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Increasing Historically Underserved and Underrepresented Student Completion in STEM Pathways at a Hispanic-Serving Institution: An Action Research Study

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Abstract

There is a demand for accountability for higher education institutions to increase student completion, specifically for institutions that enroll many students from historically underserved and underrepresented populations (HUUP). Meanwhile, labor market analysis presents a demand for skilled and diverse workers in science, technology, engineering, and mathematics (STEM) fields. Hispanic-serving institutions (HSI) have an advantage when supporting student completion to meet this workforce demand. This inquiry employed participatory action research (PAR) through a partnership with an HSI in rural Washington State. Using transformative worldview as the theoretical framework, this study aimed to determine the influence of completion planning for STEM students who represent HUUP. Research participants were students in the institution's mathematics, engineering, science achievement (MESA) program. Two research questions guided this study and centered on how Hispanic participants and their lived experiences may inform completion planning for students from HUUP. The researchers sought to understand to what extent the MESA program's support services impact student participation at a rural institution. This study collected nonquantitative data through a two-phase approach consisting of a survey and focus groups. The data analysis determined two key themes related to the study's research questions: student barriers to completion at entry and strategies to support completion. The study's findings led to four program-specific recommendations and three implications for policy-making decisions for the community partner's leadership and for other higher education leaders seeking to increase student completion for students from HUUP into STEM pathways.

Keywords: transformative, MESA, student completion, STEM, HSI

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Chapter 1. Introduction

Community colleges educate over 6 million students seeking degrees and certificates annually, representing more than 40% of the U.S. college population (American Association of Community Colleges [AACC], 2013). These local institutions enroll a disproportionately large share of the expanding number of students of color and first-generation students (AACC, 2018). The rising number of higher education institutions, such as community colleges, has significantly increased higher education access for historically underserved and underrepresented populations (HUUP; Adam, 2003; AACC, 2023; Bailey, 2016; Greene et al., 2008; Hossler et al., 2015).

Although existing research has suggested community colleges are vital to increasing access to higher education, specifically for students from HUUP, researchers have revealed persistent challenges with student completion (Bailey, 2016; Berry, 2017; U.S. Department of Education, 2022). Barriers to completion at community colleges include a lack of intake and support services. These intake and support barriers have been found to increase student attrition (Bailey, 2016). Literature has also indicated barriers to completion are more significant for students from HUUP, signaling a more substantial challenge for community colleges that often enroll underserved students (Adam, 2003; McClenney & Waiwaiole, 2005). In this study, the researchers defined *student completion* as mathematics, engineering, science achievement (MESA) program students earning a 2-year science, technology, engineering, and mathematics (STEM) degree with admissions to a 4-year STEM program.

There are multiple benefits of completing a degree at a community college. First, a 2-year degree increases lifetime earnings by 25% when compared to the earnings achieved by someone with a high school diploma (Monear et al., 2022). Moreover, individuals with a college degree earn a median of $2 million over their lifetime, averaging $50,000 annually (Monear et al.,

2022). As such, supporting student degree completion is critical for personal and generational economic success.

As of 2019, employment in STEM represented 23% of jobs in the United States (Okrent & Burke, 2021). Increased demand for STEM credentials has positioned community colleges as crucial players in responding to workforce demand; however, national studies have revealed student degree completion in STEM majors remains alarmingly low at these same community colleges (Payne et al., 2022). The challenge for higher education leaders is to develop effective completion strategies to support credential attainment. Based on known barriers for students from HUUP, community college leaders need to understand the unique needs of this population to leverage student support services to encourage completion, which will positively impact enrollment and persistence (Adam, 2003; Bailey, 2016; Greene et al., 2008; Guenther et al., 2019; Hurtado & Carter, 1997; Irvin et al., 2012; McClenney & Waiwaiole, 2005). Subsequently, there is an opportunity for higher education leaders to understand the relationship between student completion and a STEM student support program (i.e., MESA). MESA provides intensive support services such as tutoring, advising, and mentorship for historically underserved and underrepresented students (MESA USA, 2022). For this study, the researchers defined *MESA participants* as students who intend to transfer to a 4-year institution to pursue a calculus-based STEM degree. Furthermore, the researchers defined *enrollment* as all students currently registered for an academic term at a higher education institution.

The researchers chose a public Hispanic-serving institution (HSI) in rural Washington State for the context of this study and assigned it the pseudonym of Pacific Northwest Community College (PNWCC). Since 2019, PNWCC has sought to increase equity for its Hispanic student population and has received Title V funding for its MESA program (R. Taylor,

personal communication, July 6, 2022). Title V is federal funding designated to expand and enhance HSI offerings, program quality, and institutional stability (U.S. Department of Education, 2023). Aligned with nationwide higher education enrollment trends, overall enrollment at PNWCC decreased year over year between the years of 2019 and 2021 (D. Padilla, personal communication, May 25, 2021). As an HSI, the urgency for PNWCC is to ensure its student completion planning strategies, specifically for Hispanic students, provide pathways into employment in high-demand fields.

Problem Statement

Since the 1970s, higher education has continued to improve student access and completion through policy and support programs (Hossler et al., 2015). Specifically, community colleges have continued to progress in this area, especially for students from HUUP (Basile & Lopez, 2015). Higher education leaders have emphasized increasing enrollment for historically underrepresented students in higher education and increasing their presence in STEM pathways (Basile & Lopez, 2015). The Hispanic population is the fastest-growing demographic subgroup in the United States (Passel et al., 2022), with the least representation in STEM careers based on population size (Funk & Parker, 2018**)**. Policies and support programs like the MESA program were created to help support the completion of HUUP in STEM pathways, particularly at the community college level. According to data from the Postsecondary National Policy Institute (2021), 67% of Hispanic undergraduate students attended an HSI in the 2019–2020 academic year. Consequently, HSIs, which include community colleges, must support Hispanic students by offering programs such as MESA to increase overall student completion.

An emerging system and support problem affects students who are least represented in STEM. Despite the inclusive practice efforts of higher education leaders in preparation for

return-to-campus planning during the COVID-19 global pandemic, in 2021, there was a reduction in enrollment and students seeking support services from programs such as MESA. For Hispanic students at PNWCC, participation in the MESA program declined significantly during the pandemic (R. Taylor, personal communication, July 6, 2022). Subsequently, this problem has impacted PNWCC's student completion planning, which has affected the institution's commitment to serving students from HUUP. As such, access to student support programs must be increased to support student completion into STEM pathways. This study investigated the MESA program leadership's student completion planning efforts after transitioning from virtual to in-person operations. The investigation was completed using a participatory action research (PAR) approach to understand the area of concern.

Purpose Statement

This PAR study aimed to determine the influence of the MESA program leadership's completion planning on historically underserved and underrepresented STEM students at PNWCC. The following two questions guided this nonquantitative study:

1. How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?
2. How have the MESA program's support strategies impacted student participation in a rural HSI?

This study used PAR to answer the research questions by capturing student voices to inform future leadership decision making.

Theoretical Framework

This study used the transformative worldview as a theoretical framework to guide the research. Creswell and Creswell (2018) defined *transformative worldview* as intertwining the

research inquiry with politics and a political change agenda to confront social oppression, leading to an action agenda for reform that will be life changing for participants, researchers, and institutions. Transformative research provides a voice for research participants by "raising their consciousness or advancing an agenda for change to improve their lives" (Creswell & Creswell, 2018, p. 9). Contemporary higher education leadership theory aligns with frameworks where leaders support the inclusion of industry partners, students, and the community in students' access and completion. Many higher education institutions have successfully used leadership approaches (e.g., transformational and adaptive leadership) to increase student completion (Northouse, 2019). Thus, organizations have a competitive advantage when leaders use transformational leadership tenets. More importantly, using transformational leadership methods (e.g., modeling the way, inspiring the vision, challenging the process, and enabling others to act) creates positive organizational cultures (Kouzes & Posner, 2002; Taylor, n.d.). Challenging climates and constant change present an opportunity for leaders to use both transformational and adaptive leadership. These leadership tenets encourage followers to face and deal with problems, challenges, and change (Heifetz & Linsky, 2002; Northouse, 2019; Schein, 2010).

Significance of the Study

This inquiry aimed to guide leadership at PNWCC in developing a completion policy that is inclusive of all students, with specific practices to serve Hispanic students. At the macro level, this inquiry expanded on the existing literature by generating new data for higher education leadership on STEM student completion at minority-serving institutions. A purposeful and explicit consideration of completion strategies informed the critical analysis of educational approaches that advance equitable practices and future transformation. Furthermore, this study deliberately addressed MESA, a student support program, and its role in completion planning for

current students. The results from this study increased the understanding of the relationship between increased access, mentorship, sense of belonging, persistence, barrier reduction strategies, and psychological support for students from HUUP.

Additionally, leaders may use these results to support STEM students in their pathways to gain high-demand family wage jobs. According to data from Washington STEM (n.d.), Washington State ranks among the top states in the nation when comparing STEM jobs to non-STEM jobs. By 2030, 70% of high-demand, family wage jobs will require a postsecondary credential, with 67% requiring a STEM credential (Klein, 2019). Washington State has also established a goal to achieve 70% postsecondary credential attainment across races and regions (Washington Student Achievement Council, 2022). However, Washington State's community and technical college system reported significant drops in their Fall 2020 completion for students of color—with the most significant declines among Native American and Hispanic students (Kwakye et al., 2021). Furthermore, the full extent of the COVID-19 global pandemic on higher education has yet to be determined. To address these challenges, study sought to understand leadership strategies in supporting students from HUUP and their completion of STEM pathways in the community college setting. The findings can serve as a foundation for future research to understand (a) female student completion in STEM; (b) postsecondary STEM pathway decisions; (c) MESA alumni engagement; and (d) the long-term impact of the return-to-campus strategies on higher education, the workforce, and the community.

Summary

Through affordability and enrollment initiatives, community colleges have been vital to increasing equitable access to higher education for students from HUUP. Student support services (e.g., MESA) strengthen student persistence and completion into STEM careers (MESA

USA, 2022). HSIs develop strategic initiatives that support historically underserved populations in their approach to planning STEM career pathways; yet, emerging systems and support challenges affecting HUUP continue to persist. The current study aimed to understand the influence of the MESA program leadership's completion planning for students, which may inform future leadership decision making.

Chapter 2. Literature Review

A literature review was vital to develop the foundational context for examining the research questions guiding this study—specifically, the role of student support programs in completion planning for science, technology, engineering, and math (STEM) students from historically underserved and underrepresented populations (HUUP). Much like the research problem itself, the topics of interest for the literature review were multifaceted. For one, the researchers needed to explore strategic enrollment management (SEM) because the study sought to analyze the extent to which higher education institution leadership includes specific planning for students from HUUP. Additionally, the study warranted the examination of the mathematics, engineering, science achievement (MESA) program as support for underrepresented STEM students at community colleges and a comprehensive review of STEM diversity. Because the research focused on STEM students, the researchers also examined literature on pathways into the workforce, exploring the accountability of higher education to meet workforce needs. Finally, a leadership literature review was warranted to identify the appropriate practices to support student completion planning. Overall, this literature review provided context for analyzing (a) the impact of community colleges when increasing access, persistence, and completion for students from HUUP and (b) how student support services are vital in student completion planning.

The access of students from HUUP to careers in STEM fields is greatly influenced by student completion at community colleges. Community colleges have a history of preparing learners of all ages and socioeconomic backgrounds for postsecondary education and an ever-changing workplace (Bejar, 2008). Additionally, these same community colleges enroll a disproportionately high number of first-generation students and students of color (Aspen Institute

& Achieving the Dream, 2013). Moreover, national surveys have shown community colleges have shockingly low student completion rates in STEM fields (Payne et al., 2022). A review of the relevant literature found effective higher education leadership is crucial in student recruitment, persistence, and completion (Basile & Lopez, 2015; Passel et al., 2022; Payne et al., 2022).

The literature search strategy for this review began with an initial search for 12 key terms: adaptive leadership, transformational leadership, inclusive leadership, MESA, strategic enrollment management, mentorship, STEM student success, community college leadership, STEM workforce demand, Hispanic students in STEM, gender in STEM, and student support services. The researchers used the Seattle University Lemieux Library system to find peer-reviewed articles and dissertations published from 2012–2023 in the EBSCO Host and ProQuest databases. Moreover, the research questions provided a lens to determine the relevance and applicability of the search findings for the research problem statement. The research team developed a literature map of the common themes found in the literature review and related literature to the greater theme. Figure 1 includes the topics discovered in the initial stages of the literature review, and Figure 2 illustrates the mapping of themes throughout the literature review process.

Figure 1. Literature Topic Mapping

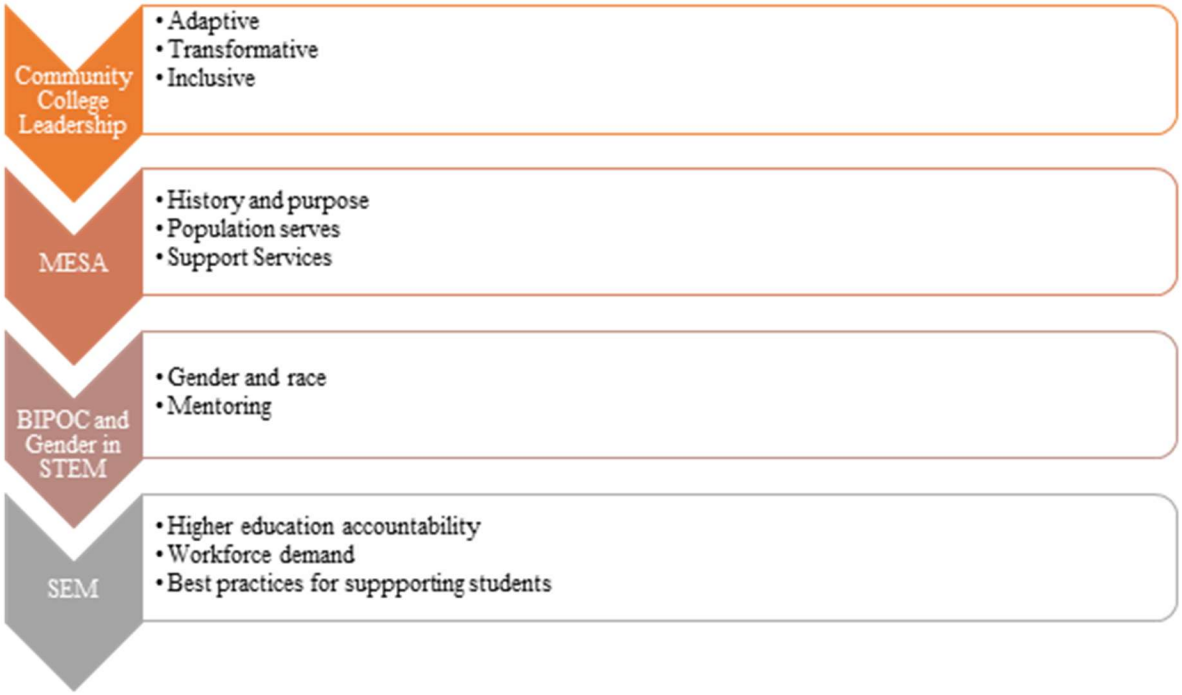
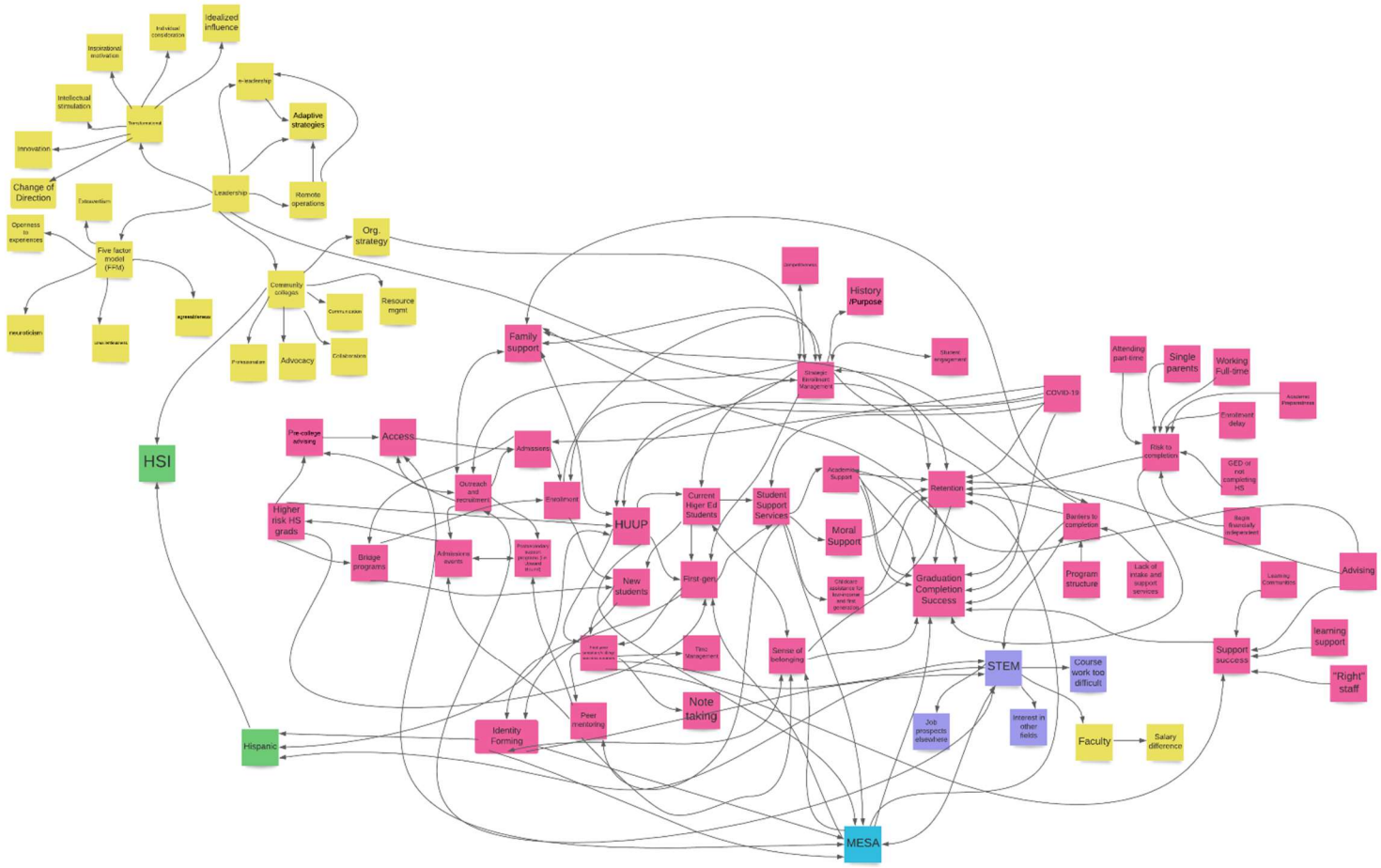


Figure 2. Literature Theme Mapping



Note. The intent of Figure 2 is to illustrate the logical mapping order of the literature search and analysis process, rather than the search terms themselves.

