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Minoritized Two-Year College Students: Examining Course-Taking Patterns, Experiences, and Interventions

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There is a strong need in the United States to increase the size and diversity of the domestic workforce trained in science, technology, engineering, and math (STEM). With almost half of all students that earn a baccalaureate degree enrolling in a 2-year public college at some point, the nation's 2-year colleges provide great promise for improving the capacity of the STEM workforce for innovation and global competition while addressing the nation's need for more equity between groups that have been historically included and those that have been economically and politically disenfranchized. Almost half of underrepresented minoritized (URM) students begin their post-secondary education at 2-year colleges yet their transfer rates within 5 years are only 16%. This study describes interventions put in place at a 2-year college to support increased transfer rates and STEM transfer readiness for URM STEM-interested students. The program studied, in place from 2017 through 2020, had an overall transfer rate of 45%. Analysis of administrative, transcript, and student survey data connects the program interventions to the existing research on STEM momentum and other research on URM STEM transfer success.

Ultimately, this study identifies potential leading indicators of transfer readiness, providing much needed documentation and guidance on the efficacy and limitations of interventions to improve upward STEM transfer.

Keywords: STEM transfer, community college, diversify STEM science technology engineering mathematics, underrepresented minority, momentum, motivation, 2-year college, holistic support

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Increasing STEM Transfer Readiness Among Underrepresented

INTRODUCTION

The United States public interests including national defense, safety, health, computing, communication, and energy rely upon a domestic workforce that is highly trained in science, technology, engineering, and mathematics (STEM). Initiatives to increase the numbers of students who complete degrees in STEM must engage and retain students from racial and ethnic groups that have been historically excluded from full participation in higher education and actively discriminated against in the context of STEM education and research (Malone and Barabino, 2009; Benish, 2018; McGee, 2020). Interventions that support students' efforts to pursue a STEM career pathway while addressing institutional practices and policies that limit access to or complicate the

navigation of such pathways hold the greatest promise for impact and sustainable change (Whittaker and Montgomery, 2012; Upshur et al., 2018; Wilson et al., 2018).

The transfer pathways between 2 and 4-year institutions play a critical role in growing a bigger and more diverse domestic STEM workforce (National Science Board, 2015). Collectively, community colleges have more students enrolled for degree credits than 4-year public and private institutions combined (Horn and Skomsvold, 2011; Handel and Williams, 2012). National Student Clearinghouse data show that almost half of students who have obtained their baccalaureate degrees had been enrolled in a 2-year public college during the previous ten years (Two-Year Contributions to Four-Year Completions, 2017). In 2010, Black and Hispanic students made up 23.3% of all students who began post-secondary education and almost half (49.6%) of those students started their college enrollment at a 2-year public college (Shapiro et al., 2017a). The Beginning Postsecondary Student Longitudinal Study (BPS) found that among first-time community college students, 80% of White students expressed an interest of earning at least a bachelor's degree with slightly larger percentages of Black (83%) and Hispanic (85%) students expressing such an interest (Horn and Skomsvold, 2011; Handel and Williams, 2012). Among community college students who are in STEM disciplines, 75% indicate they are enrolled to obtain credits toward STEM baccalaureate degrees (Mooney and Foley, 2011).

Transfer rates and degree completion rates are not consistent with the large percentages of students who intend to earn a bachelor's degree. On average, 26% of community college students transfer to a 4-year institution each year. For students who begin their post-secondary education at a 4-year institution, the degree completion rate is 70% for enrolled juniors. For transfer students, the six-year baccalaureate degree completion rate is 45% (Handel and Williams, 2012). When the scope of transfer success is narrowed to students majoring in science and engineering disciplines, the outcomes are even more concerning. An analysis of six-year outcomes for community college students found that 16% of science and engineering students and 7% of technician[1] students had completed a STEM baccalaureate degree (National Academies of Sciences, E., and Medicine, 2016). With respect to broadening participation in STEM, the factors that slow or complicate transfer and degree completion have a disproportionate impact on students from minoritized groups (Black, Latino/a, Native American, Alaskan Native, Native Hawaiian and other Pacific Islanders). One study found that the 2–4-year transfer rate after five years was 23% for White students compared to 16% for Black and Hispanic students (Horn and Skomsvold, 2011). With respect to degree completion, Black and Hispanic students starting at a 2-year college have bachelor's degree completion rates after six years of 8.6 and 10.8%, respectively, compared to 19.2% for White students (Shapiro et al., 2017a).

The discrepancy between student enrollments in community colleges with the intention to transfer and complete a degree in STEM and the transfer and degree completion rates for the same students indicates that the 2–4-year transfer pathways into STEM are not serving all students equally. The present study describes an intervention, the Madison College Inspire Scholars Program, to increase the STEM transfer readiness and ultimately transfer rates for underrepresented minoritized (URM) students[2] who are intending to pursue STEM careers. The program was based on an existing transfer preparation program at the college and on Wang's research (Wang, 2015a; 2015b) on supporting students with transfer aspirations in STEM.

LITERATURE REVIEW Research and Evidence for Clear Pathways to Transfer Success

Wang's holistic theoretical model for community college student success specifies three domains within which momentum is developed: curricular (e.g., course-taking trajectories); motivational (e.g., students' aspirations and beliefs); and instructional (e.g., classroom and advising approaches that support students' engagement with learning a discipline) (Wang, 2017). Four key factors that stop or slow STEM transfer momentum are financial barriers, lack of clear pathways, inadequate or lack of advising, and lack of professional development for faculty, which she refers to as counter-momentum friction (Wang, 2017). Providing support and resources in each of these domains is key to supporting successful STEM transfer and baccalaureate degree attainment. The curricular and motivational momentum domains are the primary focus of this project.

Wang's momentum domains align well with other research on successful STEM transfer initiatives. For example, within the instructional domain, research shows the need to improve advising as a method to support student transfer in STEM (Carlsen and Gangeness, 2020; LaViolet

[1] ficate
Technician in this context refers to occupational programs that award a certi or applied associate degree.

[2] "underrepresented minoritized" (URM) to describe
In this paper we use the term minority status based on disproportionate numbers of people from different ethnic and racial backgrounds. The term minoritized in this context reflects both the numeric underrepresentation as well as structural, social, and cultural factors that affect access to and persistence in STEM disciplines for students of color (Benitez, 2010; Stewart, 2013).

and Wyner, 2020; Packard and Jeffers, 2013). Additional case studies have highlighted successful STEM transfer initiatives that address the motivational domain through holistic mentoring (Luedke, 2017; Rodenborg and Dessel, 2019) and development of a STEM identity (Rodriguez et al., 2017), and the curricular domain through strong transfer partnerships (Xu et al., 2018). In addition to addressing the counter-momentum friction that students experience, additional research has shown positive connections around supporting student momentum. The concept of "STEM Momentum" first defined by Wang (2015b), and based on prior work on academic momentum (Attewell et al., 2012), is the idea of studying both the quantity of STEM credits and the quality of progression in the STEM courses as leading indicators of successful STEM transfer. Wang focuses on the quantity and quality of students' progress through STEM coursework as a direct indicator of their momentum toward a likely, successful transfer. This is accomplished through analyzing a component of STEM momentum called STEM "Quality Points" a community college STEM-aspiring student earned in their first semester. STEM Quality Points (QP) represent the "velocity" component of STEM momentum and are calculated as the product of STEM course credits and associated course grade. For example, a B in a four-credit STEM transfer course equates to twelve STEM Quality Points. The number of STEM QP earned in a semester is an indicator of the speed that a student is working through their STEM coursework.

