to meet the nation's human resource needs in STEM fields. The implications suggest there will be a gap of one million STEM professionals between the nation's economic needs and what colleges and universities deliver during the next decade as the demand is outpacing the supply (Niu, 2017).

According to Toven-Lindsey et al. (2015), URM students entering colleges in the U. S. are just as likely as their non-URM peers to aspire to complete a STEM major, yet attrition remains high for URM students in STEM majors. Failing to build an adequately trained, diverse STEM workforce that mirrors the shifting demographics in the U.S. will have critical implications for the scientific and economic development of the country (Espinosa, 2011; Foltz et al., 2014). According to Lehman (2013), "the United States is facing a critical talent gap in STEM and is not keeping pace with the foreign competition and failure to educate and employ a high technology labor force adequately will result in a diminished U.S. economy with possible international security issues" (p. 12).

Evidence suggests this underrepresentation may be due to obstacles at the undergraduate level, including a lack of effective mentoring, stereotype threats; that refers to the apprehension individuals from marginalized groups may experience when they are at risk of confirming negative stereotypes about their group, and unique curricular needs (Russell, 2017). Researcher also attributed this inequity in representation to structural inequalities, marginalization, discrimination, and lack of support (Preuss et al., 2020; Weng & Gray, 2017). While the underrepresentation of minority and economically disadvantaged students remains a topic of concern, the issue is not that these students lack interest in STEM, but more importantly, the institutional and sociocultural factors may work to undermine interest in this field (Boelter et al., 2015).

Even though students' ability and pre-college preparation are important, steady progress through the STEM pipeline also depends on the opportunities, experiences, and support services URM students receive while in college (Chang et al., 2014).

Purpose of the Study

Community colleges are widely believed to be the first point of entry for students who wish to pursue postsecondary education, and they often serve some of the most vulnerable populations, including minority students. The purpose of this study was to examine Lone Star College- Tomball (LSC-T), an HSI and MSI community college serving the greater Houston, Texas area, and its implementation of the Science First Success Center Program (Sci Fi Center), a program aimed to increase the participation and persistence of URM students in the STEM disciplines, in order to highlight what could be duplicated or modified in future higher education programs to enhance the success and diversity of URM students in STEM fields.

Research Questions

The central research questions this study sought to answer were:

1. What research and past practice informed the development of the Science First Success Center (Sci Fi Center) Project?
2. What initial steps did the initiative take to understand students' needs in the STEM disciplines?
3. What themes emerged from student and staff interviews that may inform the implementation of a program?

Definition of Key Terms

Underrepresented Minority (URM) – an acronym referring to underrepresented minorities. For this study, URM includes African Americans, Hispanics/Latinos, American Indians, and Alaska Natives (Chang et al., 2014).

Retention – the measure of the percentage of students who are maintained in an institution at a given time after entering as freshmen (Tinto, 2012).

Persistence – to remain enrolled in college through degree completion (Foltz et al., 2014; Tinto, 2012).

Community College – an undergraduate higher education institution where the highest degree attainable is an associate degree within two years (Malcom, 2010).

STEM – is an acronym for studying the disciplines of Science, Technology, Engineering, and Mathematics (Chang et al., 2014).

Minority Serving Institution (MSI) – higher education institutions that serve the needs of low-income and underrepresented students of color (Gasman & Conrad, 2013).

Hispanic Serving Institution (HSI) – higher education institutions with an undergraduate Hispanic full-time equivalent student enrollment of 25 percent or higher coupled with a substantial enrollment of low-income students (Gasman & Conrad, 2013).

Review of Literature

To understand the disparity, one must first understand that the underrepresentation in STEM is not always about academic preparation; rather, this underrepresentation may also be explained by an historical, demographic, behavioral, and psychological dimension of a campus culture that is systemically hostile to students of color (Lee et al., 2020). Additionally, the literature review focused on programs designed

to enhance the knowledge and development of minority students in the STEM disciplines.

The Challenges of Underrepresented Minorities in STEM

A positive university environment is paramount to persistence, particularly for minority students. Numerous studies have found that compared with White students, ethnic minorities who attend predominately White institutions (PWIs) are more likely to view the climate as hostile, socially isolating, unwelcoming, and unresponsive to their needs and interests (Ancis et al., 2000; Hurtado & Ponjuan, 2005). When the learning environment is perceived as such, students are more likely to fail in their academic work and are less likely to persist and remain at a university. The culture of PWIs promotes norms, values, beliefs, and behaviors associated with Eurocentric perspectives that normalize the practices and policies that deem non-Eurocentric perspectives as less than and not appropriate (Castillo et al., 2004; Wei et al., 2011). When students from backgrounds that differ from the norm enter these institutions, they may be presumed incompetent and were treated as outsiders. This kind of isolating treatment, in turn, contributed negatively to their academic achievement and hindered their adjustment, thereby decreasing their persistence in institutions of higher education (Castillo et al., 2006; Weng & Gray, 2017). Another issue students who wish to major in STEM fields may encounter was the message that their race, as a minority, was merely a check box that should be counted for a university's or STEM department's diversity initiatives or quotas. However, once on campus and enrolled in introductory STEM courses, minority students may experience the concept of 'othering', a STEM weed-out culture that conveyed the racialized message, 'you do not belong here' (Basile & Black, 2019). If

minority students are viewed as not belonging or fitting in, the effect was that those in leadership positions possibly viewed them as disinterested, uncommitted, hostile, or unable to succeed (Weng & Gray, 2017).