MESA History and Purpose

In the 1960s, MESA started as a concept that led to the establishment of a prototype program in 1970 in California to support students from HUUP in STEM pathways (MESA USA, 2022). According to MESA USA (2022), a group of educators on the University of California, Berkeley campus sought to understand why students who identified as African American, Latino, and American Indian were not enrolling at the institution's College of Engineering, which led to research of the phenomena and resulted in a precollege intervention solution (MESA USA, 2022). Those same educators went on to form the MESA program at a local high school.

The MESA program's original goal was to help high school students from HUUP mature their leadership and academic skills so they would have the confidence and educational expectations to enter STEM pathways. In turn, these methods sought to increase the 4-year college graduation rate of students from HUUP (MESA USA, 2022). Because the program proved successful, it spread to middle schools, high schools, community colleges, and universities across California. MESA created a network where industry and program alums could connect with current MESA students. The success led to Hewlett and Sloan Foundation's investment to expand and develop the MESA precollege program (MESA USA, 2022).

By the 1970s, Maryland and Colorado established MESA programs, which led to the founding of an industry advisory board for MESA to increase corporate support and involvement with the program (MESA USA, 2022). After forming the New Mexico MESA program in 1982, the William and Flora Hewlett Foundation set aside seed money for MESA programs to be designed and expanded statewide in Colorado, New Mexico, and Washington based on California MESA standards and programming (MESA USA, 2022). The MESA program would continue to receive grants from industry and federal programs with state legislatures' assistance

to expand to eight states (MESA USA, 2022). All MESA programs are based on the California programs model. Each state continued expanding its programs to serve middle and high school students and community colleges, but it was not until 1993 that MESA formalized its community college program and made an intentional effort to incorporate students at the community college level (MESA USA, 2022).

Because of its accomplishments and recognition, all individual MESA programs are funded through grants, state legislatures, and/or corporate contributions (MESA USA, 2022). The success has resulted in the National Science Foundation making MESA the most extensive consortium program to receive scholarships that target and give provisions for community college students who wish to transfer to a 4-year institution and graduate with a STEM degree (University of California, Riverside MESA, 2022). The MESA program has continued to accomplish its goals and has gained notoriety for its feats including the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring (MESA USA, 2022). This success has led to additional pilot programs in Florida, Georgia, Illinois, New Jersey, and New York that model themselves after the MESA program. MESA has sought to continue expanding its community college programs in the foreseeable future.

Population Served

As allowed by California law, in the beginning, MESA targeted students from HUUP with low eligibility rates at 4-year higher education institutions (University of California, Riverside MESA, 2022). These same populations have and continue to be underrepresented in science and engineering careers. In addition to students not getting into 4-year universities, students who do gain admission do not pursue STEM degrees through completion, furthering the gap in representation in careers that involve science, mathematics, engineering, and computer

science. The gap continues when income, first-generation status, and gender are considered. The primary student populations served by MESA are African American, Hispanic/Latino, Pacific Islander, and Native American people and women (MESA USA, 2022). Students who do not fall into these categories can also be served if they are low income and first generation.

Support Services

MESA services combine enrichment activities, industry involvement, and academic support while building confidence, skills, identity, and community (Alvarado & Muniz, 2018). Additionally, the program can encourage and guide MESA students down the STEM pipeline. The idea is to give students from HUUP the knowledge to make accurate choices related to their careers, provide them with a sense of belonging to the greater STEM community, and prepare students academically whose skills are underdeveloped. By raising students' feasibility of STEM careers, the MESA program helps students become more invested and dedicated to persisting in the STEM pipeline. The MESA program's primary services are academic excellence workshops, academic advising and counseling, assistance in the transfer process, career development, links with student and professional organizations, and professional development (Meza et al., 2017).

Tutoring and Supplemental Instruction. Academic Excellence Workshops (AEW) is a service that provides tutoring and supplemental instruction to MESA students. Tutoring has a longstanding history as an aid in student scholarship and as a successful intervention tool to boost academic persistence and performance (Tsui, 2007). The AEW program serves as MESA's most successful service, providing immediate help in classes that often are barriers for students from HUUP. AEW teaches students how to prepare for their courses, study what questions to ask, and understand STEM concepts. AEW facilitators use cooperative learning techniques to motivate students to gain a deeper understanding of the subject and work in groups (Petrucci &

Rivera-Figueroa, 2021). The student facilitators work with faculty to design the workshops and collect feedback to inform course teachings.

Academic Advising. Academic advising is critical to the success and progression of STEM students because it has an influence on student retention (Panitz, 1995). Not only do advisors guide students and keep them on the right track regarding what classes to take, but effective advising practices also keep STEM students in STEM pathways. Students may leave the STEM pathway when in contact with advisors who are more knowledgeable in fields outside of STEM (Palmer et al., 2011). Students seek guidance and follow the paths that give them the most direction. Academic advising is an opportunity for students to talk to an individual and be proactive in seeking supplemental academic, research, and personal experiences on campus while decreasing anxiety and insecurity associated with being a MESA student (Rozhenkova et al., 2022).

Transfer Support. Many transfer students from HUUP perceive the 4-year campuses as being unwelcoming, lacking support from faculty and staff, and having an overcompetitive student culture; these perceptions result in the sense of intimidation for students transferring to 4-year campuses (D. L. Jackson et al., 2013). The transfer process often makes students uneasy because they do not entirely understand the scheduling complexities or expectations of the schools to which they hope to transfer. Support service programs like MESA, through workshops and individual meetings with staff, are designed to address students' concerns by keeping the students informed, guiding them, and keeping their options open (Handel, 2007). When students know they have support, they can focus on other aspects of the transfer process, such as asking more in-depth questions about school resources, community, and institutional fit (D. L. Jackson et al., 2013). Advising and campus visits help students find the right fit where they can excel and

know where their communities exist on campus; hence, they feel welcomed and learn to access university resources as they adjust to a new environment (D. L. Jackson et al., 2013).

Career Development. The MESA program emphasizes career development among its participants. Many low-income, female-identifying students and students of color usually suffer from an opportunity gap (Steele, 2010). A lack of opportunities to explore career fields, schools, and networking makes students of color and female-identifying students feel inadequate compared to their White and male-identifying counterparts (Steele, 2010). The opportunity gap has a cumulative effect on career choices, perseverance, and belonging (Wright Watson, 2021). Career development allows MESA students to see they belong and are just as prepared as their peers.

Mentorship. Student and professional organizations are places where students can work on their leadership skills, find community, network, share knowledge and experiences, and receive mentoring (Tsui, 2007). Mentoring programs that are natural or informal tend to be more successful and have a more significant impact. These mentor relationships naturally occur over a group's specific goal or mission, reducing pressure to achieve a certain expectation that is not always clearly defined between mentor and mentee. To increase organizational success, members logically help each other improve to meet the group's goal.

Mentoring serves two purposes, giving students (a) psychological and (b) career-based support (Johnson et al., 2017). Mentoring can come from MESA staff, peers, alums, professors, and/or industry personnel. Moreover, mentoring gives students emotional support and academic and career development. Students respect and are more attentive to people who have gone through the same journey and who look like them. Mentors with a similar background to the mentee feel confidence, a greater sense of belonging, and increased aspirations to pursue their

careers in STEM (Dennehy & Dasgupta, 2017). Mentors help in this manner by protecting mentees' confidence that they can persist in a STEM degree and belong.

Professional Development. Most students from racial minority groups suffer from a lack of adequate mentoring or modeling, which is a direct result of inadequate information gathering on STEM careers; such a challenge is why MESA offers professional development for their students to work in a STEM organization, learn soft skills needed to work in teams, and gain insight to secure employment in the field (MESA USA, 2022). Developing these skills allows students to be prepared to network with others, interview successfully, and grow in confidence in their preparation for the next steps after college. Depending on location, available resources, and funding, additional development services often include industry and university visits, community-building activities, formal mentoring, STEM activities, and leadership opportunities (MESA USA, 2022).

***Industry and University Visits*.** Many postsecondary students struggle to imagine where they could go to school or career pathway due to a lack of STEM career exploration (Mark, 2016). Industry and university visits help students see the institution where they intend to transfer or might secure work. The MESA program takes students to these physical locations to help them better understand what it means to work in their field, company, and/or go to a particular school (MESA USA, 2022).

***Community-Building Activities*.** Community-building activities are essential to creating a welcoming and inclusive environment for incoming MESA students. Community-building activities help establish peer group support among students in the program. Students have described peer support as providing a positive social network and support for their academic work (Palmer et al., 2011). Peer groups encourage each other socially and academically,

increasing students' abilities to persevere because peer groups help develop a sense of belonging and help alleviate the academic stress of a STEM student.

STEM Activities. STEM activities allow students to use what they learn in class and apply that knowledge practically (Palmer et al., 2011). Such activities enable students to expand and share their knowledge with others, making connections to the real world and giving insight into STEM careers (Hite & Taylor, 2021). Students often feel discouraged from the rigor of their STEM courses without knowing how they will use the information learned. STEM activities give students hands-on experience and complement what they learn in class. STEM activities can further student interest, increase motivation, and help students identify with the STEM pathway (Hite & Taylor, 2021). These activities support the development of a MESA identity because students actively practice what they would do in their field of study.

Student Leadership Opportunities. Leadership development is vital to all professions; many undergraduate students gain these skills through leadership opportunities, making these leadership opportunities essential for productive careers in STEM (Warner, 2008). The more students of color and women enter STEM, the more frequently they are asked to be leaders and managers (Bowling et al., 2015). STEM students in leadership positions develop leadership skills that prepare them to be successful participants in project teams and equip them for their careers (Bowling et al., 2015). Working on their leadership skills in college helps students rely on their experience and skills to be successful in their careers. MESA students must be given opportunities to step into leadership roles; otherwise, their time for growth will come once they are in their careers, and often when they are less prepared.

Community College Leadership

Community colleges play a vital role in access to higher education for students from HUUP. Gray et al. (2022) stated 44% of students who obtained a degree in STEM fields in 2022 began their college experience at a community college; still, only 14% of these community college students completed their degrees from 4-year institutions. As such, community college leadership decision making is critical for the future success of students from HUUP. These leaders have been tasked with transforming an education system that has traditionally held less success for students from minoritized groups.

Moreover, community college leaders must transform their practices to the evolving needs of students from HUUP, the surrounding communities, and the workforce (Aspen Institute & Achieving the Dream, 2013). With unemployment, underemployment, and a rapidly changing economy, there is a greater necessity for innovative community colleges to meet local workforce development needs and help more students find a career with economic mobility (Aspen Institute & Achieving the Dream, 2013; Bejar, 2008).

Mission and Vision

As colleges redefine what inclusivity and equity means to all stakeholders, one of the most significant leadership and organizational change issues in higher education is vision and mission creation. Social sector organizations, such as higher education institutions, do not have the concentrated decision power that many corporate leaders possess (Collins & Kritsonis, 2006). The dilemma for many colleges and universities is to be increasingly more inclusive in forming their mission and vision statements. To this end, the formation of the vision and mission for a college or university requires leaders to create a shared understanding of why the institution exists and how to affect change for students and the community (Senek, 2009). Moreover,

creating a mission and vision involves more stakeholder engagement in the social sector than in for-profit sectors (Collins & Kritsonis, 2006). Mission and vision statements must be resilient, inclusive, and service oriented (Senek, 2009); thus, the primary benefit in social sector mission statements must be the student or client, not the leaders or employees.

College leaders, faculty, and staff are connected in this mission-creation process. Faculty are vital stakeholders in mission and vision creation because they spend the most time with students (Stringer & Aragón, 2021). Leadership and followership roles are linked as leaders tap the motives of followers to reach organizational goals (Northouse, 2019). Transformational leadership is often used by higher education leaders and mirrors the American Association of Community Colleges' (AACC) leadership competencies (Robison, 2014). Consequently, these AACC competencies have been found to positively impact the development of transformational leadership behaviors in community college leaders and increase diversity, equity, and inclusion efforts (Caldwell, 2016; Robison, 2014).

Moreover, to align with AACC leadership competencies, the Washington State Board for Community and Technical Colleges (n.d.) added language to hold community college leaders in Washington State accountable for changes in diversity, equity, and inclusion for faculty, staff, and students. The language included the following statement:

> The Equity, Diversity, and Inclusion (EDI) office at SBCTC endeavors to uphold the agency's bold vision for leading with racial equity by working to dismantle racist policies and practices throughout our community and technical college system and ensuring our students of color and other minoritized students reap the benefits that come with higher education: higher incomes, better health, and greater social and economic mobility that passes from generation-to-generation. The EDI office acknowledges that racism

> permeates across and within our communities, industries, and organizations, including our own agency and system of colleges. (Washington State Board for Community and Technical Colleges, n.d., para. 1)

Inclusive Leadership in Community Colleges

In community colleges, senior leaders often create the implementation process for inclusive organizational policies. For example, there are gaps between the policy and the practice of inclusion (Mor Barak et al., 2021). Top leaders can create policies that promote more inclusion, but if frontline employees are not trained in implementing these policies, a noninclusive climate may result. Leaders can hire a diverse workforce, but without mentorship, coaching, and inclusion, these diverse employees may not stay.

Moreover, when leaders focus on increasing a diverse student population, such focus does not always result in retaining underrepresented groups (Randel et al., 2018). Organizations must create a climate where belongingness and inclusion are encouraged. Additionally, when leaders value the uniqueness of employee contribution to the group, it can lead to higher performance for the whole team. Inclusive leadership at the senior and middle levels can help increase employees' and students' senses of belonging.

Moreover, inclusive leadership practices could benefit higher education institutions overall (Bass, 2000); for example, leaders can be trained to create positive and inclusive climates. One such skill includes training in microaffirmations (Rowe, 2021). Microaffirmations are small, often unconscious, acts that help others succeed (Rowe, 2021). These microaffirmations could consist of giving credit to others, offering support, providing helpful feedback, or rewarding superior performance. Examples of how training in microaffirmations might benefit leaders include modeling appreciative inquiry behavior or focusing on employee

morale and team member behavior. Ultimately, employees want to be seen, heard, valued, and included in a team or workgroup. Receiving friendly feedback about improving a work process is affirming and can create a positive work climate. Additionally, these skills for employee inclusion can be aligned with the stages of group development: forming, storming, norming, performing, and adjourning. More research is needed on which types of affirmations work best at each stage (Tuckman & Jensen, 1977).

On the other hand, leadership is not just about being friendly or inclusive. Leadership requires making sure the right things happen, no matter how painful, for the long-term greatness of the organization that aligns with the mission (Collins & Kritsonis, 2006). Along the same lines, leadership involves implementing the theory of humility in leadership practice in a manner that guides a leader's behavior towards others' dignity (Gist, 2020). Leaders benefit from being curious about people and using humble inquiry to ask questions that build relationships (Schein, 2013). Ultimately, leadership skills are learned by observation and practice; thus, leadership literature creates new insight in the form of frameworks that help leaders bridge from knowing into behaviors that translate into doing (Nohria & Khurana, 2010).

Diversity in Community College Leadership

Community colleges enroll a disproportionately large share of students of color and first-generation students (AACC, 2018). In light of this diverse population of students and their needs, community college leaders must understand that stereotypes and cultural norms can vary between cultures. Moreover, what may be oppressive in one culture may not be seen as oppressive in another. In the community college system, diversity in leadership can include faculty and administrators. Having a diverse faculty leads to increased recruitment and retention of students and other diverse faculty (Collins & Kritsonis, 2006; Stout, 2018). Because many

faculty are recruited into leadership positions, diversity in administrative and leadership roles may also increase (Collins & Kritsonis, 2006; Stout, 2018); therefore, recruiting female-identifying faculty into STEM positions is becoming increasingly important. Women can provide unique contributions in STEM fields (Goris, 2020). Community college leaders must use inclusive and adaptive leadership tenets for hiring and retaining more diverse faculty and administrations to transform colleges into culturally agile organizations (Collins & Kritsonis, 2006). Ultimately, *cultural agility* is the ability to enable "technically competent professionals to be successful irrespective of the multicultural or cross-culture context" (Caligiuri, 2012, p. 5).

Recruitment and Retention of Diverse Leaders. Although the "great resignation" (i.e., mass exodus from the workforce), did not begin during the COVID-19 global pandemic, there has emerged an increased need for employers to develop a comprehensive strategy to retain and recruit top-performing employees in the wake of the pandemic (Craig, 2015; Grashow et al., 2009; Taylor, n.d.). Leaders must reconsider best practices to improve retention and recruitment strategies for diverse leaders. Human resources professionals can create an atmosphere where followers will likely become more committed to the organization (Taylor, n.d.). Specifically, leaders must attract and retain qualified and top-performing candidates, manage the employees, define competitive salaries, provide training and developing opportunities, prepare performance management programs, and develop procedures for transitioning employee exits (Craig, 2015). A comprehensive process can improve organizational performance and reduce costs for hiring top talent (Taylor, n.d.).

On the other hand, if no attention is given to retaining and developing current employees, most individuals will leave an organization within 5 years (Phillips & Roper, 2009). More alarming, 57% of workers in one global study considered taking a new job in the coming year

(Breitling et al., 2021). With so many employees considering taking on a new job, hiring managers have no shortage of advice. Similarly, hiring managers incentivize loyalty and provide growth opportunities such as one-time bonuses to help employees pay their student debt or provide work-from-home stipends (Breitling et al., 2021; Dlugos & Keller, 2021). This method corrects pay inequities for employees from HUUP. Moreover, forward-thinking leaders may add retention interviews to ask each employee what it would take for them to stay in the organization (Breitling et al., 2021; Dlugos & Keller, 2021).

To retain diverse internal talent, transformational leadership—and its roots in intrinsic motivation and follower development—helps satisfy employee needs, improves motivation, and treats employees as human beings (Northouse, 2019). Additionally, such inclusive practices engage with others to create connections that raise motivation for followers and leaders alike (Northouse, 2019). When a comprehensive, transformational leadership process is used for employee retention of diverse leaders, it can improve organizational performance and reduce costs for hiring top talent (Phillips & Roper, 2009). When leaders focus on using transformational leadership tenets, it provides an organization with a competitive advantage by saving money in hiring costs over time, especially in a challenging hiring climate (Taylor, n.d.).

Conversely, although internal hiring can increase employee retention overall, adaptive leadership skills and cultural agility are needed to work with each employee who might face internal rejections because it is impossible to hire all internal applicants (Caligiuri, 2012; Dlugos & Keller, 2021). Hence, the adaptive leadership approach that encourages followers to face and deal with challenges and change could be helpful for internal candidate rejections (Northouse, 2019). Moreover, this approach lets followers down at a rate they can absorb (Heifetz & Linsky, 2002).

Cross-Cultural Competencies. Community college leaders can develop talent and increase the number of women and historically marginalized faculty and staff in cross-cultural competencies (Caligiuri, 2012). Moreover, many community college leaders hire international faculty to fill roles in STEM courses and non-STEM courses. Both faculty and staff need cross-cultural competencies. Talent development is the most effective way for human resource professionals to support their organizations in developing culturally agile professionals (Caligiuri, 2012). Talent development opportunities include strategically aligned learning opportunities that support leadership development.