Wang's research on STEM momentum found that the predicted probability of baccalaureate attainment for a student starting at a community college was 11% compared to 46.6% for a comparable student beginning at a 4-year college. Wang found that increasing STEM QP in the first semester by one-point above the mean has a larger increase on the predicted probability of STEM success for 2-year college students than for students beginning at a 4-year college (5.5 vs. 2.8% increase). The importance of STEM momentum for STEM success reflects the social and economic factors that shape the pursuit of higher education for students who begin their studies at a 2year institution compared to a 4-year institution. Students enrolling at 2-year institutions are more likely to have lower income, be first generation college students, and from groups that are minoritized in higher education, especially in STEM disciplines (National Center for Public Policy and Higher Education, 2011).

Existing Barriers

Many interrelated factors impede students' transfer and degree attainment (Hagedorn et al., 2006; National Academies of Sciences, E., and Medicine, 2016; Wang et al., 2020). The financial burden of pursuing post-secondary education is one of the most significant barriers. Four-year institutions do not accommodate the working lives and income levels of their students to the same degree that community colleges do (Hill, 2017; National Academies of Sciences, E., and Medicine, 2016). On average community college tuition rates are much lower than tuition rates at 4-year institutions. In addition, community college students are more likely to work, and to work more hours per week, than their 4-year institution counterparts.

The financial burden of higher education is further complicated by the issue of how credits earned at a 2-year college are transferred into a 4-year institution. Credit transfers, especially for coursework in STEM majors which typically sequence courses, are not guaranteed even when institutions have articulation agreements. Transfer students report that they do not have sufficient advising to help them identify their options for STEM pathways and navigate the coursework to optimize time and resources spent on preparing for transfer into a STEM major at a 4-year institution. In addition, those pathways are often difficult to navigate and vary based on which 4-year institution the student plans to transfer to, further exacerbating the problem (Bailey, 2015; Handel and Williams, 2012; National Academies of Sciences, E., and Medicine, 2016; Wang, 2020; Wang et al., 2020).

One of the conditions necessary for transfer pathways to increase access and diversity in STEM include collaboration with transfer institutions. Access created by direct transfer agreements that specify course and credit equivalencies between institutions is a step in the right direction. Articulation agreements that guarantee "credits will transfer" do not shorten transfer students' time to degree if the credits from 2-year institutions are only counted as electives. Credits have to count toward required coursework within the major, especially because coursework in many STEM majors is sequenced (LaViolet and Wyner, 2020). An additional way to increase STEM success is to provide students opportunities to engage with high impact practices, especially the promising practice of undergraduate research. Research has demonstrated the positive impact on STEM success for students that engage with undergraduate research (Brownell and Swaner, 2009; Eddy, 2014; Kilgo et al., 2015), though there are barriers to access for community college students which can be partially overcome through utilizing REU's (Research Experiences for Undergraduates) that specifically target 2-year and URM students. There is also a need to better understand the twoyear student population (Wickersham, 2020), especially the structural inequality and its impact on access and equity for underrepresented minoritized students (Bowleg, 2008).

DESIGN OF INSPIRE SCHOLARS PROGRAM INTERVENTION Inspire Scholars Program Background

Madison Area Technical College (Madison College) is a comprehensive, public two-year college serving a district spanning twelve urban and rural counties in south central Wisconsin. Madison College provides a critical educational on-ramp to a baccalaureate degree especially for URM students. Our student population is diverse, with URM students making up more than 20% of our STEM associate degree students. Madison College has been a member of the 19-institution consortium that makes up the Wisconsin Louis Stokes Alliance for Minority Participation (WiscAMP) since 2012. The Madison College WiscAMP Scholars Transfer Preparation Program (WSTPP) builds upon direct transfer agreements created between Madison College and the UWMadison College of Engineering, Milwaukee School of Engineering, UW-Milwaukee, and UW-Platteville. The WSTPP supports URM students whose academic profiles indicate they have STEM momentum and anticipate transferring into a 4-year STEM major within one year. The program facilitates students' transfer success by providing professional development, faculty mentoring, financial support through a stipend, and connecting them with programs and research opportunities at UW-Madison prior to transfer. Overall, 62% of WSTPP students transfer into a 4-year STEM major within a year of having participated in the program. Based on the success of the WSTPP, Madison College STEM faculty and administrators looked at how to extend the program's impact by expanding eligibility to the student supports in the WSTPP and expanding the supports available to help students build STEM momentum.

Though successful, the WSTPP has a number of limitations that the Inspire Scholars Program (ISP) was developed to address. One goal of the ISP was to "cast a wider net" through three key program eligibility changes to increase access to the program. The changes were based on research and direct experience with the WSTPP scholars. One limitation built into the design of the WSTPP is the eligibility requirements for students to participate. Since WSTPP was designed for students that were already wellestablished in their transfer path, it excludes the majority of STEM URM students that could benefit from the program. There are three eligibility requirements that create the largest barrier to the program. They are 1) the minimum math requirement of college algebra or higher (a.k.a. transfer-level math), 2) a minimum GPA of 2.8, and 3) the requirement that the scholars maintain full-time enrollment. For example, in the first semester of ISP implementation (Fall 2017), there were 3,310 students enrolled in STEM associate degree programs[3]with URM students totaling 820 (24.8%) of total enrollments. Of the 820 students, only 59 of the URM students were eligible for WSTPP.

Nationwide, data on student progression through mathematics demonstrates that there is a need for support for students in math below the level of college algebra. In Wang's research on STEM momentum (Wang, 2015b), the analysis was restricted to students that were in their first semester at the beginning of the study period that had started their math coursework at the level of college algebra or higher. However, the majority of students attending two-year colleges start their mathematics coursework at one or more levels below college algebra (Bailey, 2009). Remedial math courses are often seen as a "gatekeeper" to STEM success (Hagedorn and DuBray, 2010; Zhang, 2019). Only 12% of students that begin math at Madison College at the level of elementary algebra (two "levels" below) successfully progress to college algebra within three years, a rate that aligns with national figures. In addition, experience with scholars in WSTPP, led us to reflect on the need to provide more flexibility for scholars to participate in the program. This flexibility is achieved for ISP participants by reducing the enrollment requirement to half time or higher, and the minimum GPA to 2.25. These changes, along with the third change of reducing the minimum math level to elementary algebra, significantly increased our pool of eligible students. Out of the 820 enrolled URM students in fall 2017, more than half of them (463 students) were eligible to apply to the Inspire Scholars Program. This "wider net" allowed us to more broadly recruit for the program across the college community and increase awareness of the program with, not only students, but also advisors and faculty.

