Creating Pathways to Graduate Success: Lessons from a Summer Program in Mobilization and Political Economy

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Abstract

Students from underrepresented populations, including women, first-generation students, and racial and ethnic minorities, face persistent barriers in accessing graduate education and professional development opportunities, particularly in the social sciences. To address these disparities, graduate pipeline programs can provide critical support by providing networking and mentoring opportunities, closing methodological and research skill gaps, and preparing participants to apply to competitive graduate programs. This article outlines the principles and goals of a summer program focused on mobilization and political economy by detailing the rationale, implementation strategies, and evaluation framework used to assess its effects. Evaluation of the inaugural program demonstrated the success of a multilayered mentoring approach, tailored curricula, and comprehensive support structures in fostering participants' academic growth and career readiness. By highlighting best practices and lessons, we provide a template for institutions seeking to develop initiatives associated with greater diversity in graduate programs in the social sciences, the academic market, and, ultimately, higher education.

Keywords: first-generation students, underrepresented minorities, mentoring.

Introduction

Underrepresented groups, including women, first-generation students, and racial and ethnic minorities, face persistent structural barriers in accessing graduate education and professional opportunities, particularly in the social sciences. These challenges include gaps in methodological training, limited access to academic networks, and inequities in graduate admissions processes that disproportionately affect students from non-traditional backgrounds (LeBouef and Dworkin 2021; Posselt 2016). As of 2023, only 8 percent of doctoral sociologists residing in the United States (U.S.) were Hispanic or Latinx, and 9 percent were Black or African American (National Science Foundation 2023). In this field, scholars and institutions have implemented a variety of initiatives to enhance underrepresented minorities (URM) students' confidence as knowledge creators, as well as a sense of belonging in academia, by adopting critical pedagogy frameworks, providing networking and mentoring opportunities, and offering resources tailored to their specific needs for career planning (Castillo et al. 2023; Crawford et al. 1996; Jehangir 2010; Virnoche 2023; Wahl 2023). The struggle to diversify the field of sociology is also mirrored across the social sciences, including the discipline of political science (Brutger 2024; Tormos-Aponte 2021). Despite these noteworthy efforts, significant gaps remain—particularly in fields like political economy and mobilization studies— where URM representation is scarce.

To address these challenges, we developed the Mobilization and Political Economy (MPE) Summer Program, a structured research and mentoring initiative funded by the National Science Foundation (NSF) through a Research Experience for Undergraduates (REU) award. This eight-week, in-residence program which is hosted at an R-1 university was designed to support URM and first-generation undergraduate students in three core areas: (1) enhancing academic success

through expanded mentoring and networking opportunities, (2) providing rigorous methodological training to close research skill gaps, and (3) offering structured guidance in preparing for graduate school applications. By fostering an interdisciplinary approach that integrates various disciplines from the social sciences, the program also equips students with the tools to critically engage with pressing questions in the topics of mobilization and political economy, and their intersections.

Given inadequate mentoring opportunities for students from URM backgrounds (Brunsma, Embrick, and Shin 2017; Pfund et al. 2016; Schneider and Segura 2014), the MPE program provides resources, such as mentoring by faculty, graduate students, and peers, as well as professional socialization, which are factors associated with academic success and career satisfaction (Sorcinelli and Yun 2007; Virnoche 2023). Existing literature on this topic provides diverse examples in the social and behavioral sciences where mentors play a crucial role in helping URM mentees build confidence, develop self-efficacy as independent researchers, foster a sense of belonging within academic communities, develop soft skills, therefore reducing the likelihood of program withdrawal (Lanzi et al. 2019; Lovitts and Nelson 2000). Building on these models, we adopted a multi-layered model of mentoring that integrates one-on-one mentorship with a collective approach to advance racially and ethnically diverse academic communities (Schwartz-Shea 2020; Yanow 2020). By pairing experienced researchers at different levels in their academic careers with program participants, we encourage them to seek academic and professional guidance from multiple actors, including the program's directors, faculty, guest speakers, graduate student instructors, and university staff.