The cultural agility competency framework (Caligiuri, 2012) includes tolerance of ambiguity, appropriate self-efficacy, cultural curiosity, and a desire to learn. Although all components are equally important, a leader may benefit from first developing a cultural curiosity and a willingness to learn. Cultural curiosity allows leaders to learn about other cultures and people from diverse cultures, enabling them to adjust their leadership style appropriately. Leaders and followers with a cultural curiosity "are more likely to ask questions about norms, customs, values, behaviors, and other aspects of culture that are unfamiliar" (Caligiuri, 2012, p. 52). The natural desire to learn about a different culture sets a foundation for a global leader to succeed. Without that innate desire to learn about a different culture, a leader will experience difficulties in cross-cultural interactions. It is the role of organizations to provide employees with opportunities to develop cross-cultural competencies through leadership development.

Sponsorship and Mentorship. Chow (2021) and Harris (2019) provided insightful discussion on distinguishing between a sponsor role and a mentor and clearly defined that a leader must be both a sponsor and a mentor. The discussion of peer mentoring, whether formal or informal, highlights the necessity of peer mentoring to create a community to support one other

and foster a sense of belonging. Community and belonging are crucial elements when considering retention of employees from HUUP (Murrell et al., 2021; Solomon & van Coller-Peter, 2019). However, in sponsorship, people use their access to power and privilege to amplify, boost, connect, or defend a coworker or employee (Chow, 2021). Harris (2019) defined a sponsor as the individual who "has the power to get it, whatever it is, for you" (06:20). With this understanding, it becomes clear that the role of a sponsor is to bring forth recognition to a person left uninvited to a closed-door meeting or denied access to a seat at the privileged table. When considering employees from HUUP, it is essential for leaders to offer mentoring opportunities and identify opportunities for sponsorship to use social capital to elevate the work of HUUP.

Adaptive Leadership in Higher Education

Higher education leaders must adapt quickly to changing economic, societal, and regulatory issues. Adaptive leaders encourage people to deal with change (Northouse, 2019). As such, adaptive leaders must understand not only the leader–follower relationship, but also consider external factors in the environment in which their organization operates (Glover et al., 2002). Leadership, and its ability to implement change management, has become one of the most prominent objectives in higher education and is increasingly referenced in college and university mission statements (Kiersch & Peters, 2017). Additionally, colleges operate in a complex environment that includes influence from external factors, innovative technologies for teaching and learning, globalization, and changing government policies and procedures (Khan, 2017). Such complexity and constant change require a leadership strategy that is flexible and adaptive to increase success, persistence, and completion rates for students from HUUP.

E-Leadership

The COVID-19 global pandemic has increased the need for adaptive leadership strategies in higher education (Chwen-Li et al., 2022). Higher education leaders needed to implement adaptive leadership strategies to realize a digital functional culture during the early stages of the pandemic. Digital leadership skills also became necessary for leaders in higher education during this period to increase effective learning and student success in online courses (Chwen-Li et al., 2022). Additionally, higher education leadership teams faced the complex task of supporting and uplifting team morale during the pandemic using technology-based learning systems. Amid these efforts, new leadership styles were required to galvanize remote employees and students for improved success. This introduction of e-leadership allowed leaders to learn how to adapt to the virtual environment. Virtual communication is essential in e-leadership (Liu et al., 2020), Due to these challenges during the COVID-19 global pandemic, leaders needed to adopt technology-based solutions for team cohesion and effectiveness in the classroom (Liu et al., 2020).

Nonetheless, in 2021, as higher education institutions returned to on-campus operations across the country, leaders were called to transform their organizations into hybrid institutions where many courses and programs remained online and others were fully face to face. Adaptive leadership skills have subsequently become necessary to transform higher education after the pandemic (Chwen-Li et al., 2022).

Transformative Leadership in Higher Education

The full-range leadership paradigm, which also encompasses transactional and laissez-faire leadership, incorporates transformative leadership as a continuum of leadership characteristics (Bass, 2000). An effective leader must be able to use both transformative and transactional leadership behaviors, even though scholars have frequently portrayed

transformative leadership as a more positive set of activities (Bass, 2000; Judge & Bono, 2000). A strong transactional relationship between a leader and a follower must be developed before a leader can use transformative behaviors to boost followers' performance (Judge & Bono, 2000). The four Is (i.e., idealized influence, individual concern, inspiring drive, and intellectual stimulation) are the distinguishing characteristics of transformative leadership, which is on the other extreme from transactional leadership and is characterized by a relational approach (DeRue et al., 2011; Tarker, 2019).

Transformative leadership aligns with leaders who engage with others and create a connection with employees that raises the level of motivation in both the leader and follower (Northouse, 2019). Likewise, Kouzes and Posner (2002) defined *leadership* as the "art of mobilizing others to want to struggle for shared aspirations" (p. 3). Although such contemporary leadership theory aligns with higher education leadership practices, more leadership support is needed to include industry partners, students, and the community in the recruitment and retention of faculty and staff. For example, transformative leadership has been researched in educational settings worldwide and has provided a framework for leaders (Tarker, 2019). Findings have consistently shown that transformative leadership produces positive results in educational settings, especially when measuring its impact on organizational innovation, organizational commitment, organizational citizenship behaviors, employee satisfaction, and perceptions of leadership effectiveness (Nguni et al., 2006).

Many higher education institutions use leadership approaches such as transformative leadership (Northouse, 2019). When these leaders focus on using transformative leadership tenets, it provides a competitive advantage for organizations, especially in a challenging hiring climate. More importantly, using transformative leadership methods (e.g., modeling the way,

inspiring the vision, challenging the process, and enabling others to act) can save money on training and hiring costs over time (Kouzes & Posner, 2002; Taylor, n.d.). However, challenging climates and constant change allow leaders to also use adaptive leadership. These adaptive leadership tenets encourage followers to face and deal with problems, challenges, and change (Heifetz & Linsky, 2002; Northouse, 2019; Schein, 2010).

In contrast, the relationship between transformative leadership and innovative behavior is nonlinear. Specifically, the positive effects of transformative leadership on innovative behavior will be stronger at low and high levels of transformative leadership (Bednall et al., 2018; Damanpour & Schneider, 2008; Eisenbeiss & Boerner, 2010). Moreover, there remains disagreement among scholars on the relationship between transformative leadership and innovative behavior. Scholars have posited that knowledge sharing in and between teams may be lessened and produce fewer opportunities for innovative behavior (Bednall et al., 2018; Damanpour & Schneider, 2008; Eisenbeiss & Boerner, 2010).

Gender in STEM Leadership

Whether transformative or adaptive, leadership brings additional challenges to the field of STEM. Specifically, fewer women pursue engineering, computer science, math, and chemistry fields than men (Yen et al., 2017). As a result, there is a shortage of female-identifying STEM faculty in higher education. Because female-identifying faculty can inspire the next generation of female-identifying doctoral students, there should be an additional focus on inclusive leadership practices to hire and retain female-identifying faculty in STEM. Implementing inclusive practices for female-identifying faculty may contribute to their increased success (Carrigan et al., 2011). Many leaders (e.g., department chairs) could benefit from professional opportunities in

conflict management, team building, mentorship, and bias cognition to create an inclusive environment that retains female STEM faculty (Chu, 2006).

When focusing on the lack of women in STEM fields, there must first be an acknowledgement of the long history of exclusionary practices in these fields, especially in European countries (Goris, 2020). For example, there is such a long history of culture against women in specific academic and occupational fields that no matter how frequently gender advancements are made, there remains a need to shift the global culture (Goris, 2020). According to the U.S. Census Bureau, women made up about 12% of engineers and 26% of computer scientists nationwide in 2019 (Goris, 2020). Moreover, scientists and policymakers realize that participation in STEM fields by women will eventually impact the overall educational level nationally. Gender equity in STEM is very important; many inventions, consumer products, ideas, and breakthrough technologies have been developed without the largest part of the population (i.e., women) contributing. As a result, this large subgroup does not get its voice infused into the STEM community (Goris, 2020).

In addition, when early childhood biases and cultural stereotypes are established, these assumptions often impact female students' success rates in STEM and can result in significant challenges for women interested in STEM (Chapman et al., 2020). These stereotypes have long-lasting psychosocial effects on women, leading to low self-efficacy and self-doubt in young women who doubt their capacity to perform well in STEM careers. For example, the National Assessment of Educational Progress (NAEP) reported that boys in K–12 still outperformed their female counterparts on student standardized assessments. These results have further perpetuated female students' lack of interest in STEM subjects. To combat some of these issues, Kinskey

(2020) observed that science classrooms have transformed over the last 10 years to include the ability to incorporate technology, engineering, and mathematics.

To increase the involvement of female-identifying students in STEM, systems of bias and stereotypes that hinder gender-based growth in the STEM field must be reduced. Scholars have generally agreed that female engagement in STEM should begin when students are in grade school (Kinskey, 2020). Another solution hinges on the framework of the Next Generation of Science Standards (NGSS), which has focused on equity over the last 10 years. The NGSS framework focuses on the STEM contributions of women, students from diverse cultures and ethnicities, and people of color (Kinskey, 2020). Consistently portraying positive images of women in science is essential for the successful recruitment, retention, and overall industry sustainability of young female STEM students. This effort must be deliberate and consistent.

Black, Latinx, and Native Americans represented about 31% of science and engineering STEM professionals as of 2022 (Master's in Data Science, 2022). Furthermore, 21% of the same subgroup had earned bachelor's degrees, and only 13% had doctoral degrees in science-related subjects (Master's in Data Science, 2022). Gender gaps are usually pervasive in STEM programs in 4-year colleges and universities. These institutions also have the highest race and gender gaps in those science programs, furthering the disparities based on ethnic, cultural, and demographic inequalities (McWhirter & Cinamon, 2021).

Furthermore, there remains a lack of underrepresented student subgroups with STEM bachelor's degrees, which presents a continued struggle for women and minorities such as African American, Latinx, and Native American students (McWhirter & Cinamon, 2021). Moreover, scholars have emphasized the need to create spaces for students from HUUP in STEM (McWhirter & Cinamon, 2021). This practice uses expectancy value, social identity, and

social cognitive theories, which affect the ability to foster and address inclusionary practices in STEM (McWhirter & Cinamon, 2021). Ultimately, to support and nurture female leaders in STEM, women need the backing of men. Due to the overwhelming presence of men in the STEM field, it is unrealistic to try to solve the problem of diversity, inclusionary practices, a sense of belonging, and mentoring without including them (Rheingans et al., 2011); as such, men are a vital component of increasing representation in the STEM field.

Encouraging Hispanic STEM Participation

Latinas are the nation's fastest-growing group of women in the United States (Williams, 2015). Consequently, these women face a lack of consistent and ongoing same-race mentorship in the STEM field. Significant incidences occur where women are not encouraged to speak their minds and pursue upward mobility in a STEM field because they risk being ostracized. Moreover, when examining the increasing involvement of female candidates in science, the persistence issue in collegiate STEM programs is also an important topic. Talley and Ortiz (2017) referred to the terminology of a leaky pipeline, which occurs from K–12 through the 4 years of college. The leaky pipeline term explains how minorities, particularly women, gradually leak out of the STEM preparation process. Researchers have described this disparity as being controlled by genetic tendencies historically shaped by gender. For instance, compared to men, women are more likely to pursue majors in the natural science field than the more male-dominated representation in physical science. Subsequently, this discouraging phenomenon manifests itself in many women's specific science career choices (Talley & Ortiz, 2017).

Additionally, a vital approach to increasing Hispanic female participation in STEM is access to after-school support programs centered around science careers (Koch et al., 2019). After-school enrichment programs help to create success in recruitment, retention, support,

encouragement, and the social connections needed to push marginalized female subgroups forward into seeking careers in STEM. Along the same lines, STEM-focused careers require mastery in higher level math, science, and technology subjects, which sometimes quickly destroys confidence in female students (Rangel et al., 2021). This process may translate into lower achievement in these subjects. STEM enrichment programs increase persistence levels of underrepresented female students and set in motion their access to quality mentorship (Koch et al., 2019).

How to Increase and Sustain Participation of Hispanic Women in STEM

Even with many studies that discussed, articulated, and proposed solutions to increase diversity in the STEM pipeline, scholars have disagreed on the exact formula for accomplishing that goal (Koch et al., 2019). A program called Project Excite, which examined results from a longitudinal study on the positive effects of reducing minority achievement gaps in STEM, recognized ongoing oppressive systems caused these gaps (Kubilius et al., 2017); consequently, educators have exposed historically marginalized students to intensive supplemental enrichment and accelerated programming specifically for high-potential underrepresented students. The goal of Project Excite was to better prepare those 3rd–8th-grade students for success in advanced math and science courses in high school. The study provided beneficial data showing those same students' test data compared to students in their local school districts. These tests included the State of Illinois Standards Achievement test, the Explore test, and Measures of Academic Progress, and showed above-grade-level math scores. The data showed participants in the program consistently outperformed their Black, Latino, and low-income peers and came significantly closer in academic performance to their White peers (Kubilius et al., 2017).

Mentoring is crucial when determining the success and sustainability of underrepresented subgroups in STEM occupations (Pederson et al., 2021). For instance, frameworks that use success factors in mentorship can increase success for these groups. Mentorship should be aligned with race and ethnicity; shared outlooks, perspectives, and values; and psychological similarities. Furthermore, importance should be placed on the protégé style of mentorship, which focuses more closely on matching the mentee with individuals or educators beyond the qualities of similar race and gender (Pederson et al., 2021). Specifically, when pairing Hispanic women with quality mentors, matching mentors must include research–career commitment, self-efficacy, identity, community values, and psychological similarity.

Moreover, mentoring is a core component in many intervention programs targeting the lack of underrepresented subgroups in STEM (Estrada et al., 2018). Furthermore, the premise of quality mentorship is interactions between seasoned, experienced individuals who value the relationship, whereby the mentee protégé will completely develop under the mentor's consistent and direct professional guidance (Estrada et al., 2018).

Experienced mentors provide the needed support to satisfy the following outcomes:

- instrumental support (e.g., resources and opportunities),
- psychosocial supports,
- emotional and personal development,
- relationship quality (e.g., trust, empathy, respect, and connectedness), and
- values across time and science efficacy. (Estrada et al., 2018)

Higher Education Accountability

Strong public demands on increasing accountability in higher education to students and the workforce have challenged the effectiveness of higher education credentials (Dougherty et

al., 2013; Macheridis & Paulsson, 2021; Sydow & Alfred, 2013). From 2009–2013, concerns about educational quality and the education system's ability to mitigate negative changes grew rapidly (Berry, 2017). Former U.S. president, Barack Obama, criticized the U.S. higher education accreditation system and Congress during this time for "not holding colleges accountable for cost, value, and quality" (Berry, 2017, p. 127). In August 2022, as colleges and universities prepared for fewer in-person restrictions and more in-person services following the onset of the COVID-19 global pandemic, U.S. Department of Education Secretary Miguel Cardona demanded a culture change in higher education by implementing equitable practices to ensure success for all students (Brink, 2022; U.S. Department of Education, 2022). Cardona's demand was a call to action to hold higher education institutions accountable for increasing access, completion, and student support for students from HUUP.

During a time of growing accountability pressures facing institutions, community colleges that have played a vital role in increasing access to postsecondary education have remained susceptible to significant budget cuts (Adam, 2003; Bailey, 2016; Guenther et al., 2019; Hossler et al., 2015; U.S. Department of Education, 2022). These budget cuts have resulted in a fiscal crisis due to funding reductions and declines in enrollment (Bulman & Fairlie, 2022; Christensen et al., 2011). Limited resources have led to the need for not only a culture shift in community colleges, but also a shift in structure. The economic concerns have presented a challenge for institutions essential to increasing access, persistence, completion, and support to students from HUUP to do more with less funding while responding to workforce labor needs. The challenge to do more with less has created opportunities for institutions, namely community colleges, to evaluate if their organizational structures and processes can respond to environmental changes (Powell et al., 2015).

SEM

SEM is a structural framework that informs a higher education institution's structure and includes a set of processes and policies associated with postsecondary student recruitment, retention, academic success, and graduation (Hossler et al., 2015). Because of the impact on the entire student lifecycle, SEM has become a framework that breaks through campus silos by including the whole institution and relies heavily on institutional research to inform strategic goals in the framework of the overall institutional planning model (Hossler et al., 2015; Taylor et al., 2008). Furthermore, SEM operationalizes when institutions link goals and initiatives to their mission and vision statements.

SEM Purpose

SEM emerged as an approach by higher education institutions to respond to the declining number of high school graduates in the 1970s when the higher education market was highly competitive for traditional-aged college students (Hossler et al., 2015). The purpose of SEM was to create a framework to respond to the changing environment related to student access, persistence, and completion in response to continuously evolving environmental factors (Powell et al., 2015). SEM can increase its competitive position in the higher education sector by developing self-financing management teams to investigate critical factors influencing student satisfaction and implement appropriate strategies to recruit students (Ng et al., 2018). To improve student satisfaction and success, higher education institutions need to find their niche in the market by establishing their own identity (Taylor et al., 2008). SEM is a comprehensive process that requires understanding the external market, supply and demand, program development, and student recruitment and retention. Through SEM, institutions create a mission

that distinguishes them from other institutions (Hossler et al., 2015; Ng et al., 2018; Taylor et al., 2008).

History of SEM in Community Colleges

In their study of the organizational structures of community colleges, Kopecek and Clarke (1982) stated, "Community colleges must be receptive to changes and not envision expansion as the only acceptable alternative but consider restructuring to satisfy the current needs of the community" (p. 34). Historically, community colleges did not invest heavily in SEM research because of their focus on local markets and their ability to employ large numbers of adjunct faculty, resulting in the ability to adapt quickly to shifts in new student enrollments (Hossler et al., 2015). However, amid recent calls for accountability practices—especially in access, persistence, and completion—community colleges that seek to survive the high-stakes economic and political landscape must invest in developing an SEM plan.

Barriers to Access, Persistence, and Completion

Although college enrollment casts community college performance positively, educators and policymakers have recently turned their attention to college completion, which yields a much more negative image in the sector (Bailey, 2016; Berry, 2017; U.S. Department of Education, 2022). Barriers to completion at community colleges include the structure of programs and lack of intake and support services; traditional developmental education is not able to prepare students to enroll in developmental education courses (Bailey, 2016). Furthermore, these barriers to completion are more significant for students from HUUP (Adam, 2003; McClenney & Waiwaiole, 2005).

Best Practices for Supporting Access, Persistence, and Completion

Community colleges increase access to higher education (Bailey, 2016). As such, community college campuses with an SEM plan may be particularly effective at increasing student persistence and completion. The following subsections include access, persistence, and completion best practices.

