ARTICLE

Students from Marginalized Communities in Research: A Randomized Control Trial

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Abstract

The Research-Aligned Mentorship (RAM) program at Farmingdale State College is changing the trajectories of racial minority students, students of low socioeconomic status, and first-generation undergraduate students. This article reviews the RAM program from 2016 through 2022. During that period, Farmingdale welcomed seven cohorts of RAM Scholars, totaling 1530 students from historically marginalized groups (or 28 percent of each entering class of first-time, full-time students). This randomized control trial demonstrates that students from marginalized communities who enter college with varying records of prior academic achievement can succeed in undertaking rigorous mentored research. Furthermore, students in the RAM program have achieved superior outcomes in four-year graduation, retention, credits earned, and grade point average when compared to the control group of students from the same historically marginalized groups.

Keywords: *underrepresented minority, first generation, one-on-one mentored research, extracurricular research programs, interdisciplinary/multidisciplinary, primarily undergraduate institution*

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The Research-Aligned Mentorship (RAM) program at Farmingdale State College (FSC) State University of New York (SUNY) is a holistic program of intentional, carefully orchestrated mentoring and guidance that prepares racial minority students, students of low socioeconomic status, and first-generation undergraduate students to succeed in undergraduate research. The program culminates in placing students in research experiences on or off campus that open their eyes to new opportunities and change the trajectories of their lives. It also is a proven example of a cost-effective program that is increasing the four-year graduation rates of students from historically marginalized communities. RAM is a very large program that each year welcomes approximately 200 students (or 28 percent) of the entering class of first-year students seeking baccalaureate degrees.

Located on New York's Long Island, Farmingdale State College is a teaching-centered institution. Its 10,000 undergraduates embody the demographic elements found at many of America's universities today: high numbers of commuters (96 percent), racial minority students (44 percent), students of low socioeconomic status (59 percent), and first-generation students (44 percent). Institutions with these kinds of numbers generally suffer from low graduation rates (National Center for Statistics 2021, 2009).

In 2015 FSC resolved to improve education and student success by addressing two realities:

- The institution's four-year graduation rate was only 20 percent (IPEDS 2009).
- The institution was failing large numbers of individuals from marginalized groups.

With these goals in mind, FSC elected to apply for a US Department of Education Fund for the Improvement of Postsecondary Education (FIPSE) First in the World (FITW) grant that was offered by the Obama administration. As explained in the federal grants announcement for FY 2015: "The FITW program is designed to support the development, replication, and dissemination of

innovative solutions and evidence for what works in addressing persistent and widespread challenges in postsecondary education for students who are at risk for not persisting in and completing postsecondary programs" (Office of Postsecondary Education 2015). In a previous announcement, the administration placed particular emphasis on affordability: "Successful FITW projects will support greater college affordability for students, through the implementation and evaluation of practices and strategies that have the potential to reduce costs while delivering high-quality academic programs to students" (US Department of Education 2014). Moreover, the description included a priority preference for program assessment with a randomized controlled trial (RCT) methodology that met What Works Clearinghouse evaluation standards without reservations (What Works Clearinghouse 2020).

Addressing the challenges faced by students from marginalized communities at FSC, classic works on student engagement and retention were consulted (Aljohani 2016; Astin 1984; Bean 1982; Finley and McNair 2013; Kuh 2008; Pascarella 1980; Tinto 1975, 2012, 2017; Upcraft, Gardner, and Barefoot 2005). Going beyond traditional remedies such as orientation and advisement, FSC sought to create something that would bring the education of FSC students to a higher level and provide them with more powerful learning experiences. Scholarship indicated that undergraduate research increased the likelihood that undergraduate students would persist to graduation (Carter, Mandell, and Maton 2009; Chang et al. 2014; Graham et al. 2013; Hakim 2000; Hensel 2012; Lopatto 2007). FSC identified a promising model for undergraduate research offered by the University of California, Los Angeles (UCLA): the Program for Excellence in Education and Research in the Sciences (PEERS). PEERS is a research-centered program that has seen significant improvements for physical and life science majors from marginalized communities (Toven-Lindsey et al. 2015).