Wang's model for STEM momentum provided a framework for expanded supports for students in the ISP. Supporting students' curricular momentum was not explicitly included in the WSTTP design. Intentional development of supports to address curricular momentum came through understanding the critical importance of first semester STEM QP on student transfer success. A challenge and an opportunity for the program came in the background of the ISP participants. The majority of the participants were not in their first semester of post-secondary education and 2/3 of the participants started their math sequence below college algebra. The ISP was designed to both track and support STEM QP attainment each semester students were involved in the program.

A further innovation and expansion of supports for ISP is the design of tiered participation, modeled after the UW-Milwaukee WiscAMP STEM-Inspire program (https://uwm.edu/steminspire/ program-overview/). This design provided multiple opportunities for

[3] Madison College STEM associate Degree programs are provided in the Supplementary Materials.

students to engage in the program and allowed the students to maintain connection to the program and the student community throughout their time at Madison College. The different roles in the program are shown in Figure 1. As can be seen in the figure, when developing the model, the design was based on the idea of "vertical transfer". Vertical transfer is defined as a student's movement from a 2-year institution into a 4-year institution. Though there are some choices built into the design, in essence, the program was built for studentsto "enter" the program on the left as a Scholar Participant and then "advance" through the various roles until they successfully transferred in STEM.

Inspire Scholars Program Implementation

In Fall 2017, Madison College opened the doors on its new STEM Center. The ISP leveraged the new space as its hub for the project. The space was the primary location for Inspire participants to gather, build community, and work together on STEM coursework either independently, through weekly participant "Study Jams" or with the help of an ISP peer tutor. In addition to utilizing the STEM Center, ISP also provided the supports listed in Table 1. The PI and Co-PI were funded to provide a release of 31 and 18%, respectively, for the first year of the program to develop and implement the infrastructure needed to administer the ISP. This release was reduced to 9 and 0%, respectively, during year 2 of the program. In the third year of the program, a project manager position within the STEM Center was created and filled. A significant portion of the administrative duties associated with the ISP were transitioned to the project manager. Therefore, no funding for release time was provided to either the PI or Co-PI during the third year. Seventeen full time faculty applied their service hours as faculty mentors. Funding was provided for six part time faculty to also serve as mentors to participants. Faculty mentors were required to meet with their mentees for at least 2 h/mo and encouraged to attend the biweekly meetings (2 h/mo). The Co-PI developed and conducted training workshops and provided a handbook for all faculty mentors. Each semester, up to 35 students could be supported by the program in the roles shown in Figure 1. As many as four students served as peer tutors and three students served as peer leaders. Peer tutors worked up to 14 h/wk per semester and peer leaders worked up to 12 h/wk per semester. Funding of $100 per academic year was also provided for up to three peer guides.

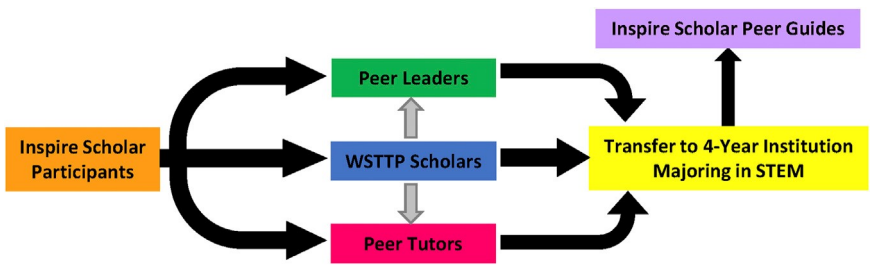

FIGURE 1 | Tiered participation model in the Madison College LSAMP Inspire Scholars Program.

TABLE 1 | Student supports provided in the Madison College Inspire Scholars Program.

1	Provide stipends tied to the participant commitment and level of involvement
2	Expand recruiting strategies to include classroom visits, collaborating with institutional research to improve targeting and with the madison college recruitment office to coordinate with other STEM-related student outreach efforts
3	Implement faculty mentor training through a college-wide mentor-training initiative that included a mentoring handbook to support holistic mentoring
4	Coordinate career exploration workshops, additional student research opportunities and industry tours through collaboration with the madison college career and employment center
5	Develop leadership skills through professional development for peer leaders, guides and tutors
6	Support participant science identity through required participation in STEM outreach activities to K-12 and community partners
7	Provide academic and career professional development in biweekly meetings and engagement with the STEM Center's "STEM speaker" series
8	Provide academic and social support to scholars through peer tutoring and biweekly study sessions
9	Provide faculty mentoring for participants from trained STEM faculty
10	Provide a "bridge" to transfer with UW-Madison through a transfer collaboration effort with UW-Madison WISCIENCE and a team of student ambassadors from UW-Madison

Funding provided for up to 25 participants to receive a maximum stipend of $500 per semester. Stipends were adjusted relative to participant commitment and involvement in the program. The PI developed and implemented a training program/and or coordinated the activities of the peer tutors, peer leaders, and peer guides.

Each of the program components supports students' aspirations for transfer in specific ways. Access to transfer services is key for supporting STEM student momentum for transfer (Wang et al., 2017a). ISP participants received this support through presentations during the ISP participant biweekly meetings, targeted text messaging or "nudging" (Bird et al., 2021; Castleman & Page, 2015) to attend transfer fairs and scheduled transfer advising sessions, and engaging with faculty mentors. The research shows a strong correlation between successfully transferring in STEM and a STEM-interested student's identity as a STEM learner (Carlone and Johnson, 2007; García and McNaughtan, 2020; Rodriguez et al., 2017; Wang, 2020; Wang et al., 2020). Supporting ISP participants' STEM identity was done through holistic faculty mentoring, career presentations led by STEM professionals of color, and engaging the peer guides (participants that had already successfully transferred into STEM) to work with the participants. Requiring participants to develop and staff STEM outreach activities also allowed them to strengthen their STEM identity (Atkins et al., 2020). Another support for students was in the curricular momentum domain in the form of opportunities for tutoring and academic support from peers utilizing the peer tutors in the ISP and regular, required group study sessions (study jams) held in the STEM Center. (Jackson et al., 2013; McPhail, 2015). These opportunities were built to support not only curricular momentum, but also support community building and the participants' STEM identity. How students are advised and mentored regarding which classes to take, the sequence of classes, and the numbers of classes is also critical as these interventions all support STEM QP attainment (an indicator of curricular momentum). As such, the program provided professional development for faculty mentors and presentations to advisors on the importance of STEM QP and how advising and mentoring could best support students in this domain.