Access: Enrollment Support

The focus on increasing access to higher education for students from HUUP has been at the forefront of higher education agendas (Adam, 2003; Adedoyin, 2022; Brink, 2022; Terrell, 2022; U.S. Department of Education, 2022). This focus has led higher education institutions to develop access programs to help prepare high school students for college by providing academic, motivational, career planning, financial aid workshops, mentoring, and tutoring (Adam, 2003; McClenney & Waiwaiole, 2005). Literature on best practices has reflected the value of access programs for historically underserved and underrepresented students because these programs provide prospective students an opportunity to build a cultural connection to higher education with their peers and mentors (Greene et al., 2008; Terrell, 2022). There is also value of front-door best practices, including implementing bridge programs that help acclimate recent and higher risk high school graduates to the postsecondary environment through academic and orientation experiences (Greene et al., 2008; Kwakye & Kibort-Crocker, 2020). Family members are widely important in the admissions process; thus, institutions should host events specifically for parents and offer admissions information in multiple languages to reduce potential language barriers (Adam, 2003).

Persistence: First-Year Experience Programs

The popularity of first-year experience (FYE) programs has significantly increased at community colleges as a best practice in support of student persistence, especially for students from HUUP (Adam, 2003; Bailey, 2016; Greene et al., 2008; Guenther et al., 2019; Hurtado & Carter, 1997; Irvin et al., 2012; McClenney & Waiwaiole, 2005). FYE programs differ slightly in programming, but the consistency in emphasizing first-generation college students has been vital to the program's success. Another consistent component is the first-year course or seminar that helps students learn the essentials of college survival, from test taking and note taking to time management (Adam, 2003; McClenney & Waiwaiole, 2005). Additionally, the inclusion of peer mentors in the FYE course is a best practice for supporting students' sense of belonging in FYE programs (Adam, 2003; Catolico, 2022; Greene et al., 2008; Guenther et al., 2019; Hurtado & Carter, 1997; Irvin et al., 2012; Schuetz, 2008; Terrell, 2022).

There has been increasing interest in understanding the role of a sense of belonging in community college students related to attrition in higher education (Adedoyin, 2022; Catolico, 2022; Hurtado & Carter, 1997; Schuetz, 2008; Terrell, 2022). *Attrition* is a student leaving higher education before achieving a postsecondary credential, often correlated with a student's poor academic preparedness, excessive work, and family responsibilities (Schuetz, 2008). With this understanding, attrition factors could be external and outside institutional scope. Some institutions believe that attrition is external; Schuetz (2008) revealed in the 2005–2006 academic year, 25% of students stopped out (i.e., stop taking courses) because of academic failure, whereas 75% of students stopped out because of difficulties related to a lack of fit between the skills and interests of students and their institution. Furthermore, researchers have examined sense of belonging of Latino students and found discussions of course content with other

students outside of class and membership in religious and social–community organizations were strongly associated with student sense of belonging (Adam, 2003; Hurtado & Carter, 1997; O'Connor et al., 2010).

Completion: Student Support Services

Greene et al. (2008) identified the following characteristics that increase a student's risk of not completing:

- delaying postsecondary enrollment,
- receiving a GED or not completing high school,
- being financially independent of their parents,
- being a single parent,
- having dependents other than a spouse,
- attending college part time, and
- working full time.

These aforementioned characteristics also describe general characteristics of community college students, which translates to them being more at risk than their 4-year peers. Furthermore, considering the impact of the COVID-19 global pandemic, the most significant drops in student enrollment were among African American and Latinx students who happened to also identify as first-generation students (Bulman & Fairlie, 2022).

To respond to the barriers to completion, community college leaders should focus on three reform elements: measurable student success, an intentional and cohesive package of programmatic components, and a culture of evidence (Bailey, 2016). In addition to impacting college completion rates, reforms must be scaled to include most of the target student population and address the entire student experience in college. Furthermore, one strategy to mitigate the

barriers to completion, specifically for students of color and low-income students, is to combine frequent advising with comprehensive wraparound student supports, holistic cohort-based learning, high-impact practices (e.g., integrating learning in and outside the classroom), and completion grants (Kwakye & Kibort-Crocker, 2020). Wraparound supports that include learning support is a way for students to understand that support goes beyond the classroom (McClenney & Waiwaiole, 2005). The final aspect mentioned as a best practice to support student completion pertains to hiring the right staff. Research on student success has continually reinforced the importance of student interaction with faculty and staff (McClenney & Waiwaiole, 2005).

STEM Workforce Shortage

As of 2019, employment in STEM occupations represented 23% of jobs in the United States (Okrent & Burke, 2021), and the percentage of STEM occupations is expected to increase by nearly 11% between 2021–2031 (U.S. Bureau of Labor Statistics, 2022). These statistics have driven several state and national efforts to increase pathways into STEM fields because of a potential workforce shortage (L. M. Jackson & Rudin, 2019; Landivar, 2013; National Science Foundation Board, 2020; Van Noy & Zeidenberg, 2017). Still, some researchers have questioned if there is a STEM workforce shortage (Camilli & Hira, 2018; Cannady et al., 2014; Hira, 2022; New American Economy, 2017; Xue & Larson, 2015). U.S. Census data from 2019 showed, of the 50 million employed college graduates between the ages of 25–64, 37% had an undergraduate degree in a STEM field, yet only 14% worked in a STEM occupation (Cheeseman Day & Martinez, 2021). These data translate into less than one third of STEM-educated workers working in a STEM job.

Although it is unknown if a workforce shortage exists, the literature points to data that may provide a more comprehensive perspective. In 2017, women represented 52% of college-

educated individuals, but only 29% of the STEM workforce; further, 50% of women in STEM careers dropped out of their field in the first 12 years (National Science Foundation Board, 2020). The potential attrition for women in STEM can be related to the persistent earning disadvantages and male-dominated, unsupportive workplace culture (Xu, 2017). Hence, women in STEM have consistently stressed the value of representation and advocacy in the STEM workforce (Pritchett, 2021; Saffie-Robertson, 2020).

An employment analysis by the U.S. Bureau of Labor Statistics (2022) projected growth in STEM occupations, presenting an opportunity to ensure equitable pathways for students from HUUP into STEM pathways. A study of U.S. adults ages 25 and older between 2017–2019 found White workers were overrepresented in STEM jobs (67%) and made up 71% of engineers and 62% of computer workers (Kennedy et al., 2021). Black and Hispanic workers represented 9% and 8% of the STEM workforce, and Native American and Pacific Islander workers accounted for 3% of STEM workers during this time frame (Kennedy et al., 2021). The lack of representation of a racially diverse workforce contributes to underrepresentation in STEM careers (Cannady et al., 2014; Pritchett, 2021).

Participatory Action Research

Participatory action research (PAR) methodologies allow researchers to engage with a community or organization to find solutions for humans and social life. Action research trains researchers to actively participate in research to find practical solutions for everyday issues (Herr & Anderson, 2015; Stringer & Aragón, 2021). Additionally, this type of research requires curiosity and questioning to approach communities and work with them to find solutions and opportunities. While engaging with communities for research, this method of inquiry requires researchers to be humble and listen intently. This research approach has a worldview that

includes lifelong learning, respect, and institutional accountability (Chavez, 2012). Action research is "inquiry that is done by or with insiders to an organization or community, but never to or on them" (Herr & Anderson, 2015, p. 3). As such, action research is a process that engages community members in research that centers the community, not as subjects, but as primary investigators and stakeholders.

Appreciative Inquiry in Research

Appreciative inquiry focuses on strengths rather than trying to diagnose a problem. The best way to lead change in organizations is to focus on what works rather than what is broken (Cooperrider, 2012). Furthermore, organizations are not just problems to be solved, but solutions and centers for human connectedness. Moreover, appreciative inquiry postulates that the questions asked in organizational research determine the responses. If researchers focus on the positive and what works well, they can replicate this finding across other areas of an organization. The positivity of this approach works in college programs, industry departments, or nonprofits that focus on the needs of stakeholders (Hammond, 2013). Additionally, by using appreciative inquiry while conducting action research, researchers avoid focusing only on organizational problems by concentrating on what works well. Many scholars are trained to find one fundamental problem and offer solutions. Focusing on what works well helps to carry parts of the past into any change that is trying to be implemented and can lead to improved chances for success and buy in from stakeholders.

Cultural Humility in Research

With action research, speaking to the relationship between appreciative inquiry and cultural humility is vital (Hammond, 2013). Appreciative inquiry uses the approach to research with the perspective that the community members are the most equipped to help lead the study.

Cultural humility in action research is the process and the commitment to entering research with appreciative inquiry. The assumption of appreciative inquiry assumes that something works in every society, organization, or group (Hammond, 2013). To that end, cultural humility would impact data collection in action research because it acknowledges a culture's history, customs, and philosophy. Rather than entering the culture as a problem to solve, cultural humility recognizes the culture's strengths and allows community members to engage and lead the research. Action research with community members using cultural humility enables the research practices and procedures to adapt to specific communities and cultures (Stringer & Aragón, 2021). Therefore, having cultural humility when engaging in action research improves the quality of the study because of the support from the primary stakeholders. Moreover, people are more comfortable engaging with people of their own culture (Wright & Wallis, 2020).

Summary

Community colleges play a vital role in student completion from HUUP, influencing leadership decision making, which is essential for the success of community colleges. The need to explore the role of leadership decision making in community colleges warranted a leadership literature review that represented appropriate practices to support student completion planning and transformative leadership tenets. Creating an inclusive environment for women and historically marginalized employees is critical to supporting adaptive and transformative leadership styles. These styles are the most effective in achieving inclusive goals for an institution. Through mentorship and career development, organizations have realized that retaining and recruiting diverse talent requires increased cross-cultural competencies and diversified staff and leadership. Amid increasing demand for accountability, community college

leaders should focus on SEM to eliminate barriers to completion for STEM students from HUUP.

A sense of belonging has been a primary focus on supporting STEM students through student support programs with services that include mentoring, academic support, and career development to expand STEM pathways and careers. In part, these programs help students from HUUP change their ideologies of inclusion in the STEM field and address inequity. Students from HUUP are provided with the tools to persevere in the STEM fields through support and encouragement.

Chapter 3. Methodology

Intake and support services are critical for student success and completion of credentials (Bailey, 2016). Additionally, barriers to completion are more significant for students from historically underserved and underrepresented populations (HUUP), signaling a more substantial challenge for colleges that often enroll underserved students (Adam, 2003; McClenney & Waiwaiole, 2005). Community college student completion planning facilitates the achievement of an institution's mission and goals; however, higher education leaders must be transformative to be prepared to respond to the ever-changing external environment to support student completion. For instance, as leaders executed their return-to-campus strategies after COVID-19 global pandemic lockdowns, the demand for skilled labor—specifically in science, technology, engineering, and math (STEM) fields—increased, challenging institutions to ensure the success of all STEM students. This study provided the opportunity to investigate the influence of the mathematics, engineering, science achievement (MESA) program leadership's completion planning on historically underserved and underrepresented STEM students in rural Washington State. Specifically, this study explored how on-campus operations affected student participation and degree completion at Pacific Northwest Community College (PNWCC), a pseudonym.

The next section of this chapter begins with the restatement of the research questions, followed by the study's methodology and an explanation of how data were collected and analyzed. Finally, the chapter concludes with an overall summary.

Research Questions

The following two research questions guided this study:

- Research Question 1: How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?

- Research Question 2: How have the MESA program's support strategies impacted student participation in a rural HSI?

Action Research Approach

Participatory action research (PAR) is a collaborative approach that allows community members to engage in systematic inquiry to discover effective ways to resolve problems in their community (Stringer & Aragón, 2021). This study used PAR to answer questions by capturing student voices, which will help inform future leadership decision making. Moreover, the best way to lead change in an organization is to focus on what is working rather than what is not. Organizations are not just problems to be solved, but are solutions and centers for human connectedness (Cooperrider, 2012). Furthermore, action research is "inquiry that is done by or with insiders to an organization or community, but never to or on them" (Herr & Anderson, 2015, p. 3). Thus, action research is a process that engages community members in the research and centers the community not as subjects, but as primary investigators and stakeholders.

To understand where there might be opportunities for growth for STEM students at a rural college in Washington State, the researchers gathered voices of MESA students through a two-phase data collection process. Phase 1 was a structured, open-ended, and closed-ended survey. Phase 2 involved focus group sessions that included semistructured questions for survey participants who identified as Hispanic. The researchers aimed to understand the experiences of Hispanic students pursuing transfer STEM pathways at a rural Washington State community college using the transformative worldview as an analytical framework. Although there appeared to be no consensus in existing literature characterizing the transformative worldview, many researchers (e.g., participatory action researchers) have engaged in critical theory using this worldview (Creswell & Creswell, 2018). As a Hispanic-serving institution (HSI), PNWCC uses

an equity centered appreciative inquiry model that uses data to implement change. This research provided stakeholder feedback for collaboration, completion pathways, and barrier reduction. The value of focusing on the community was to align the research with the community's needs and goals. Furthermore, PAR allowed community members, not outsiders, to lead the study.

Context of the Study

The context of the study included data collected from students at PNWCC. The researchers gathered voices of STEM students enrolled in a MESA program to determine how completion strategies engaged historically underserved and underrepresented students at rural community colleges. To increase equity for its Hispanic student population, PNWCC funded a MESA program. The MESA program engages students and aligns with the college's mission to inspire, educate, and support all students. This alignment led to support strategies that seek to increase completion rates for Hispanic students in STEM (Hammond, 2013).

Since 2019, PNWCC held inquiry-based sessions to revise the strategic plan for the college. The strategic planning committee implemented an appreciative inquiry assessment in four phases: discover/scope, dream/diagnose, design/mobilize, and deliver/evaluate. In this approach, the strategic planning committee identified strengths, opportunities, challenges, and aspirations to support Hispanic students and students from HUUP. Leaders also identified direct planning initiatives to become a Spanish- and English-fluent college and create degree pathways for their students from HUUP.

Although many scholars are trained to find the one fundamental problem and offer solutions (Hammond, 2013), this study used appreciative inquiry to gather information about what was working as college leadership implemented their initiative. Focusing on what was

working helped carry parts of the past into the change implementation, which can lead to improved chances for future success and stakeholder buy in (Hammond, 2013).

Study Participants

The research was conducted in two phases. Phase 1 participants were recruited as a criterion sample of current PNWCC MESA program students to participate in a MESA program survey. This population was selected for this study based on the community partner's request to gather information for program evaluation and process improvement. The MESA program specifically requires participants to belong to a historically underrepresented population in STEM, including African American, Native American, Hispanic, Native Hawaiian and Pacific Islander populations and female-identified groups. Furthermore, MESA eligibility specifies that students must transfer to a 4-year institution to pursue a calculus-based STEM degree, clearly defining completion for PNWCC MESA students. Additional MESA eligibility requirements include first-generation college student status and a socioeconomically disadvantaged background; eligible students must also not have previously earned a bachelor's degree in any field. Criterion sampling was the appropriate method for this phase of the study because it enabled the recruitment of participants with similar experiences and perspectives (Mills & Gay, 2019) and allowed for data to be collected via student voices from which policymakers and leaders may benefit when seeking to improve programs and services to be more relevant to MESA students (Denzin, 1989).

The community partner, PNWCC, identified as an HSI, with approximately 45% of the student population identifying as Hispanic. Due to the community partner's HSI designation, Phase 2 of the study focused on understanding Hispanic student experiences in the MESA program through focus group sessions. To recruit focus group participants, the researchers used a

homogenous sampling from the participants who completed the Phase 1 MESA program survey. Doing so allowed the researchers to expand on participants' responses from the survey and provide additional insight into the lived experiences of Hispanic MESA students.

Participant Recruitment

The community partner and researchers sought to collect data both through a survey and in-person focus groups, which required two phases for recruitment. The following sections explain the process of recruitment for each phase of the study.

Phase 1: MESA Program Survey

After securing the Institutional Review Board (IRB) approval (see Appendix A), the researchers began identifying research participants for the study by contacting all PNWCC MESA program students to request their participation in the Phase 1 MESA program survey (see Appendix B). Working with PNWCC's MESA program director, the researchers emailed an invitation to participate in the study to the MESA program director (see Appendix C). The MESA program director shared the invitation with all 92 MESA students via the MESA program's Canvas (i.e., a learning management system) page. Following the initial recruitment email, the research team spent the 1st week the survey was open (i.e., March 20–22, 2023) performing in-person outreach at the PNWCC MESA Center. To support recruitment, the research team developed recruitment flyers in English and Spanish (see Appendix D). The outreach resulted in a total of 27 survey responses. The survey was active for 22 days, with biweekly reminders of the cutoff date through in-person MESA staff conversations, Canvas notifications from the MESA program director, and emails from the research team. A participant consent notification was included at the start of the survey (see Appendix E); there were no incentives or compensation to complete the survey.

Phase 2: Hispanic Student Focus Group Sessions

The study's second phase involved focus group sessions with a specific emphasis on Phase 1 survey participants who self-identified as Hispanic. Participants who identified as Hispanic were invited to sign up for a focus group session to share more insights regarding their experiences with the MESA program. The research team used a recruitment communication plan that included emails, MESA program director Canvas notifications, and in-person outreach to encourage participation. The outreach resulted in 14 focus group participants across three separate in-person focus group sessions. The focus group sessions were hosted on the PNWCC campus on Wednesday, April 5, and Thursday, April 6, 2023, with April 5 offering two different available times and a third session on April 6. An informed consent form was emailed to participants who signed up for a session online, and paper forms were provided to all participants at the focus group sessions. Additionally, the researchers obtained verbal consent before each session began. Similar to the Phase 1 MESA program survey, there were no incentives or compensation to participate in a focus group.

Data Collection

As previously mentioned, data collection for this study was conducted in two phases. The following sections explain the data collection process for each phase of the study.

Phase 1: MESA Program Survey

The researchers developed a survey, titled *MESA Program Survey*, to collect data for the research questions. With the assistance of MESA program leadership, survey questions were created using the five whys method., which promotes a more profound examination of root causes by continuing to ask why (Moaveni & Chou, 2016; Senge et al., 1994). Furthermore, the

five whys method allowed MESA leadership and the Seattle University researchers to use each other's complementary expertise in survey development.

The researchers administered the survey online using Qualtrics, a digital-based questionnaire software. An email invitation to request participation, a link to the survey, a flyer, and an email reminder message were shared with the MESA program director for distribution to MESA students through PNWCC's MESA program contact list and Canvas page. The community partner reviewed drafts of these messages, including the dean of STEM, who was in favor of this research. The survey included 17 open- and closed-ended questions and took approximately 10 minutes for participants to complete. The survey questions were categorized into inquiries on communication, programming, and outreach (see Appendix F for a complete list of questions). The survey collected student demographic information such as gender, age, race and ethnicity, academic information (e.g., major and pathway), and consent. Before initiating the survey, the questions were piloted with former Washington State MESA students to gather feedback. The window for completing the survey was over 3 weeks, beginning Thursday, March 16, to Thursday, April 6, 2023. A weekly follow-up reminder email was sent starting the 2nd week the survey was opened. The researchers provided daily updates to the MESA program director with status reports of the number of participant responses collected so that additional reminders could be sent.