FSC joined the Council on Undergraduate Research and, to emphasize undergraduate research, named its effort the Research-Aligned Mentorship program. The RAM program would replicate parts of the UCLA model, but also would modify it in significant ways to account for major differences between UCLA and FSC. UCLA is an R-1 institution with large numbers of faculty researchers, whereas FSC is a teaching-centered institution with fewer faculty researchers. Entering UCLA students had SAT reading and math average scores of 680 and 760, whereas FSC student scores were 510 and 540 (IPEDS 2009). Also, unlike UCLA, the RAM program would not be an elite honors program to which students would apply, nor would RAM Scholars receive scholarships for their participation in the program. Furthermore, the RAM program would not be restricted to science majors but would be open to students from all majors.

FSC was awarded a five-year FIPSE FITW grant for $3 million in 2015. From fall 2016 through fall 2022, seven cohorts comprising 1530 first-time, full-time students participated in the RAM program as RAM Scholars.

Description

The FSC program is the subject of rigorous evaluation that meets What Works Clearinghouse Standards without reservations. Farmingdale conducts an RCT (Hesse-Biber 2013; Mertens and Hesse-Biber 2013; White 2013). Each fall, approximately 360 students are randomly selected from a database of all entering first-time, full-time undergraduate students who fall into these demographics: racial minority, first-generation, or low socioeconomic status. Approximately 200 of those selected students are randomly assigned to the RAM program and constitute the treatment group. The remaining randomly selected students (approximately 160) are assigned to the control group. This split is based on the number of entering students who are from historically marginalized communities, the capacity of the program, and the desire to have a control group at least 80 percent the size of the treatment group.

Because of random selection, the treatment group of RAM Scholars is drawn from every academic major on campus, across the divisions of arts and sciences, business, health sciences, and engineering. Random selection includes students whose records of prior academic achievements range from very strong to very weak. Because FSC is a college of applied science and technology, 57 percent of RAM Scholars are science, technology, engineering, and mathematics (STEM) majors. Although other highly regarded programs (e.g., the University of Maryland, Baltimore County's celebrated Meyerhoff Scholars Program and the new Simons STEM Scholars Program established at Stony Brook University in 2023) offer scholarships to their students, the FSC RAM program offers no scholarships and does not screen for high-performing students (Carter et al. 2009; Lee and Harmon 2013; Maton et al. 2012; Simons STEM Scholars Program 2024; "Stony Brook University" 2023).

In line with the priorities of the First in the World grant and the RAM program design, the central research questions guiding this study are: (a) How effective is the program in placing students with marginalized backgrounds into rigorous and successful mentored research experiences? (b) What is the impact of participation in the RAM program on annual retention, credits earned, and grade point average (GPA)? and (c) Can the program deliver high-quality academic education while also keeping students on track to graduate in four years, enabling them to save tuition money and time to degree?

Now that large numbers of RAM Scholars have advanced through the four-year program (including their third- and fourth-year research experience), the first research question