Further research into student success emphasizes the need to focus on "non-cognitive" factors (Farrington et al., 2012) including motivational attributes to support students' upward STEM transfer aspirations. One of the critical ways to support student motivation is through regular mentoring (Dowd, 2012; Packard, 2012). ISP provided mentoring through biweekly meetings with faculty mentors, leadership with peer leaders, and support to apply for and participate in summer REU's.

An additional support mechanism came in the form of the ISP student community. Building community among the scholars has been shown, through programs such as the Meyerhoff Scholarship Program at the University of Maryland Baltimore County, and the PEERS program at UCLA to have a strong positive impact on URM student STEM success (Maton and Hrabowski, 2004; Stolle-McAllister et al., 2011; Toven-Lindsey et al., 2015). By providing the varied roles in the program, the ISP was able to accept 69 students into the program over the course of the three years. The maximum number of students recruited in a single semester for the program was 33, which occurred in the first semester. Overall, the average number of students per semester in the program was 25.5. Participants were required to attend biweekly meetings for academic and career professional development, and for community building. The peer leaders were also tasked with supporting community through organizing volunteer activities and reaching out to participants that were unresponsive to faculty mentors.

Inspire Scholars Program Eligibility and Recruiting

The eligibility requirements for the program varied based on the role of the participant. As shown in Figure 1, there were four possible roles for ISP participants. Each tier of student participation had unique requirements for the students, though all tiers required students to be classified as URM students interested in STEM transfer who are either United States citizens or permanent residents. Each student role was recruited based on the additional criteria outlined below.

- Inspire Scholars Participant–Qualifying students are URM students with an interest in a STEM career that are: o Applicants to the WiscAMP Scholars Transfer
  Preparation Program that were not selected OR o Part-time (min six credits) or more STEM-interested
  URM students that - Have a
  2.25 minimum GPA.
  - Complete the LSAMP Inspire Scholars Participant Application.
- Inspire Scholars Peer Tutors–Qualifying students are:
  - o URM students that have taken STEM coursework andearned an A or AB in the course.
- Inspire Scholars Peer Leaders–Qualifying students are:
  - o URM students that have participated in the Inspire ScholarsProgramorWiscAMPScholars TransferPreparation Program that wish to gain leadership skills through the peer leaders program.
- Inspire Scholars Peer Guides–Qualifying students are:
  - o URM students that have participated in the Inspire ScholarsProgram or WiscAMP Scholars Transfer Preparation Program that have successfully transferred in STEM.

Recruiting for the program took on a "multipronged" approach. Because of the opening of the new STEM Center, a key aspect for the recruiting effort was to utilize the new STEM Center to let the broader college community know about the program and utilize the Center as a hub for collecting applications and fielding inquiries about the program. In its first

semester, STEM faculty visited 84 STEM classrooms on behalf of the STEM center to promote the program and encourage students to apply. Utilizing student data gathered from the Institutional Research office, email contact information for all underrepresented eligible students at the college was used to send out targeted recruiting emails. Undeclared students were included in this group, leading to emails sent to 1,454 students. Additionally, because of the tiered participation model, former WSTTP applicants and participants still on campus were contacted and encouraged to apply to the program. Another targeted effort came from emailing faculty that teach the developmental math courses (elementary and intermediate algebra) with a list of the URM students in their classes and requesting that they personally invite their students to apply. An effort was also made to work with other programs at the college including TRiO, Scholars of Promise, and the Scholars of Color Mentoring Program. The ISP application was provided to personnel in those programs to pass on to any STEM-interested URM students in their program(s). Finally, STEM faculty staffed a recruiting table during new student orientation to identify eligible students and encourage them personally to apply.

During the three years of the ISP, 115 students submitted a completed application, and 69 students were accepted into the program. The students who were denied participation in the program generally fell into two groups. Most were not members of the minoritized groups eligible to participate in the program as defined by the National Science Foundation. The second group of students who were denied participation did not show any evidence that the option of transferring to a four-year institution was being given serious consideration. Students' lack of intention to transfer was demonstrated by the absence of any transferable STEM courses in their academic record and/or by explicit statements provided in the application.

EVALUATION

The Inspire Scholars Program had the overarching goal of broadening participation in STEM degree career pathways. It was developed to augment the successful Madison College WSTTP by providing broader and more diverse entry points into some of the proven programming and supports already in place for the WiscAMP Scholars. The program had three specific objectives.

- Objective #1: Increase the STEM transfer readiness of allInspire Scholars Program participants.
- Objective #2: Increase the number of URM students thatsuccessfully transition from remedial math coursework into the STEM transfer track.
- Objective #3: Increase the number of URM MadisonCollege students who transfer into STEM programs at the college's top STEM transfer institutions.

Assessment of the program draws from transcript data (to track accumulation of students' STEM quality points and transfer success) as well as surveys administered to students when they began and exited the program. The survey instrument was modified from the upward transfer survey instrument developed by Wang (Wang, 2016; Wang and Lee, 2019).

Key Indicators of Program Success

The focus of this study is on Objective 1. The program definition of STEM transfer readiness is based on the work around STEM Momentum advanced by Wang (Wang, 2015b, 2017; Wang, 2020). Transfer readiness includes both curricular momentum (operationalized as STEM Quality Points) and aspirational momentum (operationalized through multiple scales assessing key attitudes and beliefs as outlined below). The survey questions and categories as described below were modified from Wang's upward transfer survey instrument (Wang and Lee, 2019). The complete set of matched questions used in the analysis in each category is available in the supplementary materials.

STEM Quality Points

Transcript data was used to track participants' STEM Quality Points attained per semester which are calculated as a function of math and science course credits multiplied by the grades earned for the course. For example, a student who completed a fourcredit math course with a 3.0 earned 12 quality points.

Math Self-Efficacy

Completion of transfer-level math is often used by programs (including the WSTPP) as a benchmark for identifying students who are likely to transfer successfully into STEM. The aim of ISP was to expand access to transfer preparation opportunities and include students who were not yet ready to enroll in transfer-level math. The program activities aimed to support the development of math self-efficacy to support students' continued coursework in math and science. Math self-efficacy was assessed by responses to five questions (e.g., "How confident are you that you can do well on math exams?") on Likert scale items (1 "not at all" to 5 "extremely"). Wang and Lee (2019) have documented a Chronbach's alpha for this measure of 0.95. The scale reliability analysis of the measure for this sample resulted in alphas of 0.93 and 0.95, for the baseline and first follow-up surveys, respectively.

Science Self-Efficacy

Students' confidence that they can master content with a science discipline was assessed by responses to five questions (e.g., "How confident are you that you have the ability to master the material taught in science?") on Likert scale items (1 "not at all" to 5 "extremely"). Wang and Lee (2019) have documented a Chronbach's alpha for this measure of 0.96. A scale reliability

analysis of the measure for this study resulted in alphas of 0.95 and 0.96, for the baseline and first follow-up surveys, respectively.

