



Minority/Multicultural Engineering Program Impact: A Student Perspective of Co-Curricular Support

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Abstract

Minority/Multicultural Engineering Programs (MEPs) are popular approaches to supporting underrepresented students in engineering colleges, and are commonly found at large, 4-year, public, research-intensive universities. Despite the widespread adoption of MEPs, research has not yet fully examined the function of these units. While many researchers have investigated MEPs with regard to academic impact (i.e., change in GPA and graduation rates), we know comparatively little about how such centers directly influence the institutional experiences of undergraduate students. The purpose of this paper is to highlight a student perspective of MEPs. In particular, our overarching research question asks: From the student perspective, what impact does an MEP have on the undergraduate experiences of engineering students from underrepresented populations? While students did report primarily positive impacts, they also reported some negative impacts. The combination of these positive and negative perspectives revealed pertinent lessons with regard to the impact an MEP can have on the student experience. Our findings will assist engineering colleges with offering student interventions that positively influence the undergraduate experience while mitigating unintended negative impacts. This study is a step towards better understanding the use of MEPs to provide underrepresented students with co-curricular support.

Introduction

In the late 1970s, recently desegregated universities began housing Engineering Student Support Centers (ESSCs) in the category of Minority Engineering Programs (MEPs) ^[1]. An MEP is a “student support center focused on race/ethnicity (as demonstrated by the federal guidelines) with less focus on gender while aiming to address the factors for underrepresentation of certain populations in engineering, specifically domestic students that are African-American, Hispanic, and Native American” ^[2]. The general purpose of MEPs is to recruit and improve the retention of students from underrepresented populations. Overtime, MEPs became more common and now exist at various institutions. Today, MEPs are popular approaches to supporting underrepresented minority (URM) students in engineering colleges and are commonly found at large, 4-year, public, research-intensive universities throughout the nation ^[2]. However, there are gaps in our knowledge about these support systems as a whole given their relatively short history.

Despite the widespread adoption of MEPs, research has not yet fully examined how MEPs function alongside engineering curricula to influence the institutional experience of underrepresented students from the student perspective. The purpose of this paper is to highlight a student perspective on MEPs as a source of co-curricular support. This analysis contributes to our understanding of how students perceive MEPs by examining the perspectives of students who are involved with an MEP at two different institutions. With our overarching research question we ask:

From the student perspective, what impact does an MEP have on the undergraduate experiences of engineering students from underrepresented populations?

This paper is part of a larger study ^[2] that used Tinto's Model of Institutional Departure ^[3] as a theoretical lens and a case study research approach ^[4,5] to explore the particulars of several ESSCs from the administrator (those who provide support) and student (those who receive support) perspectives. The study involved open-ended surveys, document artifacts, individual interviews, and focus groups to examine six ESSCs from three different ESSC classifications: Multicultural or Minority Engineering Programs (MEP), Women in Engineering Programs (WEP), and Diversity in Engineering Programs (DEP). To focus on the student perspective with regard to MEPs, the current analysis relies on the focus group data from each MEP (see Figure 1), henceforth referred to as MEP2 and MEP3. Note that each of the ESSCs included in the larger study was located at one of four different universities, indicated by the numbers included in Figure 1. For example, MEP2 and WEP2 are located at the same institution—University 2.

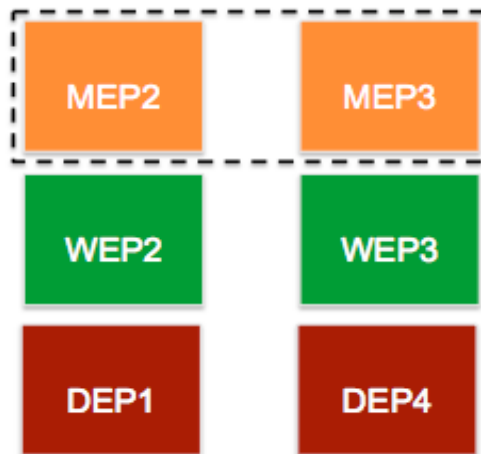


Figure 1 - Cases Selected

We begin with a brief overview of Tinto's Model of Institutional Departure. Next, the methods used to collect and analyze the focus group data are discussed. We then present thematic descriptions that summarize the student perspectives from each MEP. Lastly, we discuss the impact that an MEP can have on the undergraduate experience of engineering students from underrepresented groups, and offer advice for practitioners who coordinate or direct MEPs.