Beyond mentorship, existing research highlights that the underrepresentation of minoritized scholars in graduate programs is also linked to gaps in research proficiency, particularly in statistical skills and mathematical literacy, disproportionately affecting first-

generation students and African American students (Mireles 2023; Morris et al. 2020). Proficiency in data skills has become increasingly valuable in the age of big data, standing as an essential asset for succeeding in graduate studies and the job market, even for those focusing on qualitative research or mixed methods (Ciabattari et al. 2018; Markle 2017). Accordingly, the MPE program exposes participants to intensive methods-based training curricula designed to improve proficiency with research design, statistics, qualitative methods, analytical and software research tools, and writing practices related to the fields of mobilization and political economy.

Finally, research indicates that students from disadvantaged and racialized backgrounds face significant barriers to securing placements in graduate programs, particularly at elite universities. These universities often perpetuate formal and informal gatekeeping practices that favor students who graduated from prestigious colleges or those from multigenerational college-educated families, where they have greater access to social and cultural capital (Bhopal and Myers 2023; Chetty, Deming, and Friedman 2023; Posselt 2016). In light of these challenges, the MPE program is designed to support URMs and first-generation college students who seek to apply to graduate programs in the social sciences. This milestone requires a wide variety of skills, cultural knowledge, resources, and connections that are not often accessible to this population (Lareau 2015; Senter 2020). Acknowledging these trends, MPE's third goal is to support participants to identify graduate programs aligned with their interests, and provide resources to put together competitive application packages.

The program has attracted participants from a range of majors, including sociology, political science, economics, and anthropology, who share an interest in studying social movements, political economy, inequality, and diversity policies and politics. These topics are notably underrepresented in the awards granted by the NSF within the Division of Social,

Behavioral, and Economic Sciences. Among 210 funded grants, none include the terms “social movements” or “political economy” in their abstracts, only one mentions “collective action,” and just four references the word “politics” (National Science Foundation 2025).

In this article, we discuss the implementation and evaluation of the three goals that guided the design of the MPE program. Drawing from participant surveys, interviews, and insights from a prior pilot program at the University of Puerto Rico (UPR), we assess the program’s impact on students’ academic and professional development. By presenting these findings, we aim to offer a template for institutions to develop similar initiatives, contributing to broader efforts to increase URM representation in the social sciences and other labor markets.

This paper is organized as follows. First, we provide a detailed account of the implementation of each of the three MPE Program Goals. Next, we outline the evaluation methods based on learning outcomes and present our findings. Finally, we discuss the challenges encountered during this inaugural experience and explore opportunities for continuous improvement.

MPE Summer Institute: Inaugural Experience

The inaugural cohort of the MPE Program in Summer 2023 included seven students from underrepresented backgrounds selected from a competitive pool of over 60 applicants. Geographically, our finalists represented six higher education institutions located in Puerto Rico, California, Colorado, Florida, New York, Ohio, and Puerto Rico. Five out of seven participants were recruited from Minority Serving Institutions (MSI). The cohort included undergraduate students, from those who had just completed their sophomore year to recent graduates. Notably, two of the participants are now pursuing doctoral studies in R1 institutions.

Our recruitment efforts targeted non-R1 universities and MSIs through ongoing relationships with faculty and administrators. We expanded our outreach by sharing program information through professional societies, such as the American Sociological Association (ASA) and the American Political Science Association (APSA), leveraging social media platforms, and developing a comprehensive database of contacts using the NASA MSI List. Zoom sessions with program leaders and alumni provided additional guidance to applicants.

The application form was divided into three sections, each designed to assess different facets of the candidates' experiences and aspirations. In the first section, applicants described their research experiences. Recognizing that non-R1 institutions often offer fewer funded research opportunities for undergraduates, the selection committee evaluated not just the volume of experience. They also considered the initiative shown by each applicant in pursuing research opportunities connected with their academic journey, volunteer activities, and even their activist commitments. The second section required a short research statement outlining the project the applicant would pursue in the MPE Summer Program. We evaluated how well their research interests aligned with the program's core themes of Mobilization and Political Economy. Our aim is to create a collaborative learning environment enriched by both mentorship and peer exchange among trainees with shared interests. Finally, applicants submitted a personal statement discussing their career aspirations and explaining how the Summer Program could support their professional growth. Here, we assessed their drive to evolve as independent researchers and how they connected this opportunity to their personal backgrounds and identities. Throughout the years, we have refined this section by making the wording of the questions more precise, which in turn has helped the selection committee. Below, we describe the implementation of the three objectives that structure the MPE Summer Program, as illustrated in Table 1.