Phase 2: Hispanic Student Focus Group Sessions

The researchers facilitated three separate focus group sessions. These sessions involved in-person, semistructured interviews. The focus group questions were based on Castillo-Montoya's (2016) four-phase process interview protocol refinement (IPR) framework, which is ideal for structured or semistructured interview refinement. Each phase was designed to assist the

researchers and MESA leadership in developing a research instrument specific to study participants while keeping the study's goals front and center (Castillo-Montoya, 2016). The phases of the IPR consist of the following:

- Phase 1: Ensure interview questions are aligned with research questions.
- Phase 2: Construct inquiry-based conversations.
- Phase 3: Receive feedback on interview protocols.
- Phase 4: Pilot the interview protocol. (Castillo-Montoya, 2016)

The focus group questions were categorized into inquiries to expand on survey responses (see Appendix G). Similar to Phase 1, the research team sought feedback on the questions before the focus group sessions. The intentional design of the focus group questions gave the researchers a way to comprehend the participants' experiences as they described and brought meaning (Castillo-Montoya, 2016). Furthermore, because the study was a PAR design, participants were encouraged to describe, define, and recall experiences in their terms without framing earlier questions (Stringer & Aragón, 2021). That process allowed for a holistic account of a complete depiction of participants' life experiences (Creswell & Creswell, 2018).

The research team used the participant demographics to create student profiles of the MESA students to assist in identifying Hispanic participants for the focus group sessions. Eligible participants were invited via email with a link to the focus group sign-up form. A reminder message was sent to students at least twice a week (see Appendix H for the recruitment emails inviting students to participate in the focus group). Like the survey phase, the community partner reviewed drafts before sending messages. Although the researchers created a focus group sign-up form, eligible participants were advised that signing up for a session was preferred, but not required. Subsequently, most participants elected not to sign up for a session ahead of time,

attended as their schedule allowed, and were often joined by eligible peers and study partners. Homogeneity groups offer more free-flowing conversations with other participants while allowing for analyses of distinct groups' perspectives (Morgan, 1997).

The focus group sessions were hosted on the PNWCC campus and purposely located in a separate building from the MESA Center. This intention was to provide anonymity to the participants. Before each focus group session began, the researchers obtained verbal consent to use data collected from the participants. Additionally, participants were provided a copy of the informed consent form via email, in person, or both. The researchers asked participants six semistructured questions over 60 minutes. The focus group interviews were recorded using Zoom on the researchers' laptops, transcribed using speech-to-text software with permission from participants, and organized to assist with data analysis.

The minimum number of participants for each focus group was four students. Small groups work best when all participants are interested in the topic of study and are respectful of each other (Morgan, 1997). The researchers added participants to each focus group when any participants arrived after the start of a focus group session by obtaining verbal consent and revisiting any questions the participant may have missed. As members of the MESA program, respect for others is part of the contract MESA students must sign to be a part of the program (MESA USA, 2022). Additionally, as MESA students, focus group participants had a working knowledge of the MESA program activities.

The four-member research team was present to oversee the focus group sessions. Two research team members facilitated each focus group, and two members recorded participants' responses while observing each focus group. Before the focus group sessions, the research team designated specific roles for each member (see Table 1).

Table 1. Focus Group Roles

Focus group roles	# of researchers	Post-focus group roles	# of researchers
Interviewer	Two for each focus group	Transcription	Four
Recorder/Observer	Two for each focus group	Coding	Four

Data Analysis

This section details the process of how data were analyzed after being collected. Additionally, this section describes how the researchers ensured credibility and addressed potential biases when analyzing the data.

Data Organization and Coding

The research was conducted in two phases. The team analyzed and integrated each data set to provide a more comprehensive interpretation of the two research questions and implications. Table 2 illustrates the analysis process for each phase.

Table 2. Data Analysis Method by Phase

Data collection method	Process	Analysis method
Phase 1: MESA program survey	Structured, open-ended questions used the five whys method, over email, used the Qualtrics Survey tool, used the criterion sampling method	Participatory action research 1. Organized and prepared data for analysis 2. Reviewed all data to eliminate redundancy and overlap 3. Coded data with a common theme or description 4. Assigned codes/themes to three groups: expected codes/themes, surprising codes/themes, and unusual codes/themes 5. Arrayed the codes/themes into a conceptual map to reflect the flow of ideas 6. Wrote the narrative for each theme
Phase 2: MESA Hispanic student focus group sessions	Semistructured, open-ended, facilitated in-person and on campus, used the homogenous sampling method	Participatory action research 1. Transcribed focus group discussions and typed up notes 2. Reviewed all data to eliminate redundancy and overlap 3. Coded data by a common theme or description 4. Assigned codes/themes to three groups: expected codes/themes, surprising codes/themes, and unusual codes/themes 5. Arrayed the codes/themes into a conceptual map to reflect the flow of ideas 6. Wrote the narrative for each theme 7. Conveyed descriptive information for each participant in a table

After all data were coded, the researchers entered the data into the analysis matrix (see Appendix I). The analysis matrix included an individual matrix for each participant data set. The data set was divided vertically with the individual survey and focus group questions and

horizontally by columns. The matrix captured focus group and survey questions parent codes, subcodes, connection to the theoretical framework, leadership theory, rising themes, participant quotes, and general comments.

Survey and Focus Group Data Analysis

A pair of researchers conducted the data analysis for the survey and focus groups. When disagreements occurred during the coding process between the coding researchers, the other two researchers were called upon to use the consensus technique. Most researchers tend to have close agreements on basic themes, but their understanding of those themes may differ (Armstrong et al., 1997). Thus, the research team used the consensus technique of two researchers not involved with the coding process to provide fresh insight into the variations in the coding process. An analysis matrix allowed researchers to discern agreements, disagreements, patterns, themes, and connections to the frameworks and principles. Using coding and generating a small number of themes helped the researchers connect themes into a theoretical model (Creswell & Creswell, 2018).

The PAR analysis involved an iterative process of looking across the matrix for patterns, themes, and trends. This process gave the researchers a better sense of the information gathered and an opportunity to reflect on its overall meanings (Creswell & Creswell, 2018). To further expand the data analysis for each survey question, the researchers were able to review focus group transcripts and pull participant quotes to support the analysis.

Measures of Quality: Credibility

In this study, the researchers established credibility through the following methods:

- triangulating different data sources by examining evidence from the sources and using it to build coherent justification for themes;

- making use of the consensus technique to determine the accuracy of the findings by taking specific themes back to participants to advise if the themes were accurate;
- using detailed, thick description to convey findings to transport research consumers to the research setting and provide the discussion with an element of shared experiences;
- clarifying biases the researchers may have brought to the study through self-reflection and open and honest narratives;
- presenting negative or discrepant information that ran counter to the themes to provide different perspectives to the research and adding credibility to research when themes ran counter to other data; and
- using peer debriefing through professional networks to enhance the accuracy of the account.

Controls for Bias – Ethical Concerns

To clarify the biases each researcher bought to the study, researchers engaged in self-reflection to understand how their backgrounds, genders, cultures, histories, and socioeconomic origins shaped their interpretation of the findings (Creswell & Creswell, 2018). Incorporating reflection was necessary for this study because members of the research team were in professional roles that supported higher education enrollment and completion. Furthermore, three of the four members were in professional positions in close proximity to a MESA program. The positionality statements included in the next section frame the lens of each researcher to account for potential bias in the analysis, conclusions, and recommendations. The research team also engaged in ongoing discussions and reflection during all research study phases to minimize individual research members' biases and assumptions. Additionally, the researchers used a

consensus agreement, which involved multiple research team members in collecting, reviewing, organizing, and analyzing the data to ensure the consistency of the analysis.

Furthermore, the researchers controlled for bias in the PAR study by asking students broad questions based on their participation in the MESA program, its level of support, and future implementation and involvement of student applicants. To control bias in both phases of the data collection, the researchers engaged in the following steps:

- developed a thorough research plan;
- separated category themes;
- reviewed results with participants;
- shared duties with a diverse research team; and
- received outside peer research feedback.

Eliminating bias in research studies cannot be guaranteed. The researchers took steps to eliminate sampling bias (i.e., the process of selection), nonresponse bias (i.e., survey respondents are unwilling or unable to respond to a survey question or an entire survey), response bias (i.e., participation of respondents), question order bias (i.e., ordering of questioning), and information bias (i.e., errors in handling, collection, or analysis of data), which can affect the truthfulness and accuracy of a study (Creswell & Creswell, 2018; see Table 3).

Table 3. Positionality Statements

Researcher	Statement
Osurè Brown	Black, Japanese, Cherokee Nation, Irish, French, male, first-generation STEM, biology, education, women's and ethnic studies major, MESA expert, nontraditional student, 10 years as academic and club advisor, advocate, and when in doubt go left.
Eric Marshall	Black, African American, Creek Indian, second-generation college graduate, political science/exceptional education/educational leadership major, secondary special education teacher, K–12 assistant principal, and principal 30 years, experienced educator at all grade levels.
Inez Olive	Pacific Islander female, first-gen American and college graduate, low-income background, nontraditional college student, higher education admin, outreach, and recruitment strategist.
Kyle Winslow	First-generation female, White low-income background, self-funded college, higher education/K–12 teaching for 25 years, entrepreneurship and hospitality industry background, dean for 1,700 students in two schools. Belonging is the key to success for students.

Delimitations

The study was conducted at a medium-sized, rural HSI in Washington State. The researchers sought to understand the influence of the MESA program leadership's completion planning on historically underserved and underrepresented STEM students. The researchers conducted an initial inquiry to determine the STEM student population at the college (Mills & Gay, 2019). The STEM student population included over 2,500 students. The researchers used a criterion sample method by limiting the MESA program survey participation to the current 92 students in the MESA program. This representative sample articulated a boundary for the PAR study. Because PAR is a collaborative approach that allows community members to engage in systematic inquiry, the sample size for the focus group was limited to include students from the MESA program with Hispanic ethnicity who completed the survey. Using a homogenous sampling method for the focus group phase of the study encouraged participants to discover effective ways to resolve problems in their community (Stringer & Aragón, 2021). Using

criterion sampling the researchers selected STEM students enrolled and participating in a MESA program.

Summary

This nonquantitative research study investigated the following two research questions:

1. How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?
2. How have the MESA program's support strategies impacted student participation in a rural HSI?

The study generated findings with practical implications for the community partner. During a significant disruption caused by the COVID-19 global pandemic, PNWCC, like many others, had to adapt its services to the changing environment and student needs. For this reason, PNWCC was an appropriate setting for conducting this study. Participants in the study were first recruited as a criterion sample from current MESA program students for the research's survey phase. Then, using homogenous sampling, Hispanic participants who completed the survey were recruited to participate in the focus group phase of the study. Data were collected in a structured, open-ended and close-ended survey and semistructured focus groups. The survey questions and focus group prompts were codeveloped with the community partner and influenced by the literature review of this study. Data from the survey and focus groups were analyzed through a coding matrix, combined, and organized by codes. The data coding connected this study's theoretical framework and provided potential recommendations for the college's leadership.

Chapter 4. Results

The purpose of this study was to provide insight into how a rural Hispanic-serving institution's (HSIs) completion planning strategies involving a science, technology, engineering, and math (STEM) support program could better serve students from historically underserved and underrepresented populations (HUUP), specifically Hispanic students, by understanding students' lived educational experiences. Furthermore, this study sought to understand the impact of the mathematics, engineering, science achievement (MESA) program's support strategies on student participation in the program. *Student participation* was defined as MESA-eligible students' access and engagement with MESA resources.

The previous three chapters introduced (a) the relationship between mentorship, sense of belonging, persistence, and barrier reduction strategies; and (b) the criticality of these concepts to supporting STEM students from HUUP via completion policies. Reviewing existing literature helped to categorize known historical challenges to completion rates of students from HUUP in STEM majors and how STEM support programs (e.g., MESA) were designed to address barriers to completion. The literature review provided additional awareness of the importance of diversifying the STEM workforce and leadership to create accountability from industry partners and higher education institutions.

The researchers used a two-phase participatory action research (PAR) approach to collect data from the MESA student population through an online survey and in-person focus groups. For Phase 1 of the study, the entire 92 MESA student population was invited to participate in the online survey, which was active for 22 days (i.e., March 17 through April 6, 2023). Phase 2 involved focus group sessions for students who identified as Hispanic on the survey. There were

14 students who participated in focus group sessions over 2 days (i.e., April 5 and 6). The focus group sessions gathered data to answer the following two research questions:

1. How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?
2. How have the MESA program's support strategies impacted student participation in a rural HSI?

Data Collection Process

This section presents the process of collecting the nonquantitative data supporting the PAR study. The data were drawn exclusively from Pacific Northwest Community College's (PNWCC, a pseudonym) MESA program during the winter and spring terms of the 2022–2023 academic year. In Phase 1 of the data collection, using criterion sampling, the researchers created a bounded sample of current MESA students and emailed them a Qualtrics survey. The survey included an informed consent statement that required participants to agree before gaining access to the survey. The survey collected demographic data and had open-ended questions to allow for the collection of student voices. At the time of survey deployment, the MESA program student participation count was 92, with approximately 50% of the students identifying as men and 50% identifying as women.

Phase 2 of the data collection consisted of in-person focus groups. Using a homogenous sampling method, the students who completed the Phase 1 survey and identified as Hispanic were invited to attend a focus group session on the PNWCC campus. The researchers sent an email containing a brief explanation of the study, the Institutional Review Board (IRB) informed consent form, and a link to sign up for a focus group session to potential participants. Of the 27

students who completed the survey, 18 met the inclusion criteria and were invited to participate in the focus group.

Two instruments were used in the data collection. The Qualtrics online survey elicited survey responses that yielded demographic data and data from open-ended questions. Additionally, the researchers collected data from semistructured focus group sessions for Hispanic students to understand Hispanic students' lived experiences as they navigated higher education through STEM pathways. The research questions were addressed using an established protocol with each focus group session. The researchers identified themes in the narratives of the research participants' responses related to the research questions. Themes included Barriers to Completion at Entry and Support Strategies to Support Completion. Subthemes were also identified as appropriate. For example, Academic Support was further categorized as a subtheme to identify narratives related to proactive advising and study space.

Research Participants and Setting

This section presents background information on the participants and the study setting. The total number of MESA students who participated in the Phase 1 survey was 26, of which 13 of the participants identified as women, 12 identified as men, and one participants identified as a gender not listed in the survey list of options. Regarding age, 22 of the survey respondents identified as age 24 and under. Of the survey respondents, 26 identified as a student of color or multiracial, of which 19 identified as Hispanic. Further, 20 of the participants reported they had 30 or more course credits, with 14 having completed 60 or more credits. Additionally, four participants reported they were unsure of the number of credits they had.

Phase 2 of the study consisted of three separate focus group sessions that included 14 participants in total. All participants identified as Hispanic, and nine were men, four were

women, and one identified as a different gender not listed. Table 4 shows participant demographics for the survey participants, and Table 5 includes the gender demographics for the focus group sessions.

Table 4. MESA Program Survey Participants

Measure	*n*	%
Gender		
Male	12	46
Female	13	50
Other	1	4
Age		
Below 20	14	54
21–24	8	31
25–35	3	12
36–45	1	4
Race or ethnicity		
Asian	1	3
Native Hawaiian or Pacific Islander	1	3
Black or African American	4	13
Hispanic	19	63
White or Caucasian	4	13
Multiracial	1	3
Number of credits		
0–29	2	8
30–60	6	23
60+	14	54
I am not sure.	4	15

Table 5. Hispanic Student Focus Group Participants

Measure	*n*	%
Focus Group Session 1		
Male	6	100
Female	0	0
Other	0	0
Focus Group Session 2		
Male	3	75
Female	1	25
Other	0	0
Focus Group Session 3		
Male	0	0
Female	3	75
Other	1	25

Phase 1 consisted of an online survey, and Phase 2 was conducted on the PNWCC campus. The MESA Center is located in the STEM building on campus. To ensure student confidentiality, the focus group sessions were hosted in a classroom in the social sciences building. The research setting allowed for connection with the MESA students and supported their participation.

Data Analysis

As described in Chapter 3, data analysis was completed in two phases. The different methods of collecting data allowed the researchers to gain an in-depth understanding of the students' experiences. The structured survey and the open-ended questions provided generalizability of literature-informed, known support strategies for students from HUUP. The data collected from the semistructured and open-ended prompts for the Hispanic student focus groups provided context and tangible examples of best practices to support completion for students from HUUP.

Both data sets were organized and coded by theme or description, then integrated to provide a more comprehensive interpretation of the two research questions and implications. To

organize and prepare the data for analysis, the researchers transcribed the focus group interviews and typed up field notes. Additionally, the researchers extracted data from the survey instrument and conveyed descriptive information for each participant in a table to prepare for the integration of data collected from the focus group. Once all data were organized, the researchers read all the data to gain a general understanding and to reflect on the findings. For the coding process, the researchers read each survey and focus group transcript and coded data by a common theme or description by hand—adding some as subcodes to help with organization. The codes were then arranged in a conceptual map to reflect the flow of themes. It is important to note the data were dense and rich, and not all information collected could be used in the PAR study. Thus, in the analysis, the researchers winnowed the data to focus on specific information and disregarded other parts (Creswell & Creswell, 2018). The following sections include a discussion of the analysis for each of the two research questions that guided this study.