Support for Transfer

Wang's holistic model of STEM momentum considers the supportive factors that contribute to students' persistence in navigating the STEM transfer pathway. Students' levels of support for transfer were assessed with responses to four questions, two regarding support from family and friends and two regarding financial support for the current and future academic goals on Likert scale items (1 "none" to 5 "a great deal"). Wang assessed the four items used for this scale in a confirmatory factor analysis (see Wang and Lee, 2016). The scale reliability analysis of the measure for the present study resulted in alphas of 0.67 and 0.59 for the baseline and first follow-up surveys, respectively.

Transfer Information Acquisition

Students' lack of information about the transfer process and options for navigating the STEM transfer pathway can result in costly decisions in terms of time, money, and academic performance. Students' transfer information acquisition was assessed with five Likert responses to questions regarding how familiar students were (1 "not at all" to 5 "extremely") about different resources for guiding their transfer process. Wang assessed the five items used for this scale in a confirmatory factor analysis (see Wang and Lee, 2016). The scale reliability analysis of the measure for the present study resulted in alphas of 0.89 and 0.93 for the baseline and first follow-up surveys, respectively.

Transfer Capital

Students' connections to places and people who can help them navigate the transfer pathway were assessed with responses to five questions regarding actual behavior and intentions (e.g., "Have you met with a transfer advisor from a 4-year college or university?"). Responses were scaled 0 to two based on three response categories: 0 "No, and I don't intend to;" 1 "No, but I do intend to;" and 2 "Yes"). The measure of transfer capital is changed from Wang and Lee (2016) survey which used confirmatory factor analysis to assess a five-point Likert scale measuring TransferOriented Interactions with 1 "Never" to 5 "Very often." For the evaluation of the ISP, participants were asked to report on their actions with respect to five activities that directly support transfer. The scale reliability analysis for this adapted scale resulted in alphas of 0.60 and 0.65 for the baseline and first follow-up surveys, respectively.

TABLE 2 | Inspire Scholars Program participant demographic information in their first term in the program.

		N (=69)	%[a]
Gender	Male	35	51
	Female	34	49
Age at first semester of program participation	17–19	31	45
	20–23	17	25
	24–29	8	12
	30 and older	13	19
Race/Ethnicity	Black	30	43
	Hispanic	31	45
	Multiracial	5	7
	Native American	3	4

Transfer Self-Efficacy

One specific question was used to assess students' transfer selfefficacy: "How confident are you about your ability to handle the process and requirements for transferring to a four-year college or university?" with responses in the form of a Likert rating (1 "not at all" to 5 "extremely").

Evaluation Outcomes

A total of 69 students participated in the Madison College Inspire Scholars Program from 2017 to 2020. Table 2 provides the demographic information for program participants and Table 3 provides information about the participants' academic pathway. The average age for all participants in their first term with the program was 23.3 years old with a median age of 20, with Black students making up the majority of 24 and older students.

[a]Percentages may not total 100 due to rounding.

TABLE 3 | Inspire Scholars Program participant academic plan in their first term in the program.

Academic plan	Number of students
Civil engineering technology	2
Electrical engineering technol	2
Information technology	5
Liberal arts transfer–Arts	8
Liberal arts transfer–Engineering	7
Liberal arts transfer–Science	42
Mechanical design technology	1
Medical laboratory technician	1
Undeclared degree credit	1
Grand total	69

These ages are in line with the entire population of eligible students during the semesters the program was running, where the average age of all eligible students was 23.7 years old with a median age of 21. Based on survey responses, 61% of the participants were first generation college students. Since surveys were limited to participating students, it is not feasible to develop a comparison group to broaden the impact of this study. Specifically, one issue that arises is the difficulty comparing first generation status and economic standing with other students across the college due to the fact that the college only recently started collecting this data from all students, and many students choose not to report those items to the college. For example, only 4% of the participants did not report status for first generation in the program survey, whereas 35% of the participants and 33% of eligible students did not report that information to the college.

Transfer Readiness Analysis

As stated in objective 1 for the project, the STEM Quality Point attainment of the scholars is one of the factors used to identify "transfer readiness". In Wang's analysis on STEM momentum, transfer results were looked at within 6 years of the student's first term. The student cohort was limited to students in their first semester in 2003–2004, aged 23 or younger, majoring in a STEM field when first enrolled, and had taken at least one transfer-level STEM course during their first year. In addition, remedial math courses were excluded from the STEM momentum measures, and STEM programs were limited to those available at both a 2-year and a 4-year institution (Wang, 2015b). The population of students that participated in the ISP does not align easily with the cohort utilized by Wang for calculating STEM QP. This is a direct result of the tiered participation model and the decision to allow students entry into the program at math course-taking levels below college algebra. In fact, only six of the 69 scholars meet the cohort limitations from Wang's study. Even so, the evaluation of participants' transfer readiness was an opportunity to calculate STEM QP for the broader population in the ISP and make some preliminary findings on how well STEM QP correlates with STEM success for students outside the limited cohort previously studied. To assess the STEM Quality Points of the ISP participants, it was therefore necessary to develop a set of assumptions that aligned with and expanded those set by Wang. The set of assumptions used to analyze the STEM QP for the ISP were developed by looking at Wang's assumptions and making appropriate adjustments. First, since the program was in place starting in Fall 2017, the maximum number of years for this study is limited to at most 3 years since program start (instead of the 6 years used by Wang). In addition, due to the design of the program, only eleven of the 69 participants were in their first term (16%), and 48 participants were 23 years old or younger (70%) in their first term as a participant, it was therefore decided to not limit the cohort to students in their first term. Since the ISP cohort also included students with transfer credit, the STEM QP analysis excluded participants with 16 or more credits transferred in from another college. 16 credits was chosen based on 15 credits representing one semester for a "full-time equivalent" student which ensures that the majority of the student's coursework was completed at Madison College. This limitation excluded five scholars with 16–45 credits of transfer coursework. In addition, because this study is focused on STEM Quality Points, scholars that successfully completed transfer-level math or other STEM coursework at another institution were also excluded from the STEM QP analysis (2 additional scholars excluded). This study also deviates from Wang's analysis in that it has no age limit and does not look at STEM coursework to determine STEM intent since eligibility for the program required all students to have a stated interest in transferring into STEM and an expectation to earn a bachelor's degree or higher. To maintain alignment to Wang's analysis, the STEM QP calculations in this study were limited to the students in the Liberal Arts Transfer program, since much of the course work students completed in the other programs was not "readily transferrable" to a 4-year college. Finally, since Wang's STEM momentum analysis focused on the first semester a student took coursework, and fully 2/3 of the program participants took at least one remedial math class at the college, "first semester" for STEM QP calculation was defined for this program as the (non-summer) semester where the student first attempted transfer-level math. Five of the scholars never attempted transfer-level math and thus were also excluded from the STEM QP analysis. These limitations ultimately produced a cohort to study STEM QP of 47 students (68% of the ISP participants).