Table 1. MPE Program Goals

GOAL	DESCRIPTION
1	**Enhance academic success**: Foster the personal and professional growth and well-being of its target URM participants by exposing them to mentoring and networking resources.
2	**Close the methodological skills gap**: Reduce the quantitative literacy gap for its participants, focusing on statistical skills.
3	**Improve students' preparation for graduate school**: Equip program participants with skills for competitive graduate placement.

Goal 1: Enhancing academic success through mentoring and networking opportunities

Consistent with the first goal of providing mentorship and networking opportunities to participants, we structured our program according to the concept of multi-layered mentoring (Hayes 2018; McKean et al. 2024; González-Rostani et al., forthcoming). Throughout the eight-week program, students were exposed to different kinds of mentors, including their peers (other MPE participants as well as undergraduate research assistants hired to support the program over the summer), graduate student mentors (PhD students from Departments of Sociology, and Political Science), as well as individual faculty mentors. The participants met weekly with their graduate student mentors and leaned on them for initial feedback regarding their research projects, which included a final research proposal. These meetings were structured to be flexible to fit student needs and encompassed "hard skills" (e.g., troubleshooting issues related to datasets or software, and

providing feedback on writing samples). Additionally, graduate student mentors also used these mentoring sessions to target "soft skills," such as time management and going over how to communicate effectively and diplomatically with faculty mentors. In addition to their mentorship roles, graduate students served as teaching assistants for the MPE Program's quantitative methods training and led recurring professionalization seminars. These frequent points of contact made it possible for the graduate students to get to know the MPE participants on a personal level, which, in turn, helped them to build strong mentoring relationships with their assigned students. In the long run, these experiences were also very productive for graduate students in their academic careers.

The program directors identified mentors only after the participants accepted the offer, as the matching process was primarily based on research interest alignment. In rare cases when mentors could not be identified at the host institution, the MPE directors identified external peers with suitable expertise and a demonstrated commitment to the program's goals. To establish expectations and set best practices, faculty mentors were provided an extensive manual that drew from existing research on inclusive excellence in mentoring, including scholarship on mentoring across social group differences. In instances where mentees and mentors questioned the suitability of their placement, the MPE directors evaluated each case to identify the sources of concern. Directors provided additional guidance to mentees on their research and held discussions with mentors on how to address mentee concerns. None of these cases resulted in mentor reassignment, as students and mentors exercised flexibility in identifying plausible research projects within the mentees' research interests and mentors' areas of expertise. Directors' trusting relationship with mentors, as well as their rapport with mentees, enabled all parties to cope with issues that could have negatively impacted student learning if not addressed promptly.

In addition to the benefits offered by multi-layered mentoring, the MPE Program significantly enhanced students' networks through deliberate and consistent exposure to a diverse array of researchers and scholars specializing in topics related to the fields of political economy and mobilization. For instance, we began the eight-week program with a student-faculty mixer that drew in faculty from different departments at the host institution, thus providing an informal opportunity for students to meet faculty with whom they might share a research interest. Additionally, over the course of eight weeks, students engaged with a variety of invited speakers who shared their research and expertise in various methodologies and software tools for research in both virtual and in-person settings. These talks and workshops not only broadened students' understanding of mobilization and political economy but also provided opportunities to connect with experts whose work aligned with their academic and professional interests. Each presentation was followed by question-and-answer sessions, allowing participants to engage directly with the speakers, clarify concepts, and explore potential collaborations. By interacting with researchers from different institutions and fields, students honed their professional communication skills, learned how to ask insightful questions, and built confidence in articulating their ideas. We ended the program with a final networking opportunity, namely the "MPE Symposium," which allowed students to showcase their research projects via public presentations and interface once again with many of the program's mentors, supporters, and guest speakers who showed up to support the students and celebrate their accomplishments.