can be answered. The RAM program has been successful in placing historically marginalized students into rigorous and successful mentored research experiences outside of the traditional classroom. In Cohorts 1 and 2, which began in fall 2016 and fall 2017, 360 marginalized students initially entered FSC as RAM Scholars. In total, 264 of those students (or 73.3 percent) persisted in the program into their fourth year. Of those 264 students, 262 completed research experiences: 162 on campus with a faculty mentor and 100 in off-campus placements. It is notable that during this period 56 RAM Scholars secured competitive summer research opportunities that were funded primarily by the National Science Foundation (NSF), National Institutes of Health (NIH), US Department of Energy, and the Leadership Alliance. Students engaged in research at universities across the nation, including: Alabama, Bowie State, Brookhaven National Lab, Brown, UC Berkeley, California State University San Marcos, UC San Diego, Columbia, Cornell, City University of New York, Feinstein Institute for Medical Research, Miami, Minnesota, Massachusetts Institute of Technology, Montana, Montana State, Nebraska, New York University Medical Center, Pennsylvania, Pepperdine, Rutgers, South Carolina, Stanford, Stony Brook, Texas, Texas A&M, Wisconsin–Madison, West Virginia, and, outside of the United States, the University of Winnipeg and University of Nairobi. Prior to the RAM program, FSC students had never participated in funded off-campus placements. RAM's mentored research outside of the traditional classroom offers a truly transformative learning experience that prepares students for promising futures.

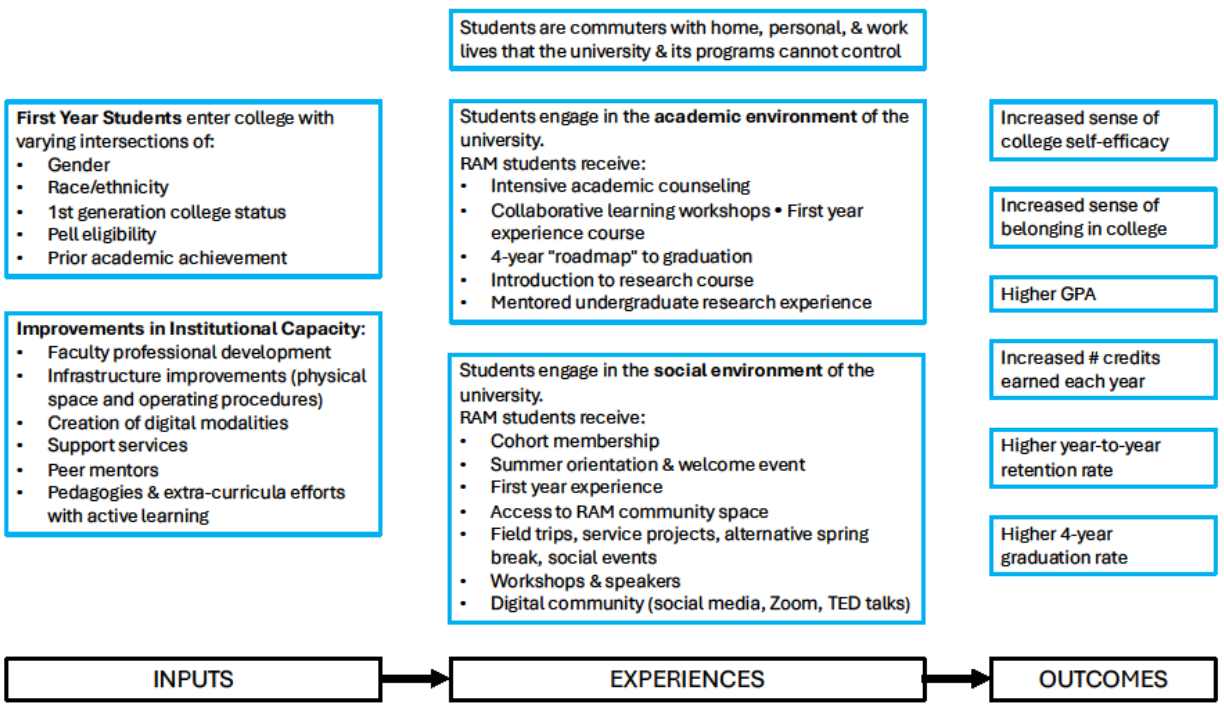
To understand and appreciate the efficacy of the program in successfully placing RAM Scholars in research experiences, one must examine the four years of support that is designed to prepare RAM Scholars for successful research. There is no single intervention that provides students with a transformative college experience (Schreiner 2010). Rather, RAM staff orchestrate different layers of experience that form the catalyst for student achievement, including improved persistence, academic performance, four-year graduation, and success in mentored research. From the start, the RAM program has employed a specific conceptual framework (see Figure 1).