The STEM QP students attained was calculated for the 47 students during each semester they participated in the ISP. Of the 47 students, 19 of them attained their "first semester STEM QP" before the program and 22 students attained them during their time in the program. The median number of first semester STEM QP between the two groups was 15 (before) and 19.5 (during). Recall that STEM QP is a focus of this study because higher first semester STEM QP attainment is associated with higher probability of STEM transfer success. So, how did these students

fair regarding transfer? Fifteen of the nineteen students that completed their first semester STEM QP before the program successfully transferred with a median STEM QP for this subgroup of 20. Of the 22 students that earned their first semester STEM QP during the program, 11 have successfully transferred and/or earned an associate degree with a median QP of 27. It is worth noting that, although fewer students have transferred that completed their first semester STEM QP during the program, those students were, on average, not as far along in their transfer journey as those students that had already completed transfer level math prior to starting the program.

Overall, the mean first semester STEM QP for all 47 participants was 15.8 with a standard deviation of 12.3. Participants were much more likely to have successfully transferred and/or earned an associate degree if they earned first semester STEM QP above the mean.

- 10 out of 24 transferred (42%) that earned STEM QP below the mean vs.
- 18 out of 23 transferred and/or earned an associate degree (78%) that earned STEM QP above the mean.

To assess how program participation might influence participants' attitudes and behaviors relevant to STEM transfer, scholars were required to complete a baseline survey upon entrance into the program, and a follow-up survey at the end of each semester they participated. Sixty-four of the 69 participants (93%) completed the baseline survey, and 48 of the 69 participants completed the follow-up survey at least once (70%). A total of 45 scholars completed both a baseline and at least one follow-up survey. For participants that completed either survey more than once, the first submission of each survey was utilized for analysis. Although this restriction limits the amount of time between the baseline and the follow-up assessment, it reduces the likelihood that participants' responses will be influenced by responding to the same survey questions multiple times.

Comparison of participants' baseline and follow-up reports of their intent to transfer in STEM, shows no significant change. It is important to note that a program eligibility requirement was a stated intent to transfer in STEM, so the mean response to the survey question "How likely are you to transfer to a four-year college or university to study in a program within science, technology, engineering, and mathematics (STEM) fields of study?" was 4.4 in the baseline survey, and 4.5 in the followup survey (out of a 5-point Likert scale). The survey responses were combined into the scales previously described: Math SelfEfficacy, Science Self-Efficacy, Support for Transfer, Transfer Information Acquisition, and Transfer Capital. A sixth measure, Transfer Self-Efficacy, was measured with a single item. The means for each scale were calculated for the baseline survey responses and for the first completed follow-up survey.

Table 4 summarizes the paired t-test analyses used to gage the program impact on six cognitive and behavioral indicators of ISP participants' STEM momentum. Four of the six measures show significant increases with the largest effect sizes found for changes in transfer information acquisition and transfer capital (1.08 and 1.01, respectively). Recall that the measure of transfer capital assesses participants intention as well as actual completion of five activities that are related to developing transfer capital. Responses to each of the five questions about transfer capital activities (e.g., Have you met with a faculty member at a 4-year institution?) range from 0 "No, and I don't intend to do so," 1 "No, but I intend to do so," and 2 "yes." The pre- and post-means are both greater than 1, the maximum score that could be achieved with only "intentional" responses, thus indicating that participants have completed or intend to complete at least some of transfer capital activities.

Transfer Pathway Progress

Thirty-One of the participants (45%) have successfully transferred since the program began in Fall 2017, with thirty of the participants transferring in a STEM major. This transfer rate is more than twice the 21% baseline transfer rate of URM STEM transfer students from Madison College for the Fall 2017 cohort. In addition, half of the program participants that transferred also graduated from Madison College with an associate degree along with an additional eleven participants, resulting in a total of 42 out of the 69 participants successfully earning an associate degree and/or transferring (61%). Table 5 shows the transfer pathway progress based on gender as well as race/ethnicity. Women were more likely to have transferred than men (53% and 37%, respectively). Multiracial, Native American, and Hispanic students were more likely to stop out than Black students.

The program was also designed to support students that were traditionally ineligible for the WSTTP, including those students that are at the beginning of their college career or are taking remedial math coursework. Research by Bahr (Bahr, 2010) on students' experiences with remedial math, found that Black and

TABLE 4 | Summary of paired T-Tests for transfer readiness analysis.

	Mean		St. Dev		T	Df	Sig. (1-Tailed)	Effect size (Cohen's D)
	Pre	Post	Pre	Post				
Math self-efficacy	3.99	4.09	0.792	0.812	0.909	44	0.185	0.72
Science self-efficacy	4.06	4.04	0.748	0.741	0.168	44	0.434	0.70
Support for transfer	3.02	3.39	0.933	0.867	3.940	44	0.000	0.64
Transfer info. Acquisition	2.70	3.26	1.022	1.095	3.452	44	0.000	1.08
Transfer capital	1.34	1.48	0.396	0.407	2.584	44	0.007	0.37
Transfer self efficacy	3.60	3.87	0.837	0.842	1.773	44	0.042	1.01

[a]These scales are to assess the effectiveness of the program interventions around improving participant self-efficacy in STEM transfer and navigating the college system.

TABLE 5 | Transfer pathway progress by gender and race/ethnicity for ISP participants (N 69).

		Transferr d[a]		Earned associate degree		Enrolled		Stopped- ut	
		N	%	N	%	N	%	N	%
Gender	Female	18	53	2	6	5	15	9	26
	Male	13	37	9	26	9	26	4	11
Race/Ethnicity	Black	13	43	7	23	7	23	3	10
	Hispanic	15	48	4	13	5	16	7	23
	Multiracial and Native American	3	37.5	–	–	2	25	3	37.5
Total		31	45	11	16	14	20	13	19

[a]Transferred includes students that transferred and also earned an associate degree.

Hispanic students are more likely to enter college needing at least one remedial math course than their White and Asian counterparts. They are also less likely to advance and achieve a passing grade in a transfer-level math class than their White and Asian counterparts. In Bahr's study, one in nine Black students that placed into remedial math eventually succeeded at completing a transfer-level math course, and one in five Hispanic students were successful, compared to one in four white students and one in three Asian students. Of the Inspire Program participants, 46 of the 69 participants took remedial math at Madison College, with 25 of the participants (36%) taking remedial math in their first semester as an ISP participant. Of the 25 students, 10 have transferred or earned an associate degree (40%), and an additional seven students are still enrolled. Overall, the 46 participants that experienced some math remediation have a transfer and associate degree completion rate of 56.5%, compared to 69.6% for the participants that never remediated in math.