Goal 2: Closing the Methodological skills gap

Beyond providing mentorship opportunities, the MPE program also aims to close the methods gap often observed among underrepresented students. The program provides a well-structured progression in methods training, which is designed to equip participants with the tools necessary

to address pressing social, political, and policy questions. The program bridges theory and practice by exploring how social scientists use data to describe, explain, and predict phenomena while highlighting the growing application of data science techniques by firms and non-profit sectors to understand customer and stakeholder preferences. The first weeks focus on foundational topics, such as research design, descriptive statistics, sampling distributions, and regression analysis, thus establishing a strong base in quantitative reasoning. Participants then advance to more complex techniques, including hypothesis testing and multi-level modeling (MLM),[1] which enable them to analyze structural inequalities by linking individual behaviors with systemic-level data.

The program's innovative approach emphasized the integration of methodological and demographic diversity to foster a more inclusive research community. Analyzing multi-level data was a central component of this approach, allowing researchers to isolate the effects of individual behaviors from broader structural influences. MLM is particularly powerful for advancing diversity and inclusion research, allowing us to reveal disparities overlooked by traditional methods. By mastering these techniques, participants acquired versatile skills to investigate the intricate interplay of individual and systemic factors within social and political contexts.

We also placed a significant emphasis on practical applications through the use of R-programming– an open-source tool widely employed in academia, government jobs, and private industry. By working with real-world datasets, participants gain hands-on experience in data management, statistical modeling, and interpreting and communicating results. Students analyze

[1] MLMs were used, for example, to uncover how disparities in health services influenced minority voter turnout, highlighting the relationship between systemic inequalities and individual outcomes.

diverse datasets, such as the Collaborative Multi-racial Post-election Survey (CMPS), census data, and health access records. In addition, they critically engaged with policy memos, social media reports, and academic articles, thus providing them with the analytical skills needed to navigate a world increasingly driven by data science. Given the small class size, the students received direct support and tailored feedback from the professor, graduate students, and peers when learning these methods and methodologies.

Goal 3: Improving students' preparation for graduate school

The third goal of the MPE program is to enhance students' opportunities to apply to and succeed in top graduate programs. The Summer program featured presentations and hands-on training sessions to help each participant strengthen their graduate application portfolio. Instructors began by discussing strategies for identifying graduate programs that aligned with the participants' preferences, emphasizing the importance of matching academic interests with the research clusters of social sciences departments. They also highlighted extra-academic factors that could affect well-being during graduate school, such as the availability of institutional resources for funding URM students and supportive environments that promote a healthy study-life balance. Participants were also introduced to the often-unspoken aspects of the application process, including how to effectively contact potential advisors by e-mail, guidance for writing a compelling statement of purpose and securing strong letters of recommendation.

The program offered a series of professionalization workshops that balanced expert presentations with hands-on practice. Each session began with a presentation covering topics such as crafting CVs tailored to graduate application needs, writing personal statements, and navigating the graduate application process. Participants then engaged in practical exercises where they

drafted key documents and received personalized feedback from mentors and MPE graduate assistants. The workshops emphasized the value of taking advantage of the materials they were working on as part of the summer program. For example, students were encouraged to include their research proposals as writing samples in their portfolios and as a valuable asset when drafting their statement of purpose.

After completing the program, the alumni from the inaugural edition who applied to Ph.D. programs received extensive support from mentors and program staff tailored to different stages of the application process. This support ranged from identifying graduate programs to writing letters of recommendation to providing individualized feedback on application materials, particularly CVs and statements of purpose. Additionally, after students received admission offers, mentors and the program coordinator acted as advisors, helping them navigate their options by weighing different offers and providing guidance on negotiable aspects such as summer funding.

Assessing Effectiveness: Evaluation and its Rationale

To assess the effectiveness of the Mobilization and Political Economy (MPE) Summer Program in meeting its three goals (see Table 1), a mixed-methods evaluation was conducted using uniquely developed instruments for quantitative and qualitative analysis. To establish the rationale for the development of these instruments, we created learning outcomes and tied them to program activities. The learning outcome themes generally involved participant perceptions of their well-being, academic and research skills proficiency, and professional outlook. These learning outcomes were aligned with the three MPE's goals and used to develop the instrument that measured the quantitative impact on program participants. Table 2 details these associations. In

addition to quantifiable metrics, a series of formative questions were developed for the evaluation plan and addressed through qualitative assessments. Table 2 in the Methodology Appendix describes these qualitative data sources summaries. Pairing this quantitative performance and qualitative feedback granted insights into the extent to which the MPE summer program was able to achieve its goals from the perspective of program metrics and participant anecdotal experience.