The reasons for the underrepresentation and underachievement of women and minorities in STEM have been researched throughout the decades. Condron and Roseigno (2003) offered that access to quality education at the K-12 level was often not an option for racial minorities, and they were least likely to be enrolled in appropriately funded school districts. Where minority students are enrolled in school also translated into the quality of teachers they were exposed to and the opportunities available for them to advance their academic interests (Jackson, 2009; Wang, 2013). Steele (1997) also found that during their time in school, minority students were subjected to negative stereotypes that justified their poor performance. Additionally, these students often come from disadvantaged backgrounds, and their parents lack the knowledge and know-how to encourage and support their interest and engagement in STEM (Chang et al., 2008; Gasman et al., 2017). While there have been numerous studies into the "why" minorities are underrepresented in STEM, many researcher agreed that racial minorities experience racism, discrimination, and prejudice, whether overtly or as microaggressions, that contributed to their persistence in STEM and the general disparity (Garcia & Johnston-Guerrero, 2016; Ghose et al., 2018; Sue et al., 2007; Weng & Gray, 2017). Overall, minority students experienced challenges across a spectrum of areas, including challenges with the sense of belonging, the racial climate of the higher education institution, lack of support and mentors due to the low numbers of minority faculty, absence of minority-student peer groups, and institutional programs that failed to address

the needs of minority students (Ghose et al., 2018; Hadinger, 2017; Solorzano et al., 2000; Weng & Gray, 2017).

Campus Racial Climate and Sense of Belonging

A positive campus climate was associated with higher grades and higher graduation rates for minority students, while a negative campus climate was indicative of academic persistence and retention rates falling. Hurtado et al. (1999) reported four elements a college campus would have when the climate is positive: (a) the inclusion of students, faculty, and administrators of color, (b) a curriculum that reflects and is representative of the historical and contemporary experiences of minorities, (c) programs to support the recruitment, retention, and graduation of minority students, and (d) a college/university mission that reinforces the institution's commitment to diversity. These four elements were likely to be absent when the campus climate was negative. Hurtado et al. (1999) also provided a framework surrounding five dimensions that shape the campus racial climate. The first component was the institution's legacy of inclusion and exclusion, "which examines institutional values, policies, and practices toward historically marginalized groups" (Lee et al., 2020, p. 2). Compositional diversity was the second component that influenced campus racial climate and reflected the numerical representation of various ethnic and racial groups on campus (Lee et al., 2020). Hostile exchanges or 'put-downs' of minorities contributed to the assumption that people of color were inferior and were made to believe they did not belong. These particular exchanges constituted the behavioral dimension. The psychological dimension was the final component that influenced the campus racial climate comprised of thoughts, attitudes, beliefs, and feelings regarding race, discrimination, and racial tension (Hurtado et al.,

1999). Understanding the experiences of minority students attending higher education institutions necessitates examining these dimensions of campus climate. URM STEM students may encounter prejudicial attitudes, stereotypes, and othering behavior as part of the behavioral and psychological dimensions. By examining these campus climate factors, researcher gained critical insight into the institutional and interpersonal challenges that impacted the sense of belonging among URM students in STEM majors at MSIs and HSIs. Unless positive messages about racial equality are supported and substantiated, minority ethnic students will face the challenge of navigating and surviving educational mistreatments due to institutional racism, racial stereotyping, reduced academic standards, and hostile learning environments (Ong et al., 2018).

In recent decades, sense of belonging has emerged as a significant concept in college student persistence literature. Sense of belonging refers to students' psychological sense of connection to their community that is important because people are naturally drawn to belong to communities, and failure to acquire a sense of belonging may negatively impact their mental health and behavior (Hausman et al., 2007; Museus et al., 2018). A student's sense of belonging is influenced by a variety of academic and social interactions, and several aspects of the college environment have been identified by researcher as having profound effects on students' sense of belonging (Johnson et al., 2007; Johnson, 2012; Locks et al., 2008). These included interactions with faculty and peers, co-curricular involvement, perceptions of the campus racial climate, and living on campus (Johnson et al., 2007; Hurtado & Ponjuan, 2005). When peer and faculty interactions are positive, a student's sense of belonging was enhanced as complex environments felt more socially and academically supportive (Johnson et al., 2007).

Johnson et al. (2007) highlighted research that showed how socializing with White students contributed to minority students' sense of belonging, while the encouragement of fellow students, faculty, and advisors supported their social integration into campus life. Johnson et al. (2007) also noted how the perceptions of a hostile or discriminatory campus racial climate negatively affected minority students' commitment and sense of belonging. Research indicated that students from different racial backgrounds experience campus climate and sense of belonging in different ways, and although a student's personal attributes are difficult to change, institutions are able to intentionally shape the environment in which their students learn (Museus et al., 2018; Johnson et al., 2007).

Programs Fostering Persistence

In recent years, there has been a proliferation of programs and initiatives designed to increase the participation of URM students in the STEM disciplines. In many higher education institutions, bridge and cohort programs are being used to promote and support student retention and persistence and enhance students' success in STEM (Business-Higher Education Forum [BHEF], 2010). Students take the bridge programs during the summer between high school graduation and the first term of college to enhance their academic skills in preparation for the rigors of college academics and living (BHEF, 2010). In cohort programs, students are grouped together through their course sequences, affinity dormitories, and other activities. Research has shown that both types of programs, through promoting student engagement and social interaction, may boost student persistence and foster a stronger sense of connection to their universities and programs (BHEF, 2010). The National Science Foundation (NSF) and the Department of Education (DOE) are major sponsors and sources of federal backing for these programs

and others. Two programs that are recognized and sponsored by the NSF and DOE, respectively, and whose goals are to increase the representation of minorities in STEM, are the Louis Stokes Alliance for Minority Participation (LSAMP) Program and the Minority Science and Engineering Improvement Program (MSEIP; Clewell et al., 2006; Department of Education, 2008).