Research Question 1 Analysis

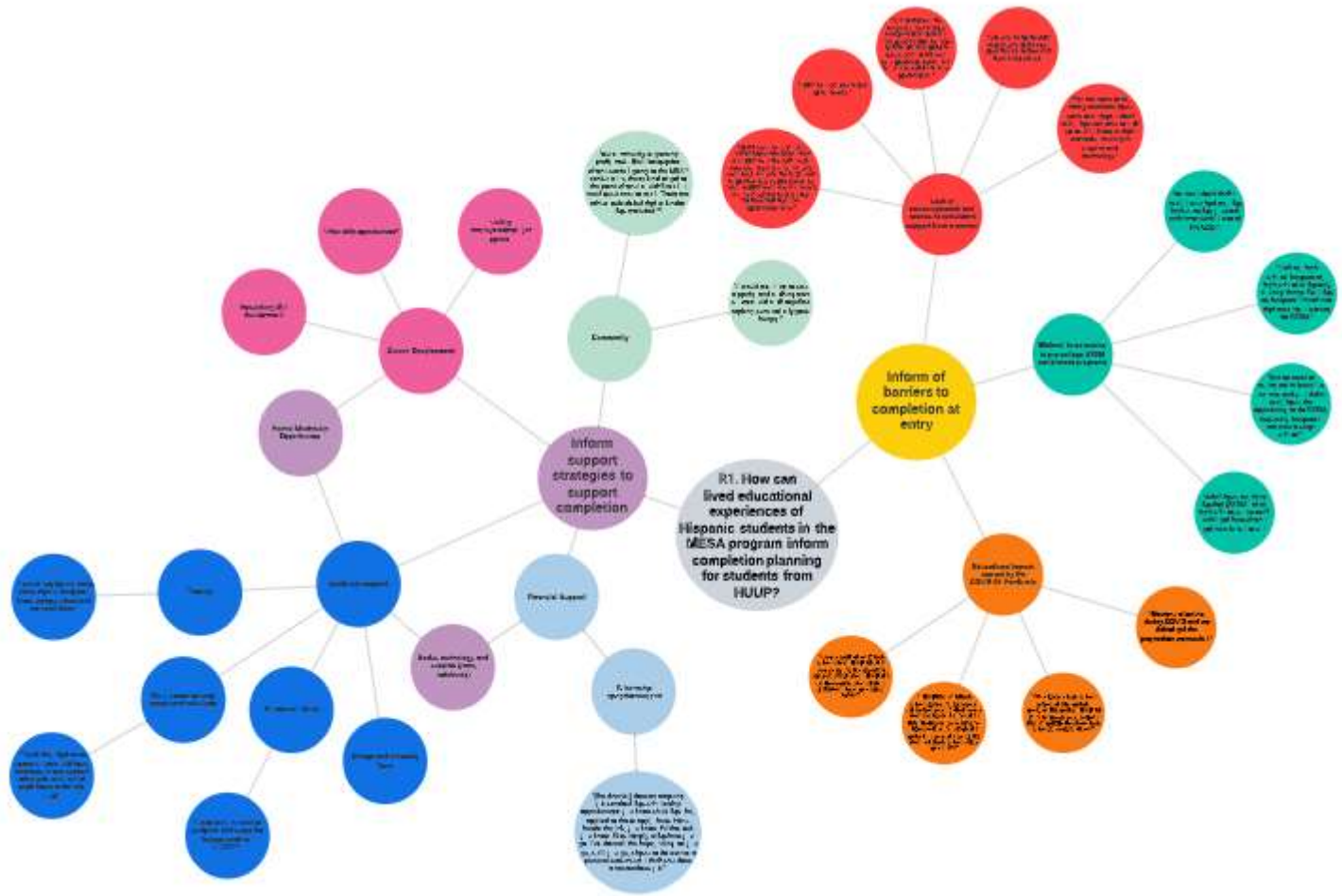
Multiple findings helped to answer the first research question: How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP? Specifically, the first research question sought to understand how the lived experiences of Hispanic students in the MESA program could (a) inform barriers to completion at entry for students from HUUP and (b) inform strategies to support completion for students from HUUP. Findings from the student survey and focus groups identified contextual themes that informed barriers to completion at entry and strategies to support completion for students from HUUP. Furthermore, the following subthemes were identified from each theme:

- Theme 1: Inform Barriers to Completion at Entry for Students from HUUP
    - Lack of Encouragement and Access to Consistent Support from a Mentor,

    - Minimal to No Access to Precollege STEM Enrichment Programs, and
    - The Educational Impact Caused by the COVID-19 Global Pandemic.
- Theme 2: Inform Support Strategies to Support Completion for Students from HUUP
    - Financial Support,
    - Academic Support,
    - Career Development, and
    - A Sense of Community.

Figure 3 illustrates the mapping of the data to Research Question 1 and the coding of the data by themes. Table 6 presents the data organized by themes and subthemes as they related to the research questions.

Figure 3. Research Question 1 Theme Mapping



Note. The intent of Figure 3 is to illustrate the logical mapping order of the data analysis and thematic identification process, rather than the themes themselves, which are described in the narrative.

Table 6. Research Question 1 Themes

R1. How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?				
Theme	Subtheme	Subtheme	Subtheme	Subtheme
Inform of Barriers to Completion at Entry	Lack of encouragement and access of consistent support from a mentor	Minimal to no access to precollege STEM enrichment programs	Educational impact caused by the COVID-19 global pandemic	
Inform Strategies to Support Completion	Career development	Academic support	Financial support	Community

Inform Barriers to Completion at Entry. Through analysis of the responses from the open-ended survey items and focus group responses, the researchers expected that observations of participant experiences aligned with generalized themes from the literature review; however, they also expected that some unknown factors related to the COVID-19 global pandemic impact on learning would surface. The researchers consolidated participants' open-ended responses into emergent coded categories and themes by winnowing the data (Creswell & Creswell, 2018). The data coding surfaced as a common theme around barriers to completion at entry. This theme reflected the need to acknowledge HUUP students' lived experiences before enrollment.

***Lack of Encouragement and Access to Consistent Support from a Mentor*.** The literature signaled the importance of mentorship as it related to students from HUUP and the challenge of a lack of consistent and ongoing same-race mentorship in the STEM field (Estrada et al., 2018; Koch et al., 2019; Kubilius et al., 2017; Pederson et al., 2021). Mentoring serves two purposes: psychological support and career-based support (Johnson et al., 2017). With this understanding of mentorship, the researchers sought to understand the participants' experiences with mentorship. Results from the study reflected a lack of encouragement through authentic and

consistent mentorship as a common theme throughout the analysis. Participants spoke about the value of mentorship and their aspirations to become a mentor and how the absence of a mentor for themselves often resulted in the participants pursuing a path into higher education with little to no support. Participant F11 shared their experiences when asked about access to mentorship with the following quote:

> I didn't really have any like mentorship by somebody who's like, I don't have the right words, someone who is like me. It's also really hard because the field I want to go into is heavily dominated by men. You don't really see women like me in a STEM field like that. And there's not that many opportunities here.

***Minimal to No Access to Precollege STEM Enrichment Programs*.** The literature highlighted the value of afterschool enrichment programs to create success for students from HUUP seeking careers in STEM (Koch et al., 2019). The literature also identified a significant hurdle for many STEM-focused pathways is the required mastery in higher level math, science, and technology subjects, which sometimes can reduce confidence in students from HUUP. In seeking to understand participant access to STEM enrichment programs before PNWCC, some participants spoke of the minimal access to STEM enrichment programs and how the lack of exposure impacted their ability to be prepared for their STEM coursework. Participant F12 responded, "For most of my life, we've been low income, and so I didn't really have the opportunity to do STEM, especially because I am from a small school." For Participant F1, they shared their high school focused on "country things" and shared, "I'm not into the farm life," which led Participant F1 to leave their high school to find a school that provided access to STEM opportunities.

***Educational Impact Caused by the COVID-19 Global Pandemic*.** While preparing for the study, the researchers acknowledged the full extent of the COVID-19 global pandemic on higher education remains to be determined. Furthermore, the literature review highlighted higher education institutions need to adapt student supports to the changing environment and student needs. Although no prompt asked explicitly about the impacts caused by the pandemic, participants shared how the impact of online learning negatively impacted their preparation for pursuing a STEM pathway.

Participant F13 shared, "I was a sophomore in high school when COVID hit and I was pretty much a straight A student [with a] 4.0, but after COVID and all the classes were online, I didn't really have good study habits." Participant F11 shared how the COVID-19 global pandemic impacted their ability to prepare for college, sharing:

> COVID hit high school during my junior year and senior year, which is usually the [time] to prepare you for college, like signing up for college and putting in your college applications. So, that was a really big hurdle for me, and I think that hurdle prevented me from opening my wings and just going to [a] 4 year [institution]. I didn't really end high school with a good GPA.

Inform Strategies to Support Completion. During the data analysis, a second common theme around strategies to support completion for students from HUUP surfaced. Subthemes highlighting this theme were Career Development, Academic Support, Financial Support, and Community.

***Career Development*.** As highlighted in the literature review, many students from HUUP suffer from an opportunity gap related to career development. A lack of opportunities to visit employers or participate in employer panels, find internship opportunities, develop networking

skills, and secure formal mentorship arrangements can lead students from HUUP to feel inadequate compared to their White and often male-identifying peers. Thus, in analyzing the data, there was no surprise that Career Development was a consistent subtheme among participants. Numerous participants highlighted the importance of internship opportunities and opportunities to connect with employers as a vital strategy to support student completion. Specifically, participant F12 stated the value of visiting employers to network with potential employers before submitting a job application, saying:

> Visiting employers [is] a good way, you know, because, as students, we know, we would have to go through the application process and stuff like that. But sometimes, you know employers usually know each other through networking. [For] MESA, we're all capable students. We all do good in our classes. Sometimes [in] our classes, you [can] get ahead of the application process [and sometimes] you're like, oh, I got homework to do, but then I have to get this application done. So it's kind of like reaching out to [employers] and [having] that one-to-one, so they can get to know you.

Academic Support. The literature inflated the importance of academic support to students from HUUP as a strategy to support student completion (Greene et al., 2008; Kwakye & Kibort-Crocker, 2020). The data analysis determined the following supports were the most common academic supports to assist in completion for students from HUUP:

- the number of tutors for math and science courses;
- study space for small groups and individuals;
- proactive or intrusive advising to increase the engagement between the students and academic advisors;
- transfer support that included college and university visits; and

- books, technology, and supplies (e.g., pens and notebooks).

Financial Support. Although the literature highlighted financial assistance as enrollment support (Kwakye & Kibort-Crocker, 2020; McClenney & Waiwaiole, 2005), the data analysis presented a common theme of financial support to assist students from HUUP to completion. Most notably, participants emphasized the value of scholarship opportunities from the MESA program director. Participant F7 shared:

> [The director] does an amazing job [by] sending out scholarship opportunities. [The director is] like, "Hey, apply to this" or "Apply here. Here's the link, fill this out." She literally is like, "Here you go. I've done all the heavy lifting for you guys. All you guys have to do is write a personal statement." I think she does a tremendous job.

Community. A final theme from the data analysis was the importance of adequate physical space on campus for students from HUUP to develop and foster a growing community. The researchers noted this theme was prevalent in both the survey and focus group sessions that highlighted the connection of space to support student completion. Participant F9 shared:

> Our community is growing pretty fast. . . . Last quarter, when I started going to the MESA Center a lot, then it kind of got to the point where I couldn't read. I need quiet time to read. There are tables outside, but that is kind of like excluding.

Research Question 2 Analysis

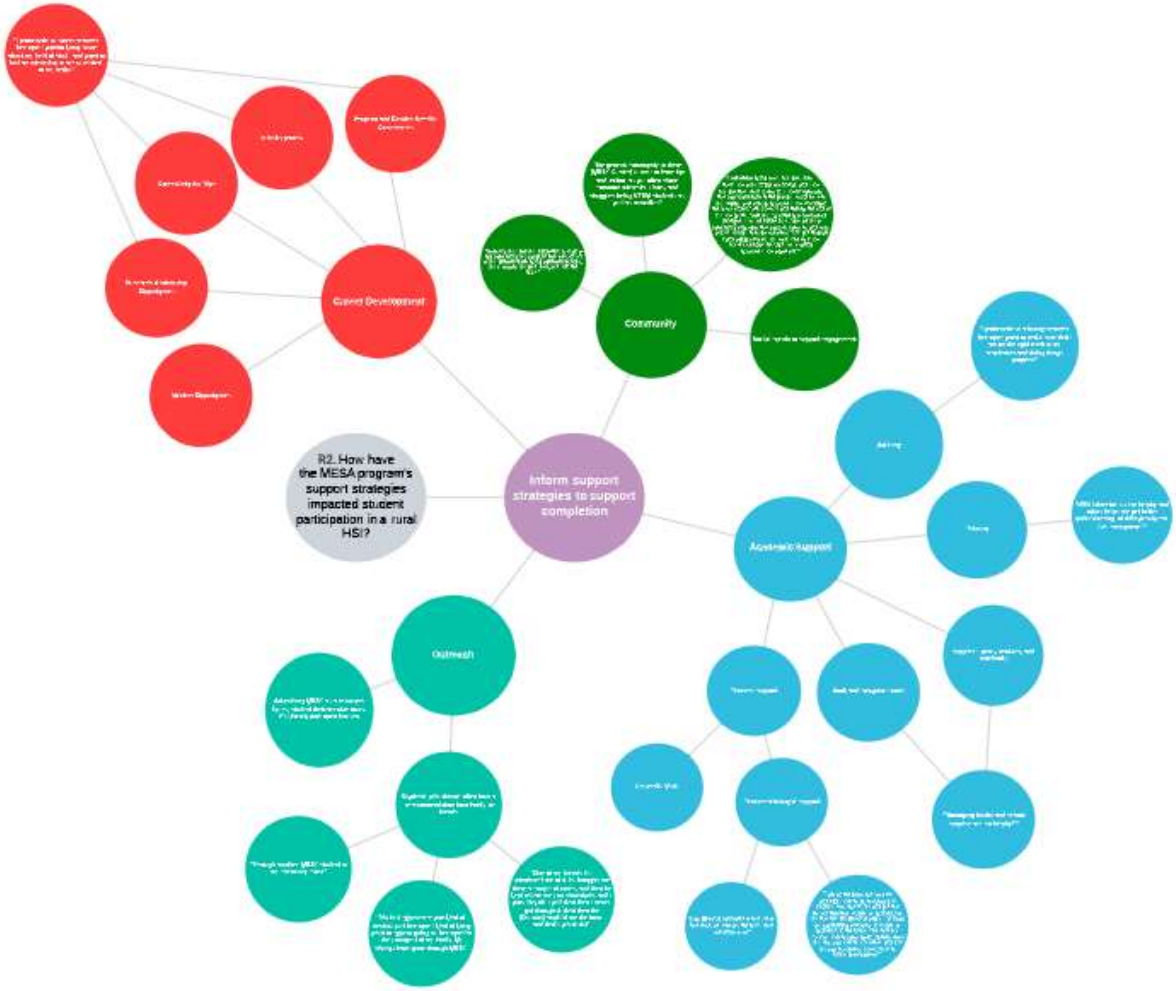
Multiple data points helped to answer the second research question: How have the MESA program's support strategies impacted student participation in a rural HSI? The data analysis determined a common theme surrounding support strategies that assist student completion as a factor influencing student participation at PNWCC. Furthermore, the findings from the survey

and focus groups helped identify the following four subthemes students deemed essential to their participation:

- Student Outreach,
- Academic Support,
- Career Development, and
- A Sense of Community.

Figure 4 maps out the subthemes from Research Question 2's data, and Table 7 organizes the data under theme and subthemes concerning the second research question.

Figure 4. Research Question 2 Theme Mapping



Note. The intent of Figure 4 is to illustrate the logical mapping order of the data analysis and thematic identification process, rather than the themes themselves, which are described in the narrative.

Table 7. Research Question 2 Themes

R2. How have the MESA Program's support strategies impacted student participation in a rural HSI?				
Theme	Subtheme	Subtheme	Subtheme	Subtheme
Inform Strategies to Support Completion	Student Outreach	Academic support	Community	Career Development

Inform Strategies to Support Completion. As stated in Research Question 2's data analysis, the theme around strategies to support completion for students from HUUP surfaced. The specific strategies related to Research Question 2 are outlined in the following sections.

Outreach. The MESA program used many strategies to outreach to students from HUUP to participate in the MESA program and to encourage current MESA students to participate in the program events. The following strategies supported Outreach as a subtheme:

- flyers,
- student ambassador tours,
- first year introduction and human development courses,
- faculty referrals, and
- high school open house events.

These aforementioned approaches were the formal approaches to outreach that the MESA program and PNWCC were directly responsible for carrying out. The survey and focus group findings supported the idea that these strategies reach the students, but might not be the most successful tactics. Overwhelmingly, participants noted word of mouth was the key to successfully recruiting students and getting them to participate. Many of the study's participants repeatedly stated family, friends, and current MESA students as the only way these students became aware of the program and/or MESA-sponsored events. This finding corroborated the literature that highlighted the value of peers in creating a sense of belonging, which includes

students from HUUP and supports their persistence and completion (Adam, 2003; Catolico, 2022; Greene et al., 2008; Guenther et al., 2019; Hurtado & Carter, 1997; Irvin et al., 2012; Schuetz, 2008; Terrell, 2022).

Academic Support. Every participant stressed the importance of the Academic Support the MESA program provided. As the literature articulated, the founders of the MESA program have acknowledged many students from HUUP are not as prepared as their White counterparts and are often the first in their families to pursue higher education, resulting in a lack of knowledge to navigate higher education (MESA USA, 2022). The data analysis upheld this narrative, and the participants also supported it. The MESA participants highlighted the following current services provided by MESA:

- transfer support,
- academic advising,
- tutoring,
- book and calculator loans, and
- supplies (e.g., pens, markers, and notebooks).

For many of these services, the MESA director was the only one providing these support services and was the primary source of academic support. Participant F2 stated, “You know, [the director] does such a great job handling that, and I am so grateful for her support.”

Community. The literature (Alvarado & Muniz, 2018) and the MESA program’s design supported a physical space for students from HUUP to make social connections with like-minded students. Many participants shared events such as Pi Day and trips allowed students to connect with each other, created a sense of belonging, and served as a chance to find study partners. According to Participant F11:

> One of the first experiences I had with MESA was the many little, tiny social gatherings that really help[ed] me connect with other people in MESA by sharing [what] we have [in common], some of their goals, and similar interests. And how we plan on getting there, which is nice because you always have [similar] plans. But it also helps to hear how other people plan on getting there, too.

As the MESA community experienced at PNWCC a growth spurt, many participants expressed the MESA Center as the epicenter of their community. Participants found acceptance, belonging, and relief in finding others just like them who were willing to help them succeed.

Due to the limited size of the physical space of the MESA Center, many participants mentioned they were nervous when they first joined because they had to try to figure out their place among the more confident and outgoing peers. Participant F10 shared their viewpoint, saying:

> I think it is just, at first, it was just that the social environment can be a little threatening, because when you come into MESA, everyone is at different spots in their lives, you hear about what classes they are doing and what they are learning, and you feel a certain amount of timidness. Just seems like the route ahead of you seems a little bit dauntless but after talking to [MESA students], and they are explaining the things that they are doing, you know, they try their best to try to explain things to us, that nervousness goes away.

Career Development. The founders of MESA understood that career development is essential for students from HUUP to continue to be as successful as their White counterparts. Literature has shown that students from HUUP lack the opportunity for career development (Alvarado & Muniz, 2018). The PNWCC's MESA program had provided such services to the

delight of the participating students. Participants noted these career development opportunities included:

- university visits,
- conferences,
- industry employer panels,
- career and industry trips, and
- internship opportunities.

The data from the study suggested that students wanted more of these opportunities. Many students worked and could not always take time off to go on these trips and events. There was interest in creating more opportunities to have increased opportunities to participate. The participants expressed desire for the following other opportunities:

- research,
- volunteer, and
- the inclusion of non-MESA-eligible students for collaboration (i.e., networking).

The inclusion of noneligible students was a surprise to the researchers. As Participant F2 summarized, many noneligible students should be "welcomed into the MESA program because many of the MESA students study with them, they are smart, and they have experiences as well as connections that could benefit current and future MESA students." The notion that MESA students will have to work with members who belong to the dominant culture provided justification for collaboration between current MESA students and non-MESA-eligible students as a strategy to serve students from HUUP in the workforce.