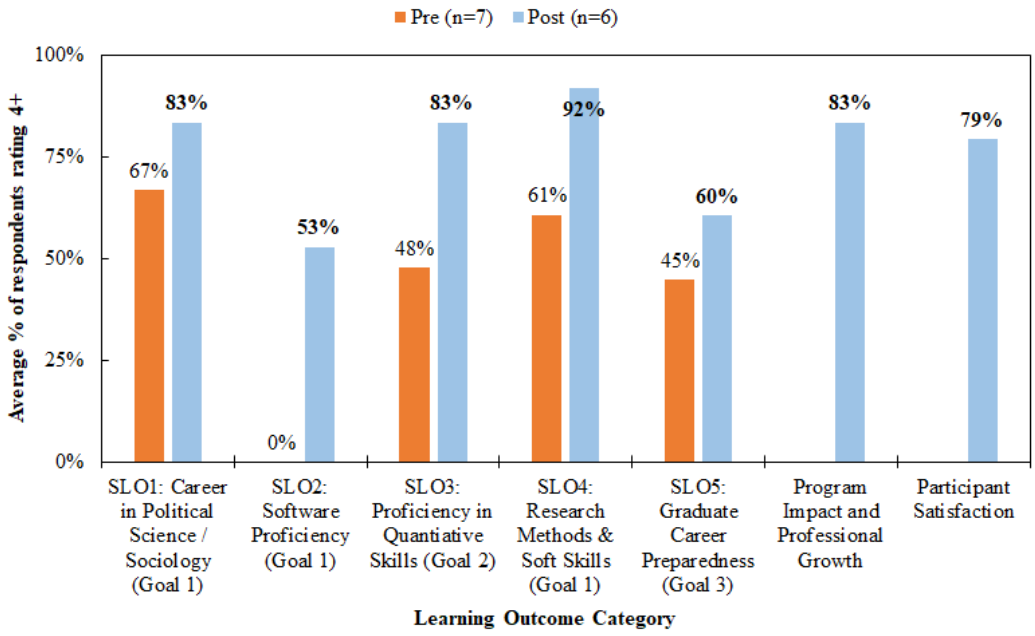
Table 2. Evaluation of Student Learning Outcome Associations with Program Goals

Student Learning Outcome (SLO) *("As a result of participation in MPE, participants will…")*	Associated Program Goal
SLO 1: Develop a sense-of-belonging and well-being, and a mindset of cultivation, growth, professionalism, and cultural-awareness.	**1**
SLO 2: Develop their ability to recognize and utilize various analytical programs and software associated with a career in research and academia.	**2**
SLO 3: Develop their ability to understand and demonstrate basic proficiency with quantitative analysis and research methods relevant to the field of social sciences.	**2**
SLO 4: Develop an acceptable level of exposure, awareness, and familiarity with the process of academic research and the skills required for navigating a successful career.	**1**
SLO 5: Develop their understanding in the preparation of fundamental research materials and gain a heightened sense of preparedness for graduate school.	**3**

The assessment of the MPE program relied on multiple data sources, which integrated both quantitative and qualitative methods. Four instruments were primarily used: (1) a pre-program diagnostic survey, (2) a pre-and post-program quantitative survey measuring participants' experiences and skill development, (3) an additional post-program survey incorporating both closed- and open-ended questions and (4) structured one-on-one interviews conducted by an external evaluator. The quantitative survey used a 5-point Likert scale to gauge participants' self-assessment across various dimensions, while anecdotal responses were qualitatively coded to identify recurring themes related to the program's impact. Of the 2023 cohort, 86 percent of participants completed both pre- and post-program surveys, and 100 percent participated in individual interviews, providing a robust dataset for evaluation.

The goal of the evaluation was to measure changes in participants' ratings on the 5-point Likert scale used in both the pre-and post-program surveys. Participants were classified into two groups based on their ratings: those who rated '4' or '5' indicated high agreement, engagement, satisfaction, or perception of helpfulness, while those who rated lower than '4' indicated lower levels of these qualities. A rating of '3' was considered neutral, reflecting neither agreement nor disagreement. The analysis focused on the percentage of respondents who rated '4' or '5' in both the pre- and post-program surveys, and performance metrics were based on the changes in these percentages before and after participation in the MPE summer program. A detailed calculation of this process is provided in the Methodology Appendix, and Figure 1 illustrates these changes.