Louis Stokes Alliance for Minority Participation (LSAMP) Program

The LSAMP program was established by the NSF in 1991 in response to a charge from Congress to support a comprehensive science and engineering education program that would increase minority participation in science and engineering. LSAMP's main objective was to increase the quality and quantity of students who successfully complete science, technology, engineering, and mathematics baccalaureate degree programs and to increase the number of students who were interested in graduate study programs, were academically qualified for them, and matriculated into those programs (National Science Foundation, 2003). The LSAMP program has contributed to an increase in minority enrollment in STEM majors from 35,670 in 1991 to over 205,000 in 2003, as reported by the LSAMP data-gathering system developed by the National Science Foundation (Clewell et al., 2006). Evaluation of LSAMP found that the program has exceeded its goals by producing URM students who obtain graduate degrees in STEM at a rate that is not only greater than that of the national URM population, but also greater than that of the White and Asian STEM baccalaureate degree recipients (Clewell et al., 2006).

Minority Science and Engineering Improvement Program (MSEIP)

The MSEIP program's intended purpose was to improve science and engineering education at predominantly minority-serving institutions and increase the number of

underrepresented ethnic minorities, particularly minority women, who enter science and technology careers (Department of Education, 2008). The specific objectives of MSEIP included the following: (a) provide minority students with better access to undergraduate and graduate science and engineering education through community outreach programs through eligible minority institutions, (b) enhance the quality of student preparation for graduate study and careers in STEM, (c) improve the capability of minority institutions to self-assess, manage, and evaluate their science programs, and disseminate their findings, and (d) improve minority institutions' existing abilities in the planning and implementation of science and engineering programs so they will be able to compete more effectively in assistance programs not explicitly intended for minorities or minority institutions (Department of Education, 2008). A variety of activities are supported by MSEIP, including pre-college programs (K-12), tutoring programs for pre-college and college students, faculty development, curriculum development, renovation of STEM labs/classrooms, stipends for participants, and other activities designed to increase the number of minority STEM graduates. Queensborough Community College in Queens, NY, developed an immersive summer biotechnology boot camp and enrolled 55 predominantly minority and female students to participate in the program. Evaluation of the Community College's MSEIP summer biotechnology boot camp program over a three-year period found that minority participants were more confident in their science and math skills, were more likely to complete a STEM degree, and most of these at-risk students were accepted into City University of New York (Novik & Gadura, 2020).

In the context of examining URM student persistence in STEM, it is crucial to recognize the significance of building upon prior programs and evaluations. By

leveraging the findings and insights from previous studies relating to LSAMP and MSEIP, researcher may gain a deeper understanding of the factors contributing to URM student success and identify areas for improvement. This approach allows for a more comprehensive examination of the challenges and opportunities that URM students face in the STEM disciplines, ultimately informing the development of targeted interventions and support systems. This case study sought to contribute to this ongoing research by using knowledge and evidence generated from prior program evaluations coupled with an examination of LSC-T's Sci Fi Center Program to shed light on effective programs and strategies for enhancing URM student success.

Methodology

This study used an exploratory single case study design (Yin, 2009). Case studies consist of a detailed investigation of an individual or group, a system or process, an organization (such as an academic institution), an environment (such as a classroom), or a particular event (Flick, 2009; Mertens & Wilson, 2019). According to Yin (2009), a case study is an investigation of a real-life situation in order to gain a deeper understanding of a particular phenomenon. Yin further noted that a case study research design is one way that researcher are able to preserve the uniqueness of real-life events, whether those events are managerial processes or observations of small group behaviors (Yin, 2009). Using case studies can provide stakeholders, administrators, faculty, staff, and students with valuable insight into various human experiences and circumstances. The researcher deemed the case study design most appropriate for conducting this study as the study focused on a specific community college located in the southern region of the United States, and within this college system, specific units were studied.

Case Selection

Lone Star College- Tomball was identified as a potential case study to evaluate their Sci Fi Center project and how this initiative will support underrepresented minority students in the STEM disciplines to increase their retention and persistence in higher education. The researcher chose this particular community college because the college recently received two grants to improve the enrollment and graduation rates of Hispanic students in the STEM discipline. More than 60% of the students who attend Lone Star College come from minority and historically underrepresented backgrounds; as such, the school is designated as both a Minority Serving Institution (MSI) and Hispanic Serving Institution (HSI) by the U.S. Department of Education (Lone Star College, 2023). In September 2021, LSC-T received a $2.8 million Hispanic Serving Institution's Science, Technology, Engineering or Mathematics and Articulation Program grant and a $1.5 million Strengthening Institutions Program grant from the U.S. Department of Education (France, 2021). The HSI STEM grant is awarded to colleges whose Hispanic enrollment is at least 25% to help increase the number of Hispanic students earning STEM degrees, and LSC-T has an Hispanic student population of 38% (French, 2021). LSC-T identified the gap between the academic success and graduation rates between minority and majority students and the need to diversify the STEM pipeline. The college created the Science First Success (Sci Fi) Center Project to address these students' needs and increase the retention and persistence in STEM majors from their community college to those who transfer to a four-year college or university to earn a degree in a STEM field.

Research Design

Several data sources were used to document the development and initial implementation of the LSC-T Sci Fi initiative project. According to Yin (2009), there are six commonly used data sources when conducting case studies: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. Yin (2009) asserted that documentary information is relevant to every case study topic and includes a variety of documents such as letters, email correspondence, administrative documents, proposals, internal records, news clippings, and other written reports of events. Archival records take the form of computer files or records and include service records, public use files (U.S. census data), survey data, and personnel records. Interviews are one of the most important sources of case study information because interviewees may provide key insights into human affairs and events (Yin, 2009). Direct observations may be formal or informal data collection activities and include observing meetings or classrooms, while participant observations occur when the researcher is not a passive observer but participates in the events being studied. The final data source used in case studies is physical artifacts, a tool or instrument, or some other physical evidence collected and observed as part of the case study (Yin, 2009).