Summary

This study aimed to provide insight into how a rural HSI's completion strategies involving a STEM support program could better serve students from HUUP, especially the Hispanic students in a MESA program. The researchers used a two-phase PAR approach to collect data from the MESA student population through an online survey and in-person focus groups. Results were generated to answer the first research question, including Barriers to Completion at Entry for Students From HUUP and Strategies to Support Completion for Students from HUUP. The key subthemes included the Lack of Encouragement and Access to Consistent Support From a Mentor, Minimal to No Access to Precollege STEM Enrichment Programs, and the Educational Impact of the COVID-19 Global Pandemic. Additionally, the analysis of the data themes gleaned that offering Career Development, Academic Support, Financial Support, and Community were the most impactful resources for student completion. Finally, multiple data points were discovered to answer the second research question. The data analysis determined that the support strategy themes of Outreach, Academic Support, Community, and Career Development were the most important for consistent participation in the MESA program. Overall, the study generated key findings with practical implications for the community partner and introduced results that can be used by other minority-serving institutions nationwide.

Chapter 5. Discussion

Chapter 5 presents an overview of the study and a discussion of the findings. The following three areas are covered: (a) discussion of findings, (b) limitations and strengths of the study, and (c) recommendations for leadership and implications for future research.

Overview of the Study

This study aimed to determine the influence of the mathematics, engineering, science achievement (MESA) program leadership's completion planning on historically underserved and underrepresented science, technology, engineering, and math (STEM) students at Pacific Northwest Community College (PNWCC), a Hispanic-serving institution (HSI) in rural Washington State. The transformative worldview was the theoretical framework that grounded this study. The following two research questions guided this study:

1. How can lived educational experiences of Hispanic students in the MESA program inform completion planning for students from HUUP?
2. How have the MESA program's support strategies impacted student participation in a rural HSI?

This participatory action research (PAR) study was conducted at PNWCC and focused on the college's MESA program participants. The research was conducted in two phases: Phase 1 was a survey of all MESA students, and Phase 2 intentionally engaged Hispanic survey participants through intimate focus group interviews. The researchers developed data collection questions through the online survey and focus group sessions using a transformative worldview as a theoretical framework to guide this study. The survey instrument collected student demographic information that included age, gender, and race and ethnicity and had narrative questions on communication, programming, outreach, and improvement. The focus group

sessions with Hispanic students consisted of open-ended questions about the participants' experiences. The sample for the survey included current MESA students (n = 92), and the sample size for the focus group interviews was derived from Hispanic students who completed the Phase 1 survey (n = 14). The researchers used a nonquantitative research methodology, including hand coding participants' descriptions of their experiences into common themes. The analysis of findings was explored through nonquantitative methods and was further triangulated with the literature review. Findings related to experiences that impacted students from historically underserved and underrepresented populations (HUUP) resulted in two main themes: Barriers to Completion at Entry and Strategies to Support Completion.

Overall, the study yielded a variety of notable findings. For Phase 1, the data analysis of survey responses indicated that 58% of the participants used the MESA Center daily, followed by 27% who reported using the MESA Center at least two to three times a week. The participants indicated the most engagement with the MESA Center related to academic support services such as tutoring, academic advising, and college and university trips.

When disaggregated by gender, the findings showed female participants were more likely to participate in MESA for the ability to socialize and connect with peers. In contrast, male participants engaged most in academic support services and career development. Regarding the use of the MESA Center, 46% of the female participants indicated using the MESA Center daily, whereas approximately 67% of the male participants indicated using the MESA Center daily. Most participants reported the MESA program supported their efforts toward completing their academic goals.

The data analysis from the Hispanic participant focus group sessions identified two common themes: Barriers to Completion at Entry and Strategies to Support Student Completion.

These themes, when integrated with the data analysis from the survey, provided a comprehensive analysis to understand the strategies to support student participation in MESA. Accordingly, the findings from this study can guide higher education student service leaders in their completion planning for students from HUUP. The findings aligned with the transformative worldview, which focuses on the needs of groups and individuals in society who may be marginalized or disenfranchised (Creswell & Creswell, 2018). Furthermore, research with a transformative worldview "contains an action agenda for reform that may change lives of the participants, the institutions in which individual work or live, and the researcher's life" (Creswell & Creswell, 2018, p. 9).

In Phase 1 of the study, the researchers recruited current MESA students as survey participants using criterion sampling. In Phase 2 of the study, the researchers used homogenous sampling and invited Hispanic students who completed the Phase 1 survey to participate in a focus group session. The nonquantitative method and the PAR approach were deemed appropriate for this research because of the collaborative approach that allowed PNWCC community members to engage in systematic inquiry to discover effective ways to resolve problems in their community (Stringer & Aragón, 2021).

Findings from the data analysis highlighted themes across open-ended survey responses and focus group sessions. The conclusions from this research can determine the influence of the MESA program leadership's completion planning on historically underserved and underrepresented STEM students at PNWCC.

Discussion

The discussion of this study's findings contextualizes this study's theoretical framework, transformative worldview, which guided this study in conjunction with existing literature

reviewed related to higher education leadership; MESA; Black, Indigenous, people of color; gender in STEM, and strategic enrollment management (SEM). The discussion points are grouped by themes: Barriers to Completion at Entry, and Strategies to Support Completion. The following section is a high-level overview of the notable findings related to the literature reviewed.

Connection to Literature

The resulting data from this study aligned with discourse in the literature in most respects, whereas the data diverged in others. The literature suggested barriers to completion were more significant for students from HUUP (Adam, 2003; Greene et al., 2008; McClenney & Waiwaiole, 2005); therefore, lived educational experiences for students from HUUP and completion planning for HUUP are interrelated. The researchers sought to identify how lived educational experiences and support services from a student support program, MESA, could impact students from HUUP at rural HSI. The results of the data analysis confirmed completion planning and lived educational experiences for students from HUUP were interrelated and provided additional insight into the barriers to completion that students from HUUP may encounter. These findings aligned with the literature that identified students from HUUP have characteristics that increase their risk of not completing (Greene et al., 2008).

Additionally, the findings corroborated the literature regarding supporting completion for students from HUUP. The study's findings supported a toolkit that provides frequent advising with comprehensive wraparound student support (e.g., academic, social, and financial), community-based learning, and high-impact practices in career development and outreach (Kwakye & Kibort-Crocker, 2020; McClenney & Waiwaiole, 2005). Furthermore, regarding the impact of the MESA program support strategies on student participation in a rural HSI, the

findings supported the literature that career development, academic support, student communities of peers, and outreach are among the most effective strategies to support student participation in MESA (MESA USA, 2022; Meza et al., 2017; Palmer et al., 2011; Rozhenkova et al., 2022). Furthermore, the findings also supported the importance of academic advising in student completion. Specifically, for female-identifying STEM students from HUUP, academic advising could encourage or discourage student completion (Greene et al., 2008; Kwakye & Kibort-Crocker, 2020). The findings also spoke to the importance of having MESA program staff who share characteristics with the MESA students, a point that aligned with the literature on student success that reinforces the importance of hiring the right staff (McClenney & Waiwaiole, 2005).

The resulting data also showed that access to precollege STEM enrichment programs and formal mentorship opportunities are essential for increasing students from HUUP into STEM pathways (Estrada et al., 2018; Koch et al., 2019; Kubilius et al., 2017; Pederson et al., 2021). However, precollege STEM enrichment programs did not significantly influence the study participants' selection of a STEM pathway. These findings diverged from the literature by revealing a new relationship between STEM students from HUUP and their awareness of workforce and labor market trends.

The literature review indicated female students were more likely to pursue natural sciences (e.g., life sciences) due to leaking out of the STEM preparation process caused by the disparity controlled by genetic tendencies historically shaped by gender (Talley & Ortiz, 2017). Yet, results from the analysis indicated no significant difference between female and male students pursuing STEM pathways into physical science (e.g., physics and chemistry). These findings diverged from the literature that indicated female students were more likely to pursue

pathways into natural science fields when compared to their male counterparts, who were more likely to pursue paths into physical science fields (Talley & Ortiz, 2017).

This high-level overview of notable findings highlighted the complexity of the topic under investigation. The findings aligned with the transformative worldview, which focuses on the needs of groups and individuals in society who may be marginalized or disenfranchised (Creswell & Creswell, 2018).

Lived Educational Experiences of Hispanic Students in the MESA Program

The first research question focused on understanding the lived experiences of Hispanic students in the MESA program. An analysis of the data produced two main themes: Barriers to Completion at Entry and Strategies to Support Completion. Although all participants highlighted barriers to completion at the entry to PNWCC, the following barriers were the most pronounced barriers for Hispanic participants at entry:

- lack of encouragement and access to consistent support from a mentor,
- minimal to no access to precollege STEM enrichment programs, and
- the educational impact caused by the COVID-19 global pandemic.

The following specific strategies helped to support completion:

- career development (i.e., internship opportunities, networking, and visiting employers and participating in employer panels),
- academic support (i.e., tutoring, study spaces, proactive advising, and college and university visits),
- financial support (i.e., scholarship navigation and support, books, technology, and supplies), and
- community with peers.

MESA Program's Support Strategies Impact on Student Participation

The second research question focused on the relationship between the MESA program's support strategies on student participation at a rural HSI. The findings determined that MESA student support services influenced student participation positively and directly impacted a student's ability to persist toward completion. An analysis of the data produced one central theme: Strategies to Support Completion. The following strategies were specific strategies to support student participation:

- career development (i.e., volunteer opportunities, research and internship opportunities, and program- and gender-specific conferences),
- academic support (i.e., tutoring, transfer support, book and calculator loans, and advising),
- outreach, and
- community with peers.

Strengths and Limitations

This study had a variety of strengths and limitations. The use of criterion sampling for Phase 1 of the study was a strength because it aligned with the goals of the community partner and provided sufficient data for the analysis of the structured, open-ended survey questions. Another strength of the study was that a member of the research team was an employee of the community partner, which allowed for increased engagement throughout the study. Moreover, a strength was that 63% of the sample identified as Hispanic and 50% as women, which allowed for the development of recommendations for students with multiple identities; however, the participant sample was only approximately 28% of the population under study. The most important strength of this study involved the researchers. The research team varied in age,

gender, race, and ethnicity. Additionally, there were differences in positionalities among the researchers that contributed to personal experiences navigating higher education. Through these varied lenses and experiences, the researchers asked follow-up questions during the focus group sessions that led to a richness and depth of the answers and provided many opportunities for future research.

A limitation of this study was recruitment for Phase 1 of the research due to the constraint that only Hispanic students who participated in the survey were recruited for the focus group sessions. This process created a barrier to participation for interested, non-Hispanic students. The proximity of the research team member to PNWCC was also a limitation because it was unclear how comfortable research participants were with sharing their experiences knowing a team member was also an employee of the institution. Additionally, the timing of the study was a limitation. The data collection occurred 1 week before the community partner's finals week, and overlapped with the college spring break; consequently, this process was completed the 1st week of the spring quarter. Moreover, a limitation included the MESA program director's staff turnover during the study, which impacted the knowledge transfer between the directors.

Recommendations

Findings from this study inspired multiple recommendations about the experiences of students from HUUP and the support services to encourage increased student participation in STEM support programs. Recommendations consistent with the literature and this study's findings include recommendations for stakeholders, implications for policy-making decisions, and opportunities for future research.

Stakeholders

The literature supported frequent advising with comprehensive wraparound student support in academic, social, and financial areas and community-based learning and high-impact practices in career development and outreach (Kwakye & Kibort-Crocker, 2020). The current study amplified student voices in these same areas. During the study, participants communicated ways of alleviating academic and social challenges by college leadership providing support that would further the success of PNWCC students as they continue to participate in the MESA program.

This section outlines and highlights the common themes recognized throughout the research. The student responses reflected the main focus areas to support student completion for students from HUUP in STEM fields. The following recommendations may benefit stakeholders.

Academic Support. The researchers found increasing completion for students from HUUP is interrelated to increasing student participation in student support programs such as MESA. A recommendation for leadership is to increase the diversity of student support staff, such as mentors, advisors, and tutors. When students interact with staff who identify as the same race and/or gender, there is an increase in self-efficacy and confidence they can succeed (Pederson et al., 2021).

A second recommendation is implementing a funded summer bridge or precollege program, which would provide college-level mathematics and science courses for rising high school students before their 1st year of college. Specifically, STEM students from HUUP could benefit from increased opportunities for precollege enrichment programs focusing on additional awareness and knowledge acquisition (i.e., exposure to higher-level mathematics, science, and introductory technology courses) because it will introduce students to the rigor of the courses and

provide the opportunity to connect to key staff and programs to support completion. This recommendation would help students from HUUP who have not had prior knowledge, exposure, or authentic mentorship in STEM-focused coursework.

Staffing. This study identified the relationship between student support program staffing and student participation. A recommendation for leaders is to assess the program and student needs to encourage student completion. This recommendation may create a more inclusive model for students, specifically students from HUUP who may have additional responsibilities that require access to enrichment services beyond scheduled program hours.

Sense of Belonging. The research aligned with literature that supports the impact of a sense of belonging on STEM student participation and completion (Adam, 2003; Hurtado & Carter, 1997; O'Connor et al., 2010). A recommendation for college leaders is to increase sense of belonging through the development of intentional physical space that includes resources such as tutoring, socialization, and a space for quiet reflection and/or study. This recommendation could provide more opportunities for students to engage with like-minded students from HUUP who share similar interests in STEM to promote more communication, sense of belonging, and mentorship.

Technology. The research highlighted the value of technology loaner programs to student participation in support programs and as an effective resource for student completion. During the COVID-19 global pandemic, additional resources were made available at PNWCC to support technology access for all students. A recommendation for leadership is to identify resources to support the continuation and expansion of the technology program, such as the inclusion of Wi-Fi hotspots, virtual storage drives, and tablets. Specifically, the tablet recommendation would benefit students with different learning needs.

Implication for Policy-Making Decisions

The researchers recommend three implications for policy-making decisions for the community partner's leadership team. Additionally, other higher education leaders who seek to increase student completion for students from HUUP into STEM pathways can glean insight for student success policies.

STEM-Specific Advising. STEM programs can lead to hundreds of career pathways, which is why it is critical for student completion. Having the appropriate advising to support future career goals is required to increase student participation in support programs, such as MESA. Recommendations from the researchers include hiring STEM-educated advisors and/or adding increased training in STEM pathways options and corresponding courses. Literature aligned with this recommendation regarding the importance of students from HUUP receiving program-specific advising; for instance, STEM-focused advising can support students' abilities to persist toward completion in their program of study (Palmer et al., 2011). Notably, for students at 2-year institutions who seek to transfer to a 4-year institution, program-specific advising can be essential to students meeting transfer requirements.

Outreach. The research highlighted the value of increased outreach into high school programs focusing on postsecondary transition support, such as MESA. With additional staff and policy support, high school students from HUUP could be exposed to precollege STEM enrichment opportunities through higher education institutions that offer STEM support programs, summer camps, and mentoring programs. The researchers recommend that higher education institutions create equitable outreach planning to support the diverse needs of students from HUUP. Doing so could help mitigate some barriers to completion at entry for students from HUUP and provide early connections to student support program participation.

Mentor Programs. The research findings aligned with literature that supports the impact of authentic mentorship for students from HUUP to increase completion (Rangel et al., 2021). Specifically, when mentorship is consistent, without interruption, and proactive, it can help completion by expanding the support system for students from HUUP. A recommendation for leadership is to examine ways to implement a formal mentorship program for students to connect to peers, industry contacts, and STEM faculty.

Opportunities for Future Research

The findings raised questions that future researchers will need to address. The topics that require further research are: female student completion in STEM; postsecondary STEM pathway decisions; MESA alum engagement; and the long-term impact of the return-to-campus strategies on higher education, the workforce, and the community. Researching additional high school student mentorship opportunities prior to college enrollment will help in understanding the impact on students' prior knowledge in their success in STEM pathways.

Female Student Completion in STEM. Due to the depth and richness of the data acquired during the survey and focus groups, there exist myriad opportunities to increase historically underserved and underrepresented student completion in STEM. The study could be replicated in other community and technical colleges to duplicate or contradict the data and analysis. Further studies could expand the knowledge of female Hispanic students in STEM. The research could be qualitative and focus on student experiences, including precollege, to gain a deeper understanding of factors that contribute to student completion. The research could also be a quantitative study that allows researchers to conduct a measurement analysis of student outcomes and academic trajectory.

Postsecondary STEM Pathway Decisions. This study was limited to students currently pursuing postsecondary credentials. Further research could include the pathway for students to choose a particular STEM career or major. Specifically, a future study could help better understand the relationship between positive reinforcement in high school STEM courses and postsecondary STEM self-efficacy. The research could be an action research study that collects data through focus group sessions led by a student facilitator.

MESA Alumni Engagement. Because this study focused on an appreciative inquiry to understand what strategies support current student completion, a potential area of future study could be to expand the MESA research to include alums. Including MESA alums could provide a deeper understanding of the student program services' effectiveness related to student completion at a 4-year institution, transition to the workforce, and impact on their socioeconomic status. A mixed methods study that captures alum voices through interviews and a quantitative survey to capture demographics and income data could provide great insight into the long-term impact of the MESA program.

Long-Term Impact of Return-to-Campus Strategies. A potential area of future research is to examine the impact of the return-to-campus strategies on higher education student completion. This study focused on strategies to support completion for MESA students during a time when PNWCC was implementing return-to-campus strategies due to the COVID-19 global pandemic. As highlighted in this study's findings, remote learning during the pandemic adversely affected students' academic progress and transition from secondary to postsecondary education. Understanding the impact of the return-to-campus strategies will provide additional insight into best practices to increase student participation and engagement in student support services. A longitudinal qualitative study that includes current students and alums could provide

data to understand the long-term impact of the return-to-campus strategies on overall student completion.

Summary

This chapter presented an overview of the study and a discussion of the study's findings. The following three areas were covered: (a) discussion of findings, (b) limitations and strengths of the study, and (c) recommendations for leadership and implications for future research. As the researchers looked for themes related to the research questions, the data analysis produced two main themes: Barriers to Completion at Entry and Strategies to Support Completion. Every participant mentioned and discussed various barriers that impact completion while attending PNWCC, but the most noticeable barriers for Hispanic participants occurred at entry, which included academic readiness impact from the COVID-19 global pandemic, little or no access to precollege STEM programs, and lack of encouragement and/or steady access to a mentor. The support strategies that assisted participant completion, as cited by participants, were career development, academic support, financial support, and a sense of belonging with peers. This study analyzed the impact of community colleges increasing access, persistence, and completion for students from HUUP and how student support services are vital to student completion. Although the research questions focused on MESA participation, the findings determined that the MESA student support services influenced student participation positively. An analysis of the data produced one central theme: strategies to support completion.

There were various limitations and strengths in this study. The strengths of the study consisted of criterion sampling, a member of the research team who was an employee of PNWCC, a high percentage of the sample population identified with the targeted group of the study, and the variety in personal experience and characteristics of the researchers. The

limitations included the recruitment and participants of the Phase 2 focus groups, a research team member who was an employee of PNWCC, the timing of the study, and the MESA director staff turnover.