Figure 1. Average Percentage of Responses Indicating Agreement with the Goal (Rating 4 or Higher)



As shown in Figure 1, the changes in participants' self-reported proficiencies across key learning categories indicate growth in nearly all measured dimensions as a result of participation in the summer program. The following sections emphasize how the results of these analyses represent the achievement of MPE program goals.

Evaluation Results on Goal 1: Enhancing academic success through mentoring and networking opportunities

As discussed earlier, the first goal of the MPE program was to enhance participants' academic success by fostering a strong support system through resources such as mentoring and networking. The results highlight a 16 percent increase in the number of participants who expressed confidence in pursuing careers in sociology and political science after completing the program (see Figure 1,

SLO 1). Interview responses further emphasized the role of mentorship, with participants citing productive mentor-mentee dynamics, increased self-efficacy, and greater exposure to academic networks as key takeaways. Many described the collaborative and inclusive nature of the mentorship structure as critical in helping them envision a future in graduate school. One MPE participant stated the following: “I’ll say the most impactful thing I learned is that I’m not just a student, that any of these things I want to do after undergrad is attainable, regardless of any of the stigma that’s attached to grad school or anything like that. These things are attainable for me as long as I’m willing and open to be helped by people that are willing to help me” (MPE3).

Participants also appreciated the ease of connecting with the program’s leadership, facilitators, and peers, thus highlighting the accessibility of these relationships and the valuable resources provided to expand their networks. For example, one participant noted: “I like the proximity, and I feel like I’m able to connect with the people in the program more like we’re all pretty close” (MPE4).

Evaluation Results on Goal 2: Closing the Methodological Skills Gap

A second major focus of the program was reducing disparities in methodological training, particularly in quantitative analysis. The evaluation demonstrates significant improvement in participants' research skills, with a 32 percent change in increased confidence in research design and methodological proficiency after completing the MPE summer program (Figure 1, SLO 4). Additionally, 53 percent of participants who previously had no experience using statistical software, such as R statistical, LaTeX, and Nvivo, reported substantial gains in proficiency.

From the interviews, participants noted an initial hesitation toward quantitative methods but described a positive shift in perspective following structured, hands-on training. One

participant shared their experience with quantitative analysis training: “I’ve gained a lot of confidence, and that was one of my main issues with quantitative methods. It’s that first of all [in my experience], they don’t teach it well, and second of all, I've never been like a big fan of computers or coding and stuff, despite being surrounded by programmers growing up…it was really a big help to have such an emphasis on the thought process or the logical explanations for why coding is done in a certain order and why different functions do the things they do. It helped me not just learn to code, but understand why I’m coding it that way” (MPE6). By presenting statistical analysis in an accessible manner, the program helped participants overcome apprehension toward data-driven research. As this quote illustrates, participants left the program with a robust analytical toolkit and, most importantly, increased confidence in engaging with quantitative analysis and interpretation.

Evaluation Results on Goal 3: Improving Preparation for Graduate School

The third goal of the MPE program is to equip participants with the necessary skills and resources to navigate the graduate school application process. As seen prior, the post-program survey results indicate a 16 percent increase in participants expressing an improvement in their research skills. Beyond that, there was an increase of 15 percentage points in participants reporting higher confidence levels in their preparedness for graduate school, with many citing greater awareness of application requirements, funding opportunities, and strategies for securing strong letters of recommendation (see Table 1, SLO 5).

In interviews, participants highlighted the value of structured guidance on personal statements, research proposals, and CV preparation. Many mentioned that the program helped

them better understand the expectations and challenges of graduate education, which had previously seemed unclear or out of reach. They also appreciated the mentorship and networking opportunities that extended beyond the program. One participant shared: “I have high expectations as to the programs I want to get into because now I’m confident with the skills that I have developed throughout this program. I also feel better about my letters of recommendation, how my resume should be, how to write my personal statement and my research statement, and I know exactly how to go on about those… So [the MPE program] definitely helped in terms of that. Also the whole application process to grad school. They tell you about it in undergrad, but they don't really go into details. However, [this program’s leaders] were completely 100 percent honest here and told us what to expect and that it would be a hard, tiring journey. But they’re still showing us that they did it. It was worth it in the end” (MPE2). Another participant spoke about how mentorship boosted their confidence in applying to graduate programs and how the mentor: “explained to me that everything you learn in grad school and the high expectations they put you on to just produce the work…things are going to take a lot longer. Sometimes, you're going to have to spend a week, two or three brainstorming ideas before you even put a word on a page...So when you actually do the research, you'll easily write a hundred-page dissertation in grad school. And I felt really good when [they] said that. I was just like, this is attainable for me.” (MPE3)