Data Collection

For this study, data sources used to evaluate the initiative's implementation came from documents provided by Lone Star College -Tomball describing the Sci Fi Center project, including the target population, services provided, proposed activities, and the evaluation plan. Field notes were also taken during three meetings and interactions with the LSC-T team. The researcher also used de-identified secondary data garnered and collected by Lone Star College- Tomball as part of their 2023-2024 evaluation of the

students, faculty, services, and activities offered by the Sci Fi Center project. This data was collected via focus groups with students regarding their experiences about being psychologically and academically prepared to pursue a degree in the STEM disciplines and the factors contributing to their persistence. The focus group was led by a facilitator, who was also a LSC-T employee, and transcripts were produced and de-identified. There was interaction and discussions throughout the focus group session, and the participants were also asked to respond to writing prompts provided by the facilitator. The focus group video recording and the participant's written responses were provided to the researcher, accounting for two data types. The data was de-identified, including the elimination of names of faculty and students, and any other personally identifiable information prior to their receipt. A total of eight students from LSC-T agreed to participate in the focus group interviews during the fall semester of 2023. (Table 1). The group of students included males and females, STEM and non-STEM majors. One student who participated in the focus group self-identified as being on the autism spectrum, and the remaining seven students are a part of TRIO, a federally funded college program that supports students who are first-generation, low-income, or have a disability to pursue and attain a college degree (Lone Star College, 2023). To address the first and second research questions, the researcher conducted a factual interview with the Dean of Health Sciences at LSC-T to discuss the program's inception and what steps were taken to understand the students' needs in the STEM disciplines.

Table 1

Lone Star College- Tomball Participant Demographics

Participants	Gender	Race/Ethnicity	Current Year
P1	Female	Black	1
P2	Male	Hispanic	1
P3	Male	Hispanic	3
P4	Female	Hispanic	3
P5	Female	Hispanic	2
P6	Female	Hispanic	2
P7	Female	Hispanic	2
P8	Female	Hispanic	1

Note. This table displays student participant demographic information recorded during the focus group interviews. The racial/ethnic identities are based on the researcher's observation and not verified by the participants.

Data Analysis

Upon receipt of the focus group interview from LSC-T, the recording was transcribed by a third-party transcription service, Rev.com. This same service also transcribed the interview with the Dean of Health Sciences. The researcher reviewed the transcriptions and conducted a thematic analysis of all documents to uncover patterns in the data (Table 2). Clarke and Braun (2017) described thematic analysis as a method of identifying, analyzing, and interpreting patterns of meaning (themes) within qualitative data. The phases of thematic analysis, as provided by Braun and Clark (2006) included the following: (1) familiarization with the data, (2) generate initial codes, (3) search for themes, (4) review themes, (5) define and name themes, and (6) produce the report. Codes represent the smallest unit of analysis and are the building blocks for themes, the larger patterns of meaning that provide the framework for organizing and reporting the

researcher's analytical observations (Clarke & Braun, 2017; Braun & Clarke, 2006). In this study, the thematic analysis approach was used to examine the participants and the process to determine what meaning URM students had given to their academic experience. Qualitative analysis was conducted to identify words, utterances, attitudes, and the impact of faculty, peers, and external forces on students' persistence.

For this case study, the first phase of analysis involved reviewing grant documents and other background information about the college and the initiative. The second phase involved the researcher reading through the transcripts while studying the recorded videos to ensure accuracy and completeness. An Excel table was then created with rows and columns, and the data gathered from the interviews was summarized for each focus group participant and entered into the table (Table 3). This process allowed the researcher to identify significant statements and develop initial coding categories. The researcher then used the Atlas.ti software, a qualitative data analysis program, to code the transcribed interviews and identify key themes within the data (Table 4).

Table 2

Data Analysis Steps and Actions

Steps	Actions
Document Review	Reviewed grant documents provided by LSC-T.
Data Collection	Two recorded interviews were collected and transcribed verbatim using a third-party service, Rev.com.
Review Transcripts	Transcripts were verified for accuracy by viewing the recorded videos and making necessary corrections. An Excel table was created, and a summary of responses was entered into the table.
Code Data	Transcribed interviews were coded using Atlas.ti software. The first step was coding for themes, and the second step was looking for trends.
Theme Development	Key themes emerged from coded data.

Findings

The purpose of this study was to examine an HSI community college serving the greater Houston, Texas area and its implementation of a program aimed to increase the participation and persistence of URM students in the STEM disciplines in order to highlight what could be duplicated or modified in future higher education programs to enhance success and diversity of URM students in the STEM fields. To accomplish this task, the researcher reviewed grant materials and other documents provided by the college, was a participant observer in meetings with LSC-T staff members, conducted a one-on-one interview with the Dean of Health Sciences at LSC-T, and also obtained secondary data from a focus group held with students during the fall 2023 semester. The following research questions guided this study:

1. What research and past practice informed the development of the Science First Success Center (Sci Fi Center) Project?
2. What initial steps did the initiative take to understand students' needs in the STEM disciplines?
3. What themes emerged from student and staff interviews that may inform the implementation of a program?

To answer the first two research questions, a one-on-one interview with the Dean of Health Sciences at LSC-T, informed my document review and meetings with college staff members, was conducted to discuss the grant the school was awarded and the inception of the Sci Fi Center Project. The researcher learned the opportunity for the grant came about in late 2020, and the Dean assembled a team of full-time faculty to determine how the grant could be used to improve in areas where the school may not be doing well. The team reviewed projects approved in the past along with other college campuses with wrap-around services. The overarching model used was the What Works Clearinghouse Accelerated Study in Associate Programs (ASAP), a three-year program designed to remove barriers to college success and completion for students seeking associate degrees offering financial, academic, and personal supports (Institute of Education Sciences, 2019). The team also examined the Math Achievement Center (MAC) at the Lone Star College- North Harris (LSC-NH) Campus and decided to create a science success center. The Dean stated, "The faculty really were the driving force behind what they wanted to see; they really drove it home, they named it and decided what was needed; I mean it was very much driven by that committee." The grant was awarded in 2021, and one stipulation required LSC-T to have a partner university, a four-

year institution for those students who chose to transfer to a four-year college or university, and the school partnered with another university in the greater Houston area.