RAM's six-person team (director, associate director, assistant director, two counselors, and an administrative coordinator) provide students with a dynamic immersive experience that, through careful mentoring and engagement, sees students grow in self-confidence, develop higher-order cognitive skills, and display the competencies of successful researchers (Cabrera et al. 2021).

The essential inputs of the RAM program are:

- Physical space. A large conference room in the library is the headquarters for RAM students to study and socialize. Students call it RAM central.

FIGURE 1. RAM Program Conceptual Framework



- Faculty development. On October 23, 2015, Nancy Hensel, past president of the Council on Undergraduate Research, launched the program with a keynote address to faculty, administrators, and staff on engaging students in undergraduate research. As part of the RAM program, faculty receive professional development to strengthen their roles as mentors, teachers, and sympathetic allies of RAM Scholars. The program makes special efforts to apprise faculty of the noncognitive factors that often disrupt the sense of social belonging and derail the academic success of marginalized students (Sparkman, Maulding and Roberts 2012; Walton and Cohen 2011).

As the conceptual framework suggests, the RAM program provides academic and social environments that are conducive to academic success. What happens in the first year is key (Felton et al. 2016; Gardner 2023). The key RAM experiences are: (a) welcome programs, (b) new courses, (c) first-year to fourth-year mentoring and holistic counseling, (d) community-building activities, and (e) mentored research.

Welcome Programs

- Welcome materials: Each student receives a personalized letter congratulating the student on being selected for the prestigious RAM program, explaining that the student is one of just 200 lucky incoming students who "won the lottery" for admission into RAM. A 12-page pamphlet introduces the RAM staff and highlights the program's components.
- Intensive summer orientation: The two-day RAM kickoff is a celebratory welcome event that brings the incoming cohort of RAM Scholars together with the RAM staff, student leaders, and key support staff (parents are welcome on Day 1). By the second day the program becomes more interactive, and early friendships and bonds are formed among RAM Scholars. They even play a raucous game of "RAMily Feud" (Chan 2019).
- Opening program: RAM hosts an evening reception for all new RAM Scholars and their family members. The college president, provost, deans, and key faculty mentors speak with new students and their families.

New Courses

- First-year seminars: In the summer, RAM counselors meet one-on-one with each new RAM student and their parents or guardians. In the fall, each new student enrolls in RAM 101, a first-year seminar, taught by their own RAM counselor. RAM 101 acclimates students to the expectations of undergraduate instructors and the need to participate in class activities and to acquire listening and study skills through journaling. They also view and discuss TED talks, for example, Angela Duckworth on the ability to develop "grit" (Duckworth 2013, 2016). First-year experience courses have been found to have a pronounced impact on the trajectory of students' lives (Fitzpatrick et al. 2020; Goodman and Pascarella 2006; Upcraft et al. 2005).
- Collaborative learning workshop: RAM 102, 1-credit sections attached to statistics and precalculus courses and populated exclusively by RAM students, are modeled on the innovative work of Uri Treisman (Duncan and Dick 2000; Louis 2022; Treisman 1985, 1992).
- Introduction to Research seminar: As second-year students, RAM Scholars enroll in a research seminar, RAM 201, with separate sections dedicated to STEM, business, social science, and communication majors (Cunningham et al. 2015; Shields, Gajdosik-Nivens, and Ness 2017). The seminar covers searching for research articles, developing research proposals, and research ethics. Students become institutional review board (IRB)–certified to undertake research with human subjects. There also are workshops on securing NSF research experiences for undergraduates (REUs) and other funding for student research.