DISCUSSION

Two-year institutions are important access points for students who want to pursue STEM careers, especially students from communities that are minoritized in STEM disciplines. The focus of this work is to describe a successful program at a 2year college that was designed to support underrepresented minoritized (URM) students transferring from the two-year college into a four-year STEM major at a four-year institution. We are seeking an increase in STEM transfer readiness through STEM Quality Point attainment, better self-efficacy in STEM transfer and navigating the college system, and a greater commitment to STEM transfer and career goals. Though challenging to implement in practice, preliminary results from this study suggest that supporting students in the curricular domain to take more STEM credits and to successfully complete those credits early in their academic career (analyzed as first semester STEM Quality Points) improves their probability of successfully transferring. Most striking, this result held true for students even if they are starting their math trajectory below college level. The median STEM QP attained by students that successfully transferred and that completed their first semester STEM QP during their time with the program was also substantially higher than for the students that transferred and completed their first semester STEM QP prior to participating in the program. These promising results speak to the efforts put in place to support students in the curricular domain, although further research with a comparison group is needed to establish the independent impact of the program on participants' academic progress and success. The program supports included providing professional development to faculty mentors and academic advisors on the importance of STEM Quality Points, and through providing peer tutoring and weekly "study jams" for participants to support their success in STEM coursework. Additional

support for participants, especially those at the remedial math level, was found through interactions with peer leaders, regular ISP meetings, and utilizing the STEM Center for additional community building and peer support.

TABLE 6 | Inspire Scholars Program participant momentum trajectories by academic load.

Academic load	Linear upward	Detoured	Deferred	Taking a break
Half-time	2		2	
Three-quarter time	2	3		4
Full time	28	14	5	9
Total	32	17	7	13
% Of total (out of 69)	46%	25%	10%	19%

The process of developing the cohort and a definition of "first semester" to use for analysis of STEM Quality Points brought sharply into focus how few of the participants in ISP 'fit' the traditional "vertical transfer" model. Wang and other researchers have broadened the STEM Momentum model (Park et al., 2020; Wang, 2017) to include student aspirations and motivation as predictors of STEM Baccalaureate success. This more nuanced look at the student experience is further investigated in Wang's book "On My Own" (Wang, 2020) which categorizes the STEM student transfer experience into four "momentum trajectories". The first trajectory, called "Linear Upward" follows the vertical transfer model that is the typical model for transfer from a 2 to 4year institution and is used in much of the research around transfer (Handel, 2013; Handel and Williams, 2012; Shapiro et al., 2017a; Shapiro et al., 2017b). The second trajectory is referred to as "detoured". This detoured group experiences delays in transfer and/or engages in "swirling", which, in itself, has many definitions (Wang and Pilarzyk, 2009; Soler, 2020; Wickersham, 2020), though, most generally is defined as backand-forth enrollment at different institutions. The third trajectory is the "deferred" student, which is a student that chooses to forego transfer after credential completion at the two-year college. The final trajectory, called "taking a break" is the students that are typically categorized as "stopped-out", though, as noted by the student interviews in the book, that does not necessarily mean they will not return to their studies at a later time (Adelman, 2006; Shapiro et al., 2017a). Each of these trajectories points to the varied ways 2-year college students navigate their journey to transfer and highlight the challenges researchers face to understand the how and the why of successful STEM transfer. The participant characteristics were matched onto the momentum trajectories defined in Wang (2020, pp. 193–194), leading to the breakdown for all 69 participants in the program as shown in Table 6. As can be seen in the table, fewer than half of the participants were "Linear Upward" in their trajectories.

Often, programming to support STEM transfer is designed for the "linear upward" group of students, though results from this program (see Table 7) show just 25 of the 42 students (60%) that transferred and/or earned an associate degree were in the Linear Upward trajectory. The large number of students in the "Detoured" momentum group were found to have either spent a large number of semesters at Madison College, or have transfer credits from one or more other colleges, and/or repeated critical STEM coursework.

Breaking down the participant characteristics by momentum trajectory allows for some interesting patterns to emerge and highlights some unintended challenges and benefits of the Inspire Scholars Program. For example, it is not surprising that all of the "deferred" students came from applied associate degree programs. Students in those programs do have access to transfer, but in general, the transfer agreements in place for their programs are in place for only a specific college, that is often expensive, or has other barriers such as being outside of the local area. So, the students end up with credits with very limited transferability. In addition, almost half of the Black, male scholars were on this trajectory and enrolled in applied STEM programs, which explains why the transfer rate for women was higher than for men as shown in Table 5. Another interesting finding is the large number of 'detoured' students that the program was able to support to successfully transfer and/or earn an associate degree (10 out of 17 students or 59%), with the remaining students still enrolled at Madison College. Another promising result from ISP is the large percentage of the students in the Linear Upward trajectory that are low income, as shown in Figure 2 and 1st generation, as shown in Figure 3.

There are limitations to the conclusions that can be drawn from this study, due to the small number of participant (n 69), and the challenges that exist in having participants engage with the program and differing points in their journey, and the diverse student trajectories. That said, the promising results from the Madison College Inspire Scholars Program show that interventions can help support URM STEM-interested students build transfer capital in the following ways:

- By providing a variety of roles for participants to engage with the program, students were able to create and grow with a STEM community and engage with the program at a level that worked best for their personal and educational needs. 20% of the participants held more than one role while engaged with the ISP, and 36% of the participants were involved with the program for at least three semesters.

- The academic and professional development provided to participants during the biweekly meetings and engagement with faculty mentors ensured participants had support to help navigate the confusing path to transfer. The meetings were run by peer leaders with guest speakers and topics during the meetings including: choosing a transfer institution, financial literacy and paying for college, applying for REU′s, creating a professional presence, and more. In addition, faculty mentors were provided with checklists with key transfer and enrollment-related deadlines to support participants during their one-on-one meetings.
- The partnership with UW Madison created connections with students, faculty, staff and administrators at the college′s top transfer institution. Students and staff from UW Madison attended a program meeting each semester at Madison College to answer transfer questions and support community building. This was followed by a transfer event hosted by UW Madison that participants attended where they heard from former participants that successfully transferred, faculty, administrators, and other students about the transfer process. All of this culminated in a STEM Immersion 4-day transfer experience for all participants that were accepted to UW Madison to ensure a smooth transition.

TABLE 7 | Transfer and associate degree completion status of Inspire Scholars Program participants by momentum trajectory.

Trajectory	Status	# Of students
Linear upward	Transferred[a]	24
	Earned an associate degree	1
	Enrolled	7
Detoured	Transferred[a]	7
	Earned an associate degree	3
	Enrolled	7
Deferred	Earned an associate degree	7
Taking a break	Stopped out	13
Total		69

[a]Transferred includes students that transferred and also earned an associate degree.