To understand the students' needs, the researcher learned from the interview with the Dean that there was a low number of students who choose to obtain an associate of science degree. The Dean stated, “The problem that we noted was students really don’t know what they can do with a biology, chemistry, or geology degree, they have no idea the array of jobs available to them.” The need for career counseling was identified in order to show students what options and range of jobs were available to them. The Dean also emphasized the importance and goal of the grant in getting students excited about STEM so they can see more students enrolling and more students transferring into STEM fields at the four-year colleges and universities. Another point the Dean made was how getting students excited about STEM starts early in their education journey, and waiting until they are in high school was too late. She noted, “You’ve got to get out there into the junior high schools and plant the seeds early, especially focusing on underrepresented groups in general and bringing in the family, you must have that whole piece.” Regarding URM students, the Dean highlighted how outreach was important and parents must be included so that students may see themselves in careers in the STEM fields.

To answer the third research question, the researcher used secondary data provided by LSC-T following focus group interviews held during the fall semester of 2023. The responses of each participant were summarized and significant statements were entered into a table (Table 3).

Table 3

Summarized Responses from LSC-T Focus Group Participants

Participant	Gender	Support Services/ Faculty/ Peer: Role in remaining enrolled/involved	Ever wanted to quit? What stopped you?	Felt you belonged on campus? Faculty Role / Peer Role/ Contributing factors to you feeling like you belonged?	Are people from all walks of life welcome on campus?	What are some struggles as a college student and how have you overcome them?
P1	Female	Support services helped them learn differently. Peers played no role. Faculty sometimes made it not easy to stay in class.	Yes. Family the reason for not quitting.	Yes. Basketball coach contributed to sense of belonging; more active on campus.	Yes. Feels everyone is welcome. Entered college with a different POV but peers, advisors, and coaches caused a change in their POV	Communication. Speech class.
P2	Male	The services help you to stay on track and manage college life. Faculty are engaged and willing to help. Peers play no role.	Yes. Family the reason for not quitting.	Yes. Felt like they belonged and was accepted. Initially felt left out due to being from another state, but now it feels like home. Advisors played large role and peers were supportive.	Yes. Everyone respected and welcomed.	Procrastination and stress. Pushing through.
P3	Male	Does not use the services. Faculty makes sure they attend class and work done on time. Peers make going to school fun.	Yes. TRIO the reason for not quitting.	Yes. TRIO was very supportive. Peers - network building.	Yes. A lot o diversity seen on campus.	Mental health and communication. Advisors have helped to overcome these.
P4	Female	Working with other people. Getting to know the class and lessons.	Yes, because of homework, teachers and the people. Reason for not quitting was wanting to finish and the stress to be gone.	Only felt belonging in one of the clubs they liked. Faculty role was torment.	Everyone from all cutures should be welcome.	Pressures from homework, due dates, and classmates. Watching anime or internet helps overcome this struggle.
P5	Female	The services (advising & tutoring) always give good advise. Faculty are one on one. Peers play no role.	Yes, during first semester because of math professor. Mom the reason for not quitting.	Initially did not feel like they belonged due to being from a small town and it was a big change. Faculty in TRIO helped a lot. Peers play no role.	Yes, there are different ages of people and people from different backgrounds.	Studying and planning. Using a calender and writing things down helped overcome this struggle.
P6	Female	Services help them stay engaged. Faculty listens to them and relly care about their students. Peers play no role.	Yes. Advisor and mentor the reason for not quitting.	Advisors /mentor made them feel like they belonged. Peers play no role.	Everyone is welcome, they see you as a student who wants to succeed.	Communication and public speaking -speech class helped Degree choice - advisor helped Time management - getting focused helped.
P7	Female	Services helped. Faculty helped with responsibilty and understanding. Peers play no role.	Yes. Told themselves to pull through.	Initially did not feel like they belonged, but made friends and advisors helped along the way. Faculty/ advisors helped guide them through when they struggled. Peers play no role.	Everyone welcome no matter gender, age, ethnicity, etc.	Communication - talking in front of class or to professors helped.
P8	Female	Services help and faculty also help. Peers play no role.	Yes. Advisor the reason for not quitting.	From first day on campus, felt at peace like they belonged. Faculty easy to talk to. Peers play no role.	Everyone is welcome on this campus.	Social anxiety. Having nice people come up and to talk to them has helped.

Through comprehensive thematic analysis of the focus group interviews, the researcher identified five themes: faculty support, family support, teaching style, learning

approach, and inclusivity, each of which plays a pivotal role in shaping the program implementation process (Table 4).

Table 4

Themes Developed from Lone Star College Focus Group

Key Theme	Participant Quote
Faculty Support	"I feel like the professors here are really engaged and they really care about their students."
Family Support	"I did feel like quitting a few times, my family kept me going."
Teaching Style	"We read chapters and take notes and that's it, then yeah pop quiz." "They just throw the information in your face, that's it."
Learning Approach	"More interactive, more like how chemistry and biology labs work, you're actually hands on learning. They're teaching you as you're going and they're really explaining what's going on more so than just sitting there and a whole bunch of blah being thrown at you."
Inclusivity	"Everyone is welcome here, I've had classmates who are disabled in a wheelchair, old, young, middle-aged, from the military, came from nothing, and people who came from money."