Broader Implications and Programmatic Lessons

Our evaluation underscores the effectiveness of structured mentorship, rigorous methodological training, and graduate application support in addressing systemic inequities in higher education. The substantial improvement in participants’ research competencies and academic confidence

suggests that programs like MPE can serve as a model for increasing URM representation in graduate programs and the social sciences.

Notably, the program's greatest results were observed in areas where participants initially had the least experience, particularly quantitative methods, and research software proficiency. This trend suggests that targeted interventions can successfully bridge skill gaps that often act as barriers to graduate-level research. Additionally, the emphasis on mentorship and networking was instrumental in fostering participants' sense of belonging and professional identity, reinforcing the need for similar initiatives that extend beyond technical training to provide holistic academic support. Overall, this evaluation demonstrates that investments in structured, interdisciplinary programs like MPE can play a crucial role in training the next generation of scholars working on issues of mobilization, political economy, and inequality. The findings provide a roadmap for designing future interventions that address the structural barriers faced by URM students, ensuring that graduate education becomes more accessible, inclusive, and representative of diverse perspectives.

Concluding Remarks

The program was designed to address the needs of students and faculty in placing talented undergraduates in graduate programs in the social sciences. We see MPE-like programs as part of a broader collective effort to build the infrastructures needed to reduce barriers to access to institutions as important as higher education, as well as a step in a longer journey to subvert the conditions of marginalization that obstruct mobility and access to higher education.

As the results of the evaluation suggest, the program achieved significant improvements in research software proficiency and research methods skills. Students reported their ability to develop mentoring relationships, personal and professional growth, and an expansion of their professional network. The program's offering of a sequence of research methods courses and workshops, student stipends, professional development workshops, and team-based mentoring support were important in achieving these outcomes. Our evaluation suggests that undergraduate pipeline programs can be effective mechanisms to address barriers to access to research, mentoring, and professional development opportunities. Yet, we recognize that single programs are insufficient to address systemic inequalities in higher education. Thus, we expect networked and coordinated approaches to addressing these barriers are needed.

Moving forward, various lessons learned throughout the course of the program inform our ongoing work and the pursuit of renewal from our funder. Student, faculty, and staff evaluations yielded important insights. First, extra-curricular social interactions are paramount for student engagement, satisfaction, and the program's ability to cultivate desirable cohort effects, such as continuing networking relationships and information sharing among MPE students and alumni. Providing these opportunities necessitates intentional efforts from program leadership, resource allocations, and program management. Building and maintaining relationships with faculty, graduate students, and staff in MSIs is crucial for recruitment success. Over time, the program drew on those relationships to increase the number of applications to 90.

Second, a team-based approach to leadership is essential for program sustainability. This approach reduces the burdens on faculty and staff, particularly those who must prioritize work that ensures their employment continuity. Financial support, including student stipends, housing, and

meals, is necessary to ensure that economic inequalities do not bar economically marginalized students from participating.

Despite these victories, the program certainly faced various challenges. Host institutions often treat some services rendered as revenue-generating opportunities, such as charging excessive fees for student housing. Host institutions also place restrictions on enrolled students' access to university resources (e.g., research software licenses, training facilities, printing, healthcare), thus necessitating program investments in these necessary resources. The resources allocated by the NSF to these programs are insufficient to cover all program needs, thus potentially creating inequalities among institutions with varying economic conditions. After meeting student support needs, including travel, stipends, and housing, among other needs, compensating staff and faculty supporting the program without substantial support from host institutions poses a challenge. Programs face challenges in securing their long-term viability through a single source like the NSF, which is subject to significant attacks against its investments in diversity and inclusion programs, thus motivating the need to diversify funding sources. Programs also face challenges balancing the coverage of a wide range of topics and skills within the limited eight-week timeframe.