Mentorship

Personal and academic counseling for RAM Scholars is intrinsic to the RAM program. During their first two years, each student must meet twice each semester with their assigned counselor. In their last two years, they must see their counselor at least once a semester. They maintain a weekly online journal, a "Roadmap to Graduation and Success," that is shared with their counselor. Beyond traditional academic advisement, RAM counseling is designed to counteract the lack of self-confidence often found among students from marginalized communities (Cisneros et al. 2023, McGee 2021). The bond between the first-year student and counselor is strong because the counselor also is the instructor of the student's RAM 101 section. In fact, records show students meeting with their counselors not twice a semester, but six times each semester.

During the spring of their second year, the students transition to a new counselor, the director or associate director of the program, who also serve as instructors of RAM 201 (Introduction to Research). They prepare their advisees for their research experiences and help them with postgraduation plans.

Community

On a campus at which 96 percent of students are commuters, engagement and community do not come easily (Garza and Fullerton 2018). RAM Scholars are introduced early and throughout the years to student clubs and activities, as well as to RAM-sponsored speakers, film nights, workshops, and social gatherings. RAM created "RAMdom Acts of Service" (e.g., volunteering at homeless shelters, soup kitchens, cancer walks, and highway cleanups). RAM also launched "alternative spring break," during which students work for Habitat for Humanity while living together in another state. The students refer to these bonding activities as "RAMily."

TABLE 1. Descriptive Statistics of Treatment and Control Cohorts 1–4

	Treatment		Control	
	Frequency	Percentage	Frequency	Percentage
Sample size	771		557	
Women of color	208	27	163	29
Men of color	250	32	183	33
White women	127	17	90	16
White men	183	24	118	21
Pell eligible	440	57	303	54
First-generation undergraduate	437	57	341	61

Mentored Research

The four-year RAM program culminates in a high-impact learning experience: mentored research outside of the traditional classroom (Eagan et al. 2013; Gentile, Brenner, and Stephens 2017; Gilmore et al. 2015; Hensel 2012; Kahn 2023; Lopatto 2016 ; Sell, Naginey, and Stanton 2018). The directors of the RAM program are proactive in identifying research placements for RAM Scholars, interviewing 200-plus FSC faculty researchers and building a database of research opportunities available on campus. They also create a searchable web-based inventory of research opportunities at universities and laboratories across the nation and assist students with their applications to such summer programs.

As detailed previously, many RAM Scholars research on campus with faculty mentors. Alternatively, the students pursue a research-based internship off campus in a business or health-care setting or secure a funded research position at a major university, including NSF REUs. All participating students, faculty mentors, and off-campus mentors abide by the RAM Research Guidebook. The guidebook contains a contractual agreement that is signed by the student and mentor. The contract specifies the student's learning objectives and the responsibilities of each participant. Each student maintains a log of activities, prepares weekly journal entries that capture their thoughts about their experiences, and completes midterm and final self-evaluations. Research mentors often invite their RAM Scholars to join them in submitting posters and papers to professional conferences.

Assessment

Since fall 2016, there have been seven cohorts of students in the RAM program (1530 students assigned to the RAM treatment group and 1110 non-RAM control group students). This assessment is based upon the first four cohorts, whose data were virtually complete before the disruptions of COVID that included campus closures and suspension of key community-building get-togethers. The demographic breakdown of students in the first four cohorts is presented in Table 1.

The collection of data by FSC's Office of Institutional Research allowed this study to gain access to essential data on students (race or ethnicity, gender, prior academic achievement, Pell grant eligibility as a proxy for low income, and status as a first-generation college student). Moreover, the registrar shared information on students' progress toward graduation (GPA, credits earned, and semester-to-semester retention). The quantitative results from this randomized controlled trial with low attrition meet What Works Clearinghouse standards for evidence without reservations (What Works Clearinghouse 2020).

Beyond the impressive data presented on RAM Scholar research placements, this RCT analysis has yielded four key findings that convey the effectiveness of the RAM program.