Theme #1: Faculty Support

The quality of interaction between students and faculty members may significantly impact the success of any program. In the focus group interviews, the student participants emphasized the importance of accessible, approachable, and responsive faculty who actively engage in their learning journey. P6 stated, “I know my professors, they actually listened to me and like I said, I told him something, he said, “oh I’ll take that to the president”, and so he actually listened.” P2 referenced the role faculty played in their remaining enrolled by stating, “Professors are engaged, faculty are nice

and everyone is willing to help." When responding to this same question about remaining enrolled, P8 disclosed the same sentiment as P2, but went a bit further by stating, "The faculty play an important part because they help so much, even though some professors aren't as nice, they still care." It is important to acknowledge that not all professors may come across as warm or approachable, but even those who may not appear particularly amiable, still care about their students' success and demonstrate their concern through their dedication to teaching, availability for questions, and their commitment to fostering an environment where learning thrives.

While six of the participants were in agreement and highlighted the role faculty played in their remaining enrolled, several participants also noted how other campus support services (academic advising, tutoring, mentoring, and financial support services) helped them. P1 stated, "Support services helped me learn different things." P2 went on to state, "Support services do a lot, they helped me to stay on track and manage everything going on around my college life." P5 discussed how support services, specifically advising and tutoring, always gave good advice, and P6 discussed how support services helped them stay engaged. By examining the students' perspective, the multifaceted nature of faculty support was illuminated, emphasizing its critical role in promoting effective teaching, nurturing student-faculty relationships, and facilitating academic success.

Theme #2: Family Support

Family support emerged as another pivotal factor in shaping a student's academic experience. Feedback from focus group participants emphasized the profound impact of familial backing on their success throughout their educational journey. The findings

revealed that family support encompassed emotional support, financial assistance, and a sense of belonging that empowered students to navigate the challenges of higher education. P1 stated, “I did feel like quitting a few times, my family kept me going.” P2 echoed this sentiment by stating, “I’ve had times I wanted to quit, but my story is a little bit different because I moved over here by myself because I was recruited to play basketball. So I guess it comes down to the fact of the sacrifices my family is making for me to be here, so I just have to pull through for them every single day and show up.” One student participant (P5) mentioned how they wanted to quit school during their first semester. P5 stated, “It was my math professor that made me want to quit, I stayed because of my mom, I wanted to show her I could do it.” The indispensable role families play in facilitating student success can not be overlooked.

Theme #3: Teaching Style

The theme teaching style emerged as a significant influence on the student learning experience. The insights gained from the student participants shed light on the nuanced ways in which teaching styles impacted student engagement, comprehension, and overall satisfaction in the classroom. During the focus group interview, the facilitator asked the participants if they saw themselves taking STEM courses and there was a discussion among all participants. One participant stated, “Those classes scare me. A lot of knowledge comes with those classes, I don’t feel like that is for me.” When asked where the connection to STEM was lost, the participant said, “Right out of high school.” The facilitator asked for clarity and if the participants felt it was an issue on the professor or student side. The participants said they did not want to blame the professors, but it was a problem with the school system in general. A female participant stated, “It’s the school

system and how professors go about finding ways to educate us. At this point, all participants began to chime in and were in agreement that the problem lies in the teaching style and how professors were not engaging and some were just having students read chapters, take notes, then have a pop quiz over things not learned. Another problem participants noted was just having a professor showing slideshows and throwing information at students. The need to sometimes have a lecture was not lost on the participants as they also expressed this sentiment during the discussion.

Theme #4: Learning Approach

The learning approach theme emerged as a critical determinant of the academic experience. Responses from the student participants noted the nature of learning approaches and their profound impact on student's academic success and engagement. P1 stated:

> I don't really go to class. It's not because I don't really like it, but it's just more so sitting there for hours and then some of the things we talk about are unnecessary. So I just feel like, why am I here? My first class, he was just reading out the book. I was trying my hardest not to doze off and he's a good professor, don't get me wrong, he's a cool professor, but I just felt it was unnecessary.

The facilitator asked the group what would be their vision to have information conveyed to them. One participant spoke up and stated, "More interactive, more like how chemistry and biology labs work, you're actually hands on learning." Another student voiced how there could be a combination of interactive learning to go along with lectures and it was good to switch it up once in while; have a combination to their teaching style. The students highlighted the significance of experiential and active learning opportunities that

fostered deeper understanding and retention of course material. The findings from this theme emphasized the importance of flexible and interactive teaching methods that catered to diverse learning styles and preferences.

Theme #5: Inclusivity

The theme inclusivity emerged as a central aspect of the academic experience. What resonated prominently in the student participants' feedback was the profound sense of belonging they derived from the inclusive campus environment at LSC-T where individuals from all walks of life were welcome. The students emphasized that inclusivity created a tangible sense of acceptance and unity, where diversity was not merely tolerated but embraced. P2 stated, "There are a lot of different people here, different ethnicities, different cultures, people, and mindsets, but everyone here is respected and welcomed." P3 stated, "I've had classmates that are disabled, old, young, middle-aged. I see a lot of diversity on campus and everyone is welcomed." There was a consensus across the board from the participants that everyone was welcome on campus no matter age, ethnicity, or gender. P1 went as far to state, "I do feel that everyone is welcome. I walked into college with a whole different point of view but my advisors, coaches, and peers have changed all of this for me." This theme underscored the critical role that inclusivity played in fostering a nurturing and supportive learning environment that empowered students to succeed, contributed to their personal growth, and ultimately enhanced the quality and impact of higher education institutions.

Discussion

The success of any educational initiative relies not only on its design but also on the thorough understanding of the needs it seeks to address. In the context of STEM

education, where the demand for qualified professionals is ever-growing, institutions are constantly exploring innovative approaches to attract and support students. This discussion section delves into the research findings and insights gained through a one-on-one interview with the Dean of Health Sciences at LSC-T, shedding light on the developmental foundations of the Science First Success Center (Sci Fi Center) Project, and the initial steps taken to understand students' needs in the STEM disciplines. Moreover, through comprehensive thematic analysis of the focus group interviews held during the fall semester of 2023, the researcher identified five themes: faculty support, family support, teaching style, learning approach, and inclusivity, each of which played a pivotal role in shaping the program implementation process.