Finally, we do not claim that the insights we gained from this program generally apply to all programs. One important lesson learned from our experience is that an undergraduate research program’s success requires sensitivity to the need to tailor the program to fulfill the program’s specific aspirations and adapt to the spatial and temporal context in which it operates. Thus, the lessons and challenges discussed in this article may inform program development and operation in fruitful ways but are not intended to provide a universally replicable blueprint for all programs.

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Appendix

A methodology appendix is provided herein to expand on the methods synopsis in the greater report. For reference, the MPE program goals are stated in Table 1. The evaluation rationale in the report described the association of Student Learning Outcomes (SLOs) that sought to measure key participant attitudes, behaviors, and competencies in correspondence with program goals (see Table 2). The associations in Table 2 were then used to develop the quantitative evaluation instrument, which was the pre- and post-point Likert scale survey to be administered to program participants before and after the program. The pre-and post-evaluation instrument contained a total of 35 prompts measuring participant experiences with the various components of MPE programming, and groups of questions were associated with the Learning Outcomes stipulated in Table 2 within this Methodology Appendix. Table 3 summarizes these categories below.

Table 3. Pre and Post-Survey Question Categories[1]

QUESTION ID	CATEGORY	RESPONSE SCALE (1…5)
Q1 to Q3	Career in Political Science / Sociology	Strongly Disagree…Strongly Agree
Q4 to Q9	Proficiency in Software for Research and Academia	None…An Extreme Amount
Q10 to Q12	Proficiency in Quantitative Research Methods	None…An Extreme Amount
Q13 to Q16	Proficiency in Research Soft Skills	None…An Extreme Amount
Q17 to Q24	Graduate School Preparedness	Strongly Disagree…Strongly Agree

Q25 to Q28	Program Impact on Professional Growth	Not effective at all…Extremely Effective
Q29 to Q32	Participant Satisfaction	Not at all likely…Extremely Likely
Q33 to Q35	Participant Feedback	n/a (open-ended response)

[1](Q25 to Q35 are post- survey only)

Within each category in Table 3, participants were asked to rate their experience on a 5-point scale. The lower end of the scale (rating of 1) represented the lowest level of participant agreement, engagement, satisfaction, or perception of helpfulness towards a particular element of the MPE program, and these perception levels increased in tandem with ratings towards the maximum end of the scale (rating of 5). A rating of '3' was denoted as 'neutral', neither agreeing or disagreeing with the sentiment. To best synthesize these results into usable, actionable, and succinct metrics, the assumption was made that the ratings of interest were those of '4' or '5' on the 5-point scale.

These ratings indicate participant perception exceeding past 'neutral' territory and into a positive or strongly positive perception of the components of the MPE program. By focusing on this subset of ratings 4 and 5, high-level evaluation of programmatic components is made more feasible by measuring the observable increase or decrease of participants reporting within this rating bracket. In other words, the change in ratings of 4 or 5 were used as indicators of performance of the MPE summer program; this change in ratings of 4 or 5 is denoted as the program <u>impact</u>. Based on this assumption, the following procedure was used to conduct the analysis of the results of pre-and post- program experience survey and obtain the program impact:

1. Measure participant ratings for each question in the categories listed in Table 3, calculating the percentage of respondents for each rank on the 5-point scale.

2. Sum the percentage of respondents rating 4 and 5 for each question, creating a series of data points representing quantified positive feedback within each category.

3. Determine the average of these sum ratings of 4 or higher within each category listed in Table 3, and report a single metric of effectiveness of each element of the MPE program.

4. Repeat steps 1 through 4 for both the pre- and post- data, for repeating questions (Q1 through Q24). Obtain a set of metrics for pre- and post- for each category. Using the measured post-only responses rating 4 or higher, compare with existing SLOs to determine if target performance metrics were met.

5. Calculate the difference between the metrics established in each category and report the impact of the program on its participants with respect to each category listed.

In conducting this impact analysis, the evaluation was able to measure the changes in participants' behaviors, attitudes, and competencies as a result of participation in the MPE summer program with respect to the established SLOs. Given that each SLO has been linked to one or more key program goals (Table 2), the evaluation can adequately present metrics that indicate the effectiveness of the ability of the MPE summer program in achieving its goals.