Finding 1

Regarding graduation rates, RAM Scholars in Cohorts 1 and 2 (who entered as first-year students in fall 2016 and fall 2017) had statistically higher four-year graduation rates than the students in the control group. Additionally, beyond the RCT treatment vs control analysis, this study compared RAM Scholars with the overall FSC student population. The second table attests to the statistically higher four-year graduation rates of RAM Scholars compared to the overall FSC student body (excluding RAM Scholars). See Tables 2.

Finding 2

RAM Scholars were retained at a statistically significant higher rate than the control group. See Table 3.

Findings 3 and 4

Among those students who persisted at Farmingdale, continuing RAM Scholars were more likely than continuing

TABLE 2. Four-Year Graduation Rates: RAM Treatment vs Control and Farmington State College (FSC) Overall

RAM treatment				Control group					
	No. of students who initially entered FSC	No. of students who graduated in 4 years	% of RAM students who graduated in 4 years		No. of students who initially entered FSC	No. of students who graduated in 4 years	% of control students who graduated in 4 years	% difference	*p* value
Cohort 1	199	99	49.75	Cohort 1	157	60	38.22	−11.53	$p < .05$
Cohort 2	169	88	52.07	Cohort 2	158	48	30.38	−21.69	$p < .001$
Cohorts 1,2	368	187	50.82	Cohorts 1, 2	315	108	34.29	−16.53	$p < .001$
RAM treatment				FSC overall (excluding RAM)					
	No. of students who initially entered FSC	No. ofstudents who graduated in 4 years	% of students graduated		No.of students who initially entered FSC	No. of students who graduated in 4 years	% of students graduated	% difference	*p* value
Cohort 1	199	99	49.75	Entered Fall 2016	530	164	30.94	−18.81	$p < .001$
Cohort 2	169	88	52.07	Entered Fall 2017	521	193	37.04	−15.03	$p < .001$
Cohorts 1,2 Combined	368	187	50.82	Entered Fall ’16+’17	1051	357	33.97	−16.85	$p < .001$

Note: RAM Scholars graduated at a significantly higher rate than control students and FSC overall.

TABLE 3. RAM Treatment vs Control Cumulative Retention Rates

RAM treatment Cohorts 1–4				Control Cohorts 1–4				Comparison	
Retention	No. of students who initially entered FSC	No. of students returning in fall	% of students retained	Retention	No. of students who initially entered FSC	No. of students returning in fall	% of students retained	% difference	*p* value
Yrs 1 to 2 Cohorts 1,2,3,4	750	675	90.00	Yrs 1 to 2 Cohorts 1,2,3,4	631	518	82.09	–7.91	$p < .001$
Yrs 2 to 3 Cohorts 1,2,3	560	465	83.04	Yrs 2 to 3 Cohorts 1,2,3	463	327	70.63	–12.41	$p < .001$
Yrs 3 to 4 Cohorts 1,2	360	264	73.33	Yrs 3 to 4 Cohorts 1,2	312	195	62.50	–10.83	$p < .005$

Note: RAM students were retained at a statistically significant higher rate than control students. FSC, Farmington State College.

TABLE 4. Comparison of Mean Cumulative Credits Earned by Continuing RAM Scholars vs Control Group Students

	Treatment			Control			Comparison	
	No. of students	Mean credits	Standard deviation	No. of students	Mean credits	Standard deviation	Difference	*p* value
Cohorts 1–4	771	62.78	5.13	565	57.66	4.31	–5.12	$p < .001$

Note: RAM Scholars Cohorts 1–4 were more likely to earn more credits than control students Cohorts 1–4 in 2016–2020 at a statistically significant rate.