This exploration not only uncovered the driving forces behind the Sci Fi Center Project but also highlighted strategies to inspire a new generation of students and encourage their pursuit of STEM careers. By delving into these essential themes, the researcher aimed to provide actionable insights for educational institutions and initiatives seeking to create programs that cater to the needs and aspirations of their students and staff, ensuring a more inclusive and supportive educational environment.

Research Questions

What research and past practice informed the development of the Science First Success Center (Sci Fi Center) Project? The study found that the opportunity for the grant that led to the Sci Fi Center Project emerged in late 2020. The Dean assembled a team of full-time faculty to determine how the grant could be used to improve areas where the school might not be performing well. This reflects the proactive approach of the institution in seeking funding opportunities to enhance student support. The team

reviewed previously approved projects and examined other college campuses with wrap-around services demonstrating a commitment to learning from past initiatives and adapting successful models. The team adopted the What Works Clearinghouse Accelerated Study in Associate Programs (ASAP) as an overarching model for their project showing an evidence-based approach to program development. The team also examined the Math Achievement Center (MAC) at Lone Star College- North Harris (LSC-NH) and decided to create the Sci Fi Center. This reflected the adaptability and willingness to leverage successful strategies from within the institution. The Dean emphasized that the faculty were the driving force behind the project's development. They actively named the center and decided what was needed highlighting faculty involvement and ownership in the initiative that can be a key factor in success. To meet grant requirements, the school established a partnership with another four-year university in the Houston area. This collaboration enhanced the opportunities for students looking to transfer to a four-year college or university.

What initial steps did the initiative take to understand students' needs in the STEM disciplines? The Dean identified a significant challenge during the interview: a low number of students choosing to pursue an associate of science degree, indicating a need for intervention to make STEM fields more attractive and accessible. To address the issue of students not knowing the array of job opportunities available with STEM degrees, the need for career counseling was identified and this underscores the importance of helping students make informed decisions about their educational and career paths. The Dean also stressed the importance of instilling excitement about STEM early in students' education journeys. Waiting until high school was seen as too late, and

the focus should be on junior high schools. This emphasized the significance of early outreach and engagement to cultivate interest in STEM fields. Special attention was given to outreach efforts for URM students and it was noted that involving parents and ensuring students could see themselves in STEM careers was crucial, highlighting the importance of inclusivity and diversity in STEM education.

What themes emerged from student and staff interviews that can inform the implementation of a program? Using secondary data provided by LSC-T from focus group interviews conducted with students, the researcher identified five themes that had significant implications for program implementation: faculty support, family support, teaching style, learning approach, and inclusivity. Some information was learned from what student participants wrote down during the focus group, some information was learned from watching and listening to the focus group video, and some information the researcher learned when commonalities were found in what students said and in their written responses. In all, the focus group interviews shed light on critical factors that should be considered when developing and refining educational programs.

The theme of faculty support underscored the essential role that educators play in students' success. Effective faculty support strategies may positively impact program implementation, ensuring students receive proper guidance and mentorship for their academic journey. The family support theme underscored the interconnectedness among students, their families, and their educational institutions, highlighting the need for higher education institutions to recognize and facilitate family involvement in the education process, ultimately contributing to the holistic development and success of their students. The teaching style theme emphasized the pedagogical approaches used by professors.

Tailoring teaching styles to students' needs and preferences may profoundly impact the effectiveness of program delivery. The research findings revealed that students valued instructors who employ diverse and interactive teaching methods, fostering active learning and critical thinking. Understanding the learning approaches that resonate with students was critical for program implementation. This research theme underscored the imperative for higher education institutions to embrace a student-centered approach, offering a variety of pedagogical methods and technological tools to support an inclusive and effective learning environment. Inclusivity emerged as a pivotal theme that reflected the institutional commitment to fostering an environment where every student, regardless of their background or identity, felt valued, heard, and empowered to thrive both academically and personally. These themes are instrumental in informing the design, execution, and refinement of educational programs. The insights gained from the focus group interviews provided a comprehensive understanding of the factors that contribute to effective program implementation.

Conclusion

The study of the Science First Success Center (Sci Fi) Project and the broader landscape of STEM education revealed a multifaceted approach to enhancing student support and program implementation. We explored the development of the Sci Fi Center, the initial steps taken to understand the students' needs in the STEM disciplines, and the invaluable insights drawn from focus group interviews. Through comprehensive thematic analysis of these interviews, we identified five pivotal themes: faculty support, family support, teaching style, learning approach, and inclusivity. These themes collectively emphasized the intricate fabric of STEM education. They provide a roadmap for

institutions and initiatives aspiring to create inclusive, supportive, and responsive educational environments.

Faculty support emerged as a critical element, recognizing the indispensable role educators play in students' success. The importance of family support highlights the broader community that influences educational journeys. Tailoring teaching styles to align with students' preferences is essential, as is adapting learning approaches to resonate with diverse learners. The overarching theme of inclusivity reminds us of the imperative to create welcoming spaces for all, ensuring that no one is left behind.

In conclusion, one must consider the synergistic effect of these findings. The informed development of educational programs, the understanding of students' needs, and the incorporation of these themes collectively enrich the fabric of STEM education. The Sci Fi Center Project exemplifies how a proactive, evidence-based, and inclusive approach can positively influence the educational trajectory of students. Our findings are not confined to the walls of this institution; they hold implications for STEM education at large. They underscore the necessity of faculty involvement, the significance of early outreach, and the imperative of inclusive practices to foster diverse representation in STEM fields.