The WSTPP gave "proof of concept" for much of the programming and supports implemented in the ISP.
Specifically, the ISP built on the faculty mentoring, regular participant meetings, student stipends, and partnerships with transfer institutions. In addition, the WSTPP created a base of faculty mentors and students that increased awareness of the program and provided an initial pool of peer tutors and peer leaders from which the ISP could recruit. Processes developed in the WSTPP were expanded and institutionalized in the ISP so that students who did not satisfy WSTTP application requirements were able to access the programming through the ISP. The supports of the STEM Center, the UW Madison STEM Immersion, the one-to-one course transfer into a number of STEM programs across the state, and the geographic availability of UW Madison, all worked to support this project. Overall, the interventions and supports implemented for this program worked in tandem to provide support and improve the success for student participants.

Suggestions for Future Work

The strong results from the program have limitations that could be addressed in future work. As discussed earlier, the lack of a clear comparison group prevents robust experimental analysis of the program. A method of limiting the cohort to first semester, first time students does not adequately capture the aspects of the eligible students for this project. The authors suggest surveying all eligible students at the beginning and end of a semester. Connecting the survey data with transcript and administrative data would enable a thorough analysis of the program to determine cause and effect. Interviewing students that participated in the program would also provide valuable insights into the student experience.

In addition to a more robust analysis, there are areas to expand the program that show promise to benefit students intending to transfer in STEM, one being the development of new and/or stronger partnerships between 2 and 4-year institutions. These partnerships would provide opportunities for faculty to cultivate relationships across institutions, which have been shown to benefit transfer students (Martinez, 2019). These relationships are also critical to enable applied associate degree programs and 4-year transfer partners to build more robust/broadly accepted transfer agreements and coursework. Finally, a component of holistic momentum that was left untouched by the design of this program is in the instructional domain, specifically the student experience in the classroom. Efforts to support faculty to improve the classroom experience for URM STEM students are worth exploring, as experiences for 2-year college students in the classroom have a significant impact on their success (McPhail, 2015; Wang et al., 2017b). The more than 20 faculty mentors for the ISP are invested in the success of the participants in the program and thus may be willing participants in professional development around improving their classroom practices to further increase URM student STEM success.

Though college contexts are unique, there are many aspects of the Madison College Inspire Scholars Program that show promise for increasing STEM transfer success for URM students enrolled at a 2-year college. It is important to note the interconnected nature of the supports put in place by the program to ensure a holistic support structure for the participants. That said, a few key interventions stand out as having the greatest impact on participant engagement and success. The most important components of the ISP were the tiered participation structure, and the bi-weekly meetings coupled with faculty mentoring. The meetings served various purposes that promoted successful STEM transfer. First, the meetings provided a means for participants to connect with one another and build community through shared experiences. The meetings were the only STEM-related events on campus where the majority of the participants were ethnic minorities, and the facilitators were peers (the peer leaders). Second, the professional and academic development training provided during the meetings was specifically designed to provide students with a road-map for successful transfer and to equip students with the knowledge and tools for its successful implementation. The faculty mentors were charged with ensuring that students participating in the ISP stayed on task and followed the road-map. So critical were the mentors that all participants regardless of role, were required to meet regularly with their mentors. Mentors were provided checklists of program responsibilities and important deadlines along with summaries of the bi-weekly meetings and asked to encourage their students to take action and apply what they had learned. Faculty mentors were also provided academic progress reports on their mentees in order to provide students with timely access to the resources needed to address any challenges encountered in their classes and thus stay on track in the curricular domain. The value of mentoring by faculty cannot be understated. Most minoritized students attending Madison College are first generation students with few family members or close friends with any experience successfully completing a college degree. Through their faculty mentor, each student had immediate access to someone who retained a wealth of knowledge and experience successfully navigating higher education and who was generally well connected at the college with access to significant college resources. Any transfer support program in order to be effective should include these or similar components that both build community among students of similar interests and also provide individualized academic support through mentoring.

On a final note, the analysis of first semester STEM QP brought some interesting patterns to the front that are worth

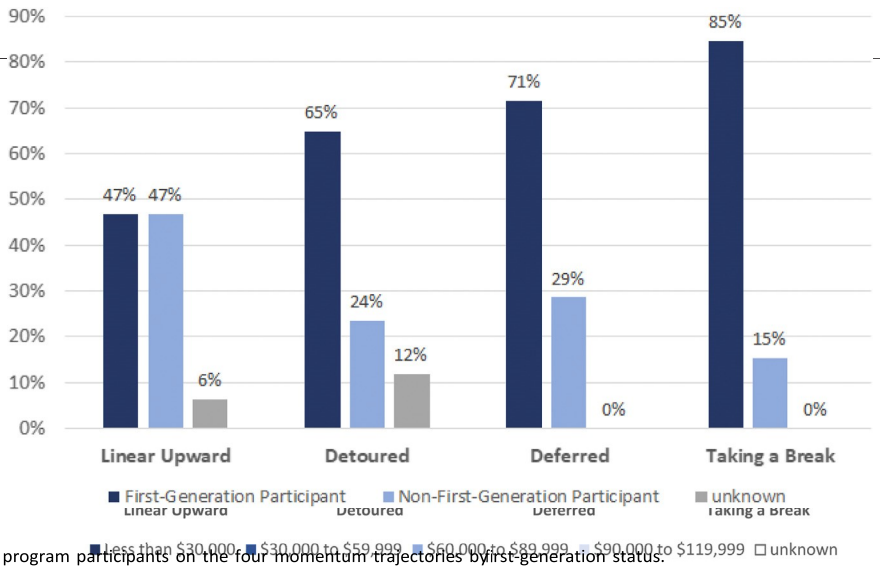

FIGURE 3 | Percentage of program participants on the four momentum trajectories by first-generation status.

FIGURE 2 | Percentage of program participants on the four momentum trajectories by family income.

consideration when developing an intervention such as the ISP. One consideration is how few of the students fit into a traditional postsecondary model with an easily definable first semester, and how little that mattered for transfer. Students that earned their first semester STEM QP during the program were completing transfer level STEM courses in other disciplines prior to the official "first semester" they attempted a transfer level math course. Even more striking, the students in the program that had experienced math remediation at some point at the college successfully transferred at a rate of 43.5%, more than double the baseline rate. It is therefore critical, when creating a program to support students interested in STEM transfer, if the goal is to truly broaden participation, to ensure the program is built with broad eligibility requirements. Colleges must remove barriers to participation in support programs by lowering minimum GPA requirements, allowing part-time students to engage with the supports, and most critically, allowing students to participate prior to completing college level math. Supporting students holistically through community, mentoring, and ensuring they take and successfully complete multiple STEM courses each semester, no matter their "level" is key to the success of the program and thus, the students.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because student data is protected through an IRB. Requests to access the datasets should be directed to bpsansinghelton@madisoncollege.edu.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at:
https://www.frontiersin.org/articles/10.3389/feduc.2021.667091 / full#supplementary-material

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