TABLE 5. Comparison of Mean Cumulative GPA of Continuing RAM Scholars vs Control Group Students

	Treatment			Control			Comparison	
	No. of students	Mean GPA	Standard deviation	No. of students	Mean GPA	Standard deviation	Difference	*p value*
Cohorts 1–4	771	2.81	0.62	565	2.61	0.67	–0.26	$p < .001$

Note: RAM Scholars Cohorts 1–4 were more likely to earn higher cumulative GPAs than control students Cohorts 1–4 in 2016–2020 at a statistically significant rate.

control group students to (a) earn more credits each year, and (b) perform better in their coursework during their first three years (cumulative GPA). See Tables 4 and 5.

It is important to recognize that, although many special initiatives do not outlast their original source of outside funding, this did not happen at FSC when the FITW grant expired in 2020. Beyond the statistical evidence that the goals of the RAM program (e.g., research experience, retention) have been achieved, FSC appreciates that the RAM program brings credit to the institution and is aware that RAM essentially pays for itself through increased retention. The highly regarded Research-Aligned Mentorship program continues at Farmingdale State College.

Discussion

This quantitative analysis demonstrates that students of a racial minority, students of low socioeconomic status, and first-generation undergraduate students, all of whom traditionally have low graduation rates, can succeed in research when they experience a carefully constructed four-year program of academic and social interventions that culminates in a significant research experience.

The overriding lessons learned are these:

1. Students with marginalized identities, with low socioeconomic status, or first-generation status, who enter college with varying records of prior academic achievement, can succeed and thrive in rigorous research experiences outside of the traditional classroom.
2. Providing students with a four-year program of social and academic supports and interventions promotes persistence, academic achievement, and success in mentored research.

Additional lessons that one can learn from the FSC RAM program are:

1. Colleges and universities like Farmingdale—primarily teaching institutions—can construct programs that produce exceptional academic achievements in marginalized groups of students.
2. When more opportunities for academic and social engagement are provided, there is a significant impact on student persistence and success.
3. Courses and experiences in the first two years appear to be key contributors to the program's success.
4. Academic achievement is directly related to the establishment of first-year through fourth-year mentoring and holistic counseling.
5. Year-to-year retention improves when students experience a social environment on campus that they think of as a family.
6. Housing a program in the academic division and embedding critical elements of it in the curriculum secures the interest and support of faculty and academic administration.
7. Faculty development efforts produce capable mentors and advocates.
8. Programs that feature powerful mentored research experiences need not be small elite programs that offer scholarships or are restricted to honors students.
9. Programs like RAM that produce superior retention rates yield increased tuition revenues that offset basic personnel and operating expenses.

Conclusion

The RAM program at Farmingdale State College was born as an answer to some difficult questions: Can students from historically marginalized groups with a wide range of prior academic achievements succeed in rigorous research? What can be done to improve the annual retention, annual credits earned, GPA, and four-year graduation rates of students of a racial minority, students of low socioeconomic status, and first-generation undergraduates?

A randomly selected group of historically marginalized students at Farmingdale State College has outperformed a control group of similar students. RAM Scholars improved on annual retention, annual credits earned, GPA, and four-year graduation rates. Moreover, RAM Scholars not only worked with FSC faculty on research projects, but many were accepted into research programs funded by NSF, NIH, and other agencies as well as at first-tier colleges and universities across the nation.

By placing RAM Scholars in rigorous research outside of the traditional classroom, the Research-Aligned Mentorship program is transforming the lives of students and preparing them for success in careers and advanced study. Because teaching-centered institutions educate most racial minority students, students with low socioeconomic status, and first-generation undergraduate students in the United States, Farmingdale's RAM program provides a model for creating better outcomes for large numbers of American students.

Data Availability

In addition to the data presented in this article, the mixed-methods analysis and detailed results of this study were collected by the outside evaluator, Kate Winter. Please contact the author (bevkahn@gmail.com) to request access to data.

Institutional Review Board

The research study supporting this article was determined exempt from IRB oversight by the institutional review board at Farmingdale State College (IRB Reg 0005068).

Conflicts of Interest

The author has no conflicts of interest to declare.

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