In the pursuit of inclusivity in higher education, it is imperative to critically examine pedagogical approaches, particularly considering the historically excluded perspective. Drawing insights from critical pedagogy, notably influenced by the groundbreaking work of Paulo Freire, there are implications in the 'Banking Model of Education' and how educational practices either reinforce or challenge historical inequalities (Seal & Smith, 2021). Paulo Freiere's concept of the 'Banking Model'

critiques traditional pedagogical methods that treat students as passive receptacles to be filled with information. In this model, knowledge is deposited into learners, who are expected to memorize and regurgitate, perpetuating a hierarchical and authoritarian approach to education (Seal & Smith, 2021). For students who are historically excluded, this model can be particularly problematic as it tends to reproduce existing power structures and marginalize diverse perspectives. The historically excluded perspective demands a departure from the banking model towards a more emancipatory and participatory pedagogy. Critical pedagogy asserts that education should be a transformative process that empowers students to critically engage with their own experiences and the broader social context (Seal & Smith, 2021).

Linking the historically excluded perspective to the pedagogy involves creating learning environments that actively challenge systemic injustices and foster a sense of belonging among the underrepresented and historically excluded students. This includes incorporating diverse perspectives into the curriculum, encouraging dialogue that confronts historical inequalities, and promoting participatory teaching methods that empower students to be active contributors to their own education. A push towards an educational approach that not only acknowledges the unique histories of marginalized groups but actively seeks to dismantle oppressive structures may create inclusive learning spaces that empower all students, regardless of their historical backgrounds, to engage meaningfully with their education and the world around them. Adapting educational approaches to cater to the diverse needs of students is a dynamic process that requires ongoing reflection, responsiveness, and a commitment to fostering a truly inclusive higher education environment.

Implications

The findings of this research hold several important implications for the field of STEM education and student support initiatives. First, the study underscored the significance of informed program development, emphasized the value of evidence-based models and past practices in shaping effective educational initiatives. This highlighted the potential for institutions to adopt research-informed strategies when designing their programs. Moreover, the study placed a strong emphasis on faculty involvement and leadership, advocating for their active participation in program development and decision-making processes. Finally, the research may have implications for educational policies and funding allocations, potentially influencing resource distribution in the field of STEM education.

Significance

This study shed light on the informed development of the Sci Fi Center Project, serving as a model for institutions seeking to create comprehensive and faculty-driven educational programs. The evidence-based approach employed in program development demonstrates the importance of incorporating research and past practices in shaping educational initiatives, potentially encouraging more institutions to follow suit. The study also highlights the role of educators in program development, stressing the value of faculty involvement and leadership. The study's emphasis on early outreach and career guidance stresses the need to inspire student's interest in STEM fields from a young age, potentially steering them towards STEM careers. The focus on inclusivity, family engagement, and diversity underscores the importance of creating equitable learning environments. The study may influence educational policies and funding decisions,

potentially redirecting resources toward effective, faculty-driven, and inclusive STEM initiatives. Overall, this research contributes to the existing body of knowledge and offers practical insights to educators, researcher, and policymakers working to enhance STEM education and support systems.

Recommendations for Future Studies

Future research in the realm of STEM education and student support initiatives should focus on several key areas. Longitudinal studies are crucial to assess the long-term impact of such initiatives on students' career choices and success. Comparative analyses should be conducted to evaluate the effectiveness of evidence-based programs like the Sci Fi Center Project. Investigating strategies to engage and empower faculty in program development and leadership roles is essential, as is exploring best practices involving families in the educational process, especially in STEM fields. Evaluating the effectiveness of transfer pathways and pedagogical approaches in STEM education is paramount, and the influence of educational policies and funding allocation should be analyzed. The scalability and adaptability of successful initiatives, intersectionality studies, and the impact of student support services also warrant attention in future research endeavors. These areas will collectively contribute to the continued improvement of STEM education and support systems.

The researcher would also like to make note of their use of the term underrepresented minority (URM) students. The term has long been used to describe individuals who have historically faced inequalities in access and representation within academic institutions. While this label has played a crucial role in acknowledging the disparities faced by minoroity populations, it is important to recognize that the term

"URM" has inherent limitations. In recent years, a more precise and contextually accurate term, "historically excluded minority (HEM) students," has gained traction and offers a more comprehensive understanding of the challenges faced by these individuals. The term historically excluded minority students acknowledges the deep-seated historical, social, and systemic factors that have led to the underrepresentation of certain racial and ethnic groups in higher education (Armstrong, 2023). The term considers the legacy of exclusion, discrimination, and systemic disadvantages that these minority communities have endured over generations. While the term URM broadly addresses the underrepresentation, it may not fully encapsulate the nuanced experiences and challenges faced by HEM students, including those related to institutionalized racism, structural inequities, and discriminatory policies. Making a transition in terminology from URM to HEM in future research does not undermine the significance of addressing underrepresentation but rather serves to amplify the importance of recognizing the complex dynamics at play.

Assumptions, Limitations, and Delimitations

Assumptions, limitations, and delimitations are present in most research studies. Leedy and Ormrod (2015) defined limitations as weaknesses that may cast doubts on results and interpretations, while delimitations were defined as what a researcher never intended to do. Assumptions are what a researcher considers to be facts without supporting evidence.

The assumptions of this study were:

Participant responses would be honest and accurate when responding to questions in focus groups and during the administration of surveys, and participants had access to the information being sought.

The limitations of this study were:

While the study aimed to select participants for the focus groups from the STEM disciplines, there was a mix of STEM and non-STEM participants. Another limitation of this study lies in the need for a longer duration to comprehensively capture the unfolding dynamics in terms of the outcomes and program modifications.

The delimitations of this study included:

The research was conducted at a predominantly HSI where responses from participants of other cultures could be limited. Consequently, the data may not be representative of the majority of URM students majoring in STEM. The generalizability of the results found through this study was limited by the fact that the participants were from a minority group from a single college.

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