The researchers made the following recommendations based on the findings:

- increase the diversity of student support staff,
- fund summer bridge and/or precollege programs,
- increase staffing levels to reflect the level of needs of participants,
- increase in physical space to accommodate different functions,
- support the continual growth of technology program,
- hire and/or train STEM advisors,
- increase outreach into high school programs, and
- implement a mentor program.

Future researchers should look into female student completion in STEM because the data indicated female participants can have a unique experience that is independent of their male counterparts; these findings may lead to systemic change beyond a single institution. Higher education leaders seeking to increase STEM student persistence and completion could benefit from future research that gathers data from prospective and recently enrolled students. This research could seek to how a STEM student's lived experiences while navigating higher education may or may not influence student persistence and completion. Furthermore, the researchers identified a gap in the research pertaining to MESA alumni. This gap presents an opportunity to engage MESA alumni to gain a comprehensive understanding of the MESA program success beyond postsecondary completion. Lastly, new research could include the long-term impact of the return-to-campus strategies post-COVID-19 pandemic on student completion.

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Appendix A

Institutional Review Board (IRB) Approval

SEATTLEU
INSTITUTIONAL REVIEW BOARD

Admin 201 | 206-296-2585
irb@seattleu.edu

March 30, 2023

Osure Brown, Inez Olive, Eric Marshall, and Kyle Winslow
College of Education

Dear Osure, Inez, Eric, and Kyle,

As I indicated in my March 15 email, your protocol **FY2023-010 Increasing Historically Underserved and Underrepresented Student Completion in STEM Pathways at an HIS: An Action Research Study** is now approved (until **June 1, 2023**). Note the following post-approval IRB policies, and always use the most current forms on our website:

- If you wish to make any changes in the course of your study, you must first submit a **Modification Request** and obtain *written* IRB approval before implementing any modifications.
- If any **unexpected problem** arises that introduces an unforeseen risk or complication, please notify the IRB immediately.
- If you conclude data *collection* and will no longer work with or contact participants (i.e., data analysis stage only), you may email the IRB to request downgrading your study to **Exempt** status, thereby ending IRB oversight of your study.
- Otherwise, by **June 1, 2023**, you must notify the IRB of your study ending, so we can officially close the protocol to remain compliant with Federal and SU human participant protections policies. In your message, you should clarify what will happen to any identifiable data (e.g., will be retained/stored by faculty adviser) as described in the approved protocol.
- If you wish to continue with the project beyond the IRB approval period, you will need to submit a **Modification Request** to transfer lead PI status to your faculty adviser. You may then continue to work in collaboration with the SU faculty affiliate in the role of an unaffiliated co-investigator.
- Finally, if for any reason, you discontinue the project, please notify the IRB immediately, so we can mark the protocol as withdrawn.

Best wishes with your research project,

Andrea McDowell, PhD
IRB Administrator

cc: Dr. Trenia Walker, Faculty Adviser

Appendix B

Survey and Focus Group Recruitment Communication Plan

Data Collection Method	Communication Method	Frequency
Survey	Email to all MESA participants	The day the survey opens, followed by an email the day the survey opens. Additional emails will be sent once a week to students who have not completed the survey until we meet the minimum repose rate of 20.
Survey	Notification on MESA Canvas page by MESA program director	Notifications were posted the entire duration the survey was open.
Survey	Paper flyers	Flyers were created, printed, and distributed throughout campus and displayed in the MESA center beginning the first week the survey was opened until it closed.
Survey	MESA Canvas and student email	Beginning the second week of the survey being open, email outreach began. With support from MESA program director will message the students on Canvas and email to complete the survey or provide a link via email.
Survey	In-person Outreach	In-person outreach began the second week of the survey being opened.
Focus Group	Email to survey participants that identify as Hispanic	Initial email was sent the second week to survey participants who identified as Hispanic. Additional emails were sent as new survey participants met the participant requirements. A follow-up email was sent to survey participants who did not complete the focus group sign-up.
Survey	In-person Outreach	In-person outreach began the second week of the survey being opened.

Appendix C

Student Survey Recruitment Email

Student Survey Recruitment Initial Email

Hello MESA Students,

We are a group of doctoral student researchers at Seattle University Educational Organizational Learning and Leadership program. Currently, we are researching the student support programs strategies as it relates to a student's ability to persist and complete their pathway. More specifically, we want to know learn about the student participant experience in the MESA program at [PNWCC]. In this study, we seek student voices to better understand how to support MESA student completion.

We invite you to participate in a brief survey designed to give us some insight into students' experiences and participation in the MESA program. Please click on this link to complete the survey.

Attached is an information statement/consent to participate that provides you with more information about this study. Please do not hesitate to contact us if you have any questions or concerns. All information you provide is strictly **private and confidential**. Your professors or any faculty and staff member in the MESA program will not have access to this study data. No individual respondents will be identified in this study and your responses will not be linked to your email or IP address.

Should you have any questions, please contact Inez Olive at xxxxx@seattleu.edu.

Thank you for taking the time to complete this brief survey and for your commitment to the future success of MESA students.

Respectfully,

Osure Brown, Eric Marshall, Inez Olive, and Kyle Winslow

Student Survey Recruitment Follow Up Email

Hello MESA Students.

We hope this email finds you healthy and well. As a reminder, we would like to invite you to participate in a brief survey on your experiences and participation in the MESA program at [PNWCC]. Please click on this link to complete the survey. Participating in the survey will allow you to help shape the future of the MESA program for future STEM students.

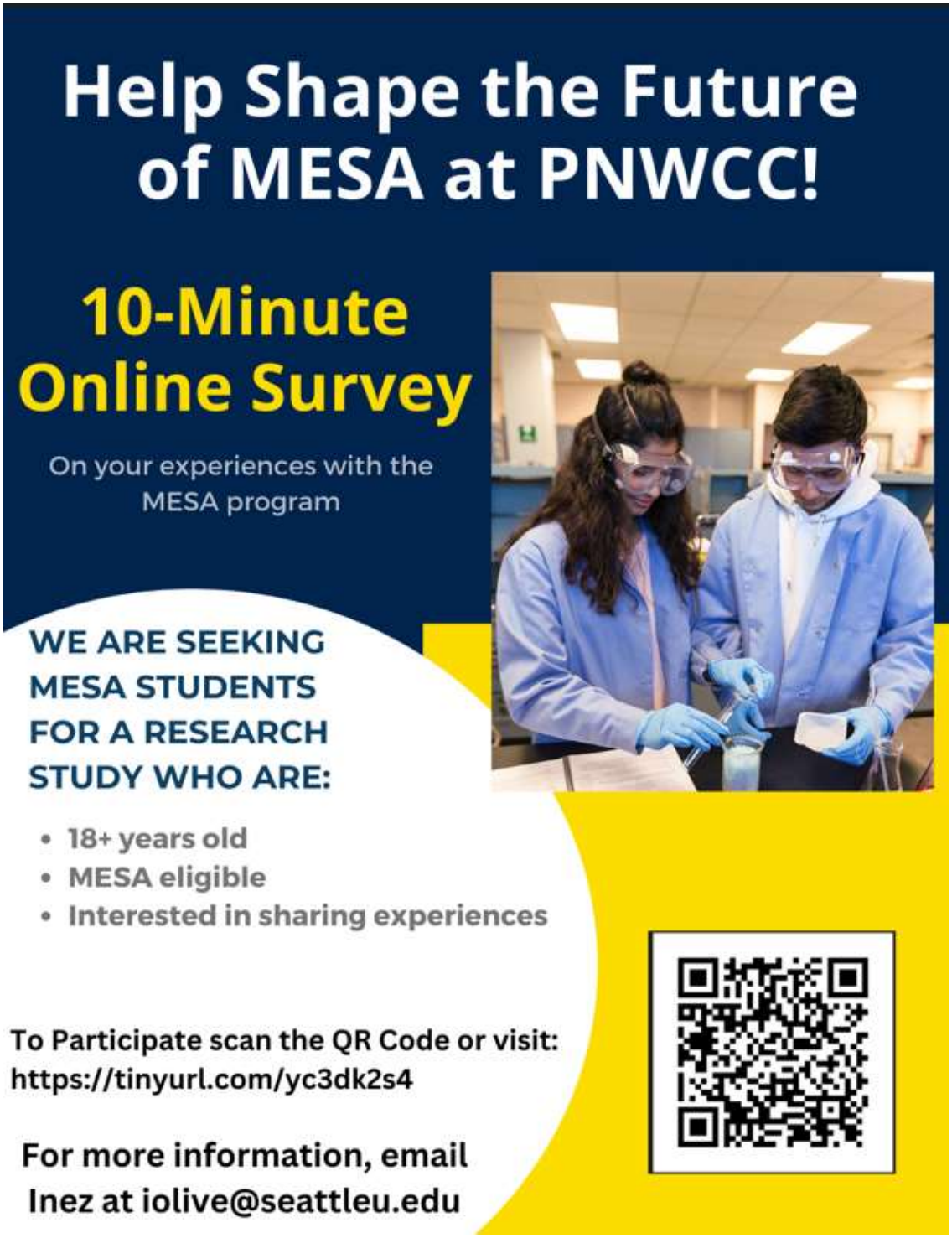
Please contact us if you have any questions or concerns. Should you have any questions, please contact Inez Olive at xxxxx@seattleu.edu.

Respectfully,

Osure Brown, Eric Marshall, Inez Olive, and Kyle Winslow

Appendix D

Recruitment Flyer



¡Ayúdanos a dar forma al futuro de MESA en PNWCC!

Completa una encuesta en línea de 10 minutos

sobre tus experiencias con el programa MESA.

PARA FINES DE INVESTIGACIÓN, BUSCAMOS ESTUDIANTES DE MESA QUE:

- Sean mayores de 18 años
- Sean elegibles para MESA
- Les interese compartir sus experiencias

Para participar, escanea el código QR o visita: https://tinyurl.com/yc3dk2s4

Para más información, envíaun correo electrónico a Inez a la dirección iolive@seattleu.edu

La encuesta es en inglés.

Appendix E

Informed Consent

Survey Informed Consent Notification

By clicking that you "Agree" below, you are agreeing that you are at least 18 years old, a current MESA student, and you consent to share your responses with the research team for the purpose of evaluating the effectiveness of the MESA program.

All identifiable information (including name, email, and demographic information) will be removed from the information collected in this project and replaced with a pseudonym to ensure your information is confidential. Your name will never be used in any public distribution of these data (publications, presentations, etc.). All research materials and consent forms will be stored on a virtual drive which is encrypted and password protected that only the researchers and faculty adviser, Dr. Walker, will have access to. Human subjects research regulations require data be kept for at least 3 years. When the research study ends, any identifying information will be removed from the data, or it will be destroyed. All of the information you provide will be kept confidential.

By clicking "Agree" I agree that I have read the above statements and understand what is being asked of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason, without penalty. On these terms, I certify that I am willing to participate in this research project. I understand that should I have any concerns about my participation in this study, I may call Inez Olive, who is asking me to participate, at XXX-XXX-XXXX. If I have any concerns that my rights are being violated, I may contact Dr. Michael Spinetta, Chair of the Seattle University Institutional Review Board at XXX-XXX-XXXX.

Please reach out to any member of the research team with any questions -

Inez Olive - xxxxx@seattleu.edu

Kyle Winslow - xxxxx@seattleu.edu

Osure Brown - xxxxx@seattleu.edu

Eric Marshall - xxxxx@seattleu.edu

Focus Group Informed Consent Form

SEATTLE UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

TITLE: Increasing Historically Underserved and Underrepresented Student Completion in STEM Pathways at an HSI: An Action Research Study

INVESTIGATOR: Osure Brown, Doctoral Student, obrown@seattleu.edu, 253-642-6201
Inez Olive, Doctoral Student, iolive@seattleu.edu, 206-434-6954
Eric Marshall, Doctoral Student, emarshall@seattleu.edu, 980-429-8520
Kyle Winslow, Doctoral Student, kwinslow@seattleu.edu, 206-409-8181

ADVISOR: (if applicable) Dr. Trenia Walker, Visiting Professor, Twalker1@seattleu.edu, 503-278-4156

PURPOSE: You are being asked to participate in a research project that seeks to investigate the influence of completion planning on historically underserved and underrepresented STEM students at Columbia Basin College. You will be asked to participate in a focus group, this will be no more than an hour in-person on the Columbia Basin College campus or virtually over Zoom.

SOURCE OF SUPPORT: This study is being performed as partial fulfillment of the requirements for the doctoral degree in education at Seattle University.

RISKS: There are no known risks associated with this study. However, some individuals may experience discomfort when answering questions if they are particularly passionate or sensitive about the subjects of inclusion, support, and barriers to success. Participants can opt to not answer questions or participate in certain discussion topics if they wish not to.

BENEFITS: There is no direct benefit (financial, academic, or other incentive) for participating. An indirect benefit may be the ability to influence future of the MESA program. A societal benefit is the ability to support a community for MESA students.

INCENTIVES: You will receive no gifts/incentives for this study. Participation in the project will require no monetary cost to you.

CONFIDENTIALITY: All identifiable information (including name and demographic information) will be removed from the information collected in this project and replaced with a pseudonym to ensure your confidentiality. Your name will never be used in any public dissemination of these data (publications, presentations, etc.). All research materials and consent forms will be stored on personal computers which is encrypted and password-protected. Human subjects research regulations require that data be kept for a minimum of three (3) years. When the research study ends, any identifying information will be removed from the data, or it will be destroyed. All of the information you provide will be kept confidential. If you are participating in a focus group,

confidentiality cannot be guaranteed in a focus group setting; however, we ask all participants to respect others' privacy and keep all information shared confidential.

RIGHT TO WITHDRAW: Your participation in this study is *voluntary*. You may withdraw your consent to participate at any time without penalty. Your withdrawal will not influence any other services to which you may be otherwise entitled.

SUMMARY OF RESULTS: A summary of the results of this research will be supplied to you, at no cost, upon request. To make this request, contact Dr. Trenia Walker at twalker1@seattleu.edu. A summary will be available no later than December 2023.

VOLUNTARY CONSENT: I have read the above statements and understand what is being asked of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason, without penalty. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any concerns about my participation in this study, I may contact the researchers to which their contact information is listed above. If I have any concerns that my rights are being violated, I may contact Dr. Michael Spinetta, Chair of the Seattle University Institutional Review Board at (206) 296-2585.

Appendix F

Survey Questions

Email address

Demographic

- Gender
- Age
- Race/Ethnicity
- Number of completed credits
- Intended area of study/major

Communication

- How often do you receive communication (email, text, canvas notifications) about services offered at MESA?
- Can you share the last communication you received from MESA?

Programming

- Can you describe the last time you participated in a MESA event or student activity?
- What MESA services/activities do you participate the most in and why?
- How often do you use the MESA Center?
- Is there MESA programing available at a time that works with your schedule?

Outreach

- How did you learn about the MESA program?
- Why did you choose to apply for the MESA program?
- Which resources can you get help with from MESA?

Improvement

- Is there a program or service that you wish MESA offered?
- Do you have any suggestions for improving participation in the MESA program?

Would you be interested in participating in a listening session to share more about your experiences with the MESA program?

Appendix G

Focus Group Questions

1) Have you had experience being involved in or having access to STEM enrichment programs? (STEM enrichment = offer children of all ages the opportunity to learn advanced concepts using approaches that get them motivated and keep them interested)
    a) Follow up: If yes, did these programs provide prior exposure to advanced level science, mathematics, and technology subject areas or courses?
2) When was your first experience with the MESA program?
    a) How was it?
3) Who introduced you to the MESA Program?
4) Did you have any life experiences that prevented you from succeeding in your STEM courses or college career?
5) Did you have an opportunity to participate in consistent and authentic STEM mentorship opportunities which were culturally responsive?
    a) Authentic Mentorship - Did you have someone who looked like you or had similar experiences as you who served as a mentor that honored your culture
6) What recommendations would you give or actions to be taken that will help to improve the experiences of MESA students?

Appendix H

Focus Groups Recruitment Initial Survey Email

Focus Groups Recruitment Initial Email

Hello MESA Students,

We hope this email finds you healthy and well. As we wrap up the data collection from our survey collection tool, we wanted to thank you for participating in the survey and extend an invitation for you to participate in a listening session. The listening session will be hosted at the [PNWCC] MESA center. You will be invited to meet with our research team for approximately 45 minutes to an hour. Available times include:

Wednesday, March 29 from 3:00pm – 4:00pm (virtual)
Wednesday, April 5 from 11:00am –12:00pm (on campus)
Thursday, April 6 from 10:00am – 11:00am (on campus)

Please sign up for a time that works best for you on this link -
https://forms.gle/7ph7NZ65VWWUpUg99

Based on responses received, the researchers will select the date that works for most participants.

Attached is additional information about this phase of the study. As you review this document, please note that we need to record the listening session, only with the purpose of facilitating the synthesis of themes across the group participants. These themes will be used to formulate results related to this study's purpose and the analysis will be published in the doctoral dissertation. Personal identifiers such as names and phone numbers will not be included during this process. Moreover, the audio recordings will be made available only to the researchers and only the transcripts will be used during the analysis.

We look forward to connecting with you in person and learning about your experiences with the [PNWCC] MESA program.

Please fill out the Google Form indicating your interest in participating and we will soon follow up with additional details. We deeply appreciate your consideration of this request.

Please contact us if you have any questions or concerns. Should have any questions, please contact Inez Olive at xxxxx@seattleu.edu

Respectfully,

Osure Brown, Eric Marshall, Inez Olive, and Kyle Winslow

Focus Groups Recruitment Follow-Up Email

Hello MESA Students.

We hope this email finds you healthy and well. As a reminder, we would like to invite you to participate in a listening session to share your experiences and participation in the MESA program at [PNWCC] with your fellow MESA peers. The listening session will be hosted at the [PNWCC] MESA center. You will be invited to meet with our research team for approximately 45 minutes to an hour. Available times include:

Wednesday, March 29 from 3:00pm – 4:00pm (virtual)
Wednesday, April 5 from 11:00am –12:00pm (on campus)
Thursday, April 6 from 10:00am – 11:00am (on campus)

Please sign up for a time that works best for you on this link -
https://forms.gle/7ph7NZ65VWWUpUg99

Please contact us if you have any questions or concerns. Should you have any questions, please contact Inez Olive at xxxxx@seattleu.edu.

Respectfully,

Osure Brown, Eric Marshall, Inez Olive, and Kyle Winslow

Appendix I

Data Analysis Matrix

Participant ID								
Data Collection Method	**Question**	**Demographic Code**	**Parent Code (Expected, Surprising, Unusual)**	**Sub-Code (Expected, Surprising, Unusual)**	**Theoretical Framework Connection**	**Leadership Theory**	**Themes**	**Important Quotes/ Comments**
Phase 1: Survey	Q1							
	Q2							
	Q3							
	Q4							
	Q5							
	Q6							
	Q7							
	Q8							
	Q9							
	Q10							
	Q11							
	Q12							
	Q13							
	Q14							
	Q15							
	Q16							
	Q17							
	Q18							
Phase 2: Focus Group	Q1							
	Q2							
	Q3							
	Q4							
	Q5							
	Q6							