Theoretical Framework

Tinto's Model of Institutional Departure ^[3] focuses on institutional action and emphasizes the process of student departure as it occurs. More specifically, Tinto's Model posits that a student's interactions with the academic and social systems within an institution influence his or her persistence. According to the model, the academic system consists of *Academic Performances* and *Faculty/Staff Interactions* while the social system consists of *Extracurricular Activities* and *Peer-Group Interactions*. Moreover, Tinto's Model suggests that students who have positive experiences in these areas will achieve integration into the academic and social systems of a university, which will lead to intentions, goals, and commitments that support remaining at an institution. As previously stated, Tinto's Model guided the larger study in which the current analysis is situated and informed the overall research design and implementation ^[2]. In this paper, the framework was primarily used to interpret the student perspective with regard to the co-curricular support.

Methods

The impact that MEPs have on the undergraduate experience was examined using a qualitative multicase study of participants from two institutions. By including multiple research sites, it was possible to look for common themes that emerged across the MEPs as well as unique perspectives. We completed the current analysis to investigate a student perspective of each respective MEP and to further our understanding of how MEPs influence the undergraduate experience. In this section, we will provide an overview of the research sites and describe data collection and data analysis.

Research Sites

The research sites (i.e., MEP2 and MEP3) were each located at a large, 4-year, public, research university^[6]. MEP2 aims to serve over 500 engineering and science students annually and is located at a university with an approximate student population of 20,000. The interventions most central to MEP2 achieving its mission are a mentoring program and personal counseling/advising. MEP2 also offers interventions such as a summer bridge program and tutoring. MEP3 aims to serve over 1,200 engineering students annually and is located at a university with an approximate student population of 50,000 students. The interventions most important to MEP3 achieving its mission are tutoring and the partnerships MEP3 has with student organizations such as the National Society of Black Engineering (NSBE) and the Society of Hispanic Professional Engineers (SHPE). MEP3 also offers interventions such as a first-year seminar and professional development course.

Data Collection

As noted, the data used for this analysis is a subset of the data from a larger study. We concentrate on the focus group data because it most closely represents how the URM students at each institution perceive their respective MEP. In particular, focus groups allowed us to investigate the general perspective as opposed to how individual students felt in isolation. Due to the ability for participants to interact with each other during focus groups, we were able to gauge whether or not there appeared to be a consensus view with regard to each perspective: this method allowed participants to provide checks and balances of each other^[7]. We conducted one focus group at University 2 and two focus groups at University 3. The sample population for the focus groups included students who indicated interest in participating in a focus group via a previously distributed open-ended survey (larger study) and students who were recruited in person during campus visits. Every student that indicated interest was invited to participate. Each student who participated in a focus group received a \$10 Amazon Gift Card. The combination of these recruitment methods resulted in a total of 3 focus groups with a total of 14 students in total (see Table 1). Note that the focus group from MEP2 is represented as 2-1 and the focus groups from MEP3 are represented as 3-1 and 3-2.

Table 1 - Focus Group Demographics

MEP2	Gender	Race/Ethnicity	Major	Year
2-1	Male	Hispanic	Mechanical Engineering	Senior
	Female	Hispanic	Biomedical Engineering	Sophomore
	Male	Hispanic	Electrical Engineering	Senior
	Female	Black	Electrical Engineering	Senior
	Female	Black	Bioengineering	Senior
	Male	Black/White	Mechanical Engineering	Junior
	Female	Black	Electrical Engineering	Senior
MEP3				
3-1	Female	Hispanic	Chemical Engineering	Junior
	Female	Hispanic	Architectural Engineering	Senior
	Male	Hispanic	Civil Engineering	Junior
	Female	Hispanic	Electrical Engineering	Junior
	Male	Hispanic	Civil Engineering	Junior
3-2	Male	Hispanic	Chemical Engineering	Freshman
	Male	Hispanic	Mechanical Engineering	Sophomore

Through the focus groups, we investigated the advantages and disadvantages to being involved, and reasons students were and were not involved. During these focus groups, we discussed the collective student experience with the respective MEP. The salient focus group questions were:

- How would you describe this MEP to incoming students or their parents?
- In what ways do you believe the existence of this MEP impacts the experience of the engineering students who are involved?
- What sorts of problems or challenges does this MEP help students deal with or avoid?
- What do you think students, both involved and not involved, see as the advantages and disadvantages of being involved with this MEP?
- Are there any problems that this MEP does not help students deal with that you believe they should?

Data Analysis

Focus Group data was analyzed using a priori codes and open coding techniques. First, the lead author coded the interviews independently using a word processor such that highlighting denoted an a priori code, i.e., *Advantage* or *Disadvantage*. *Advantage* represented a student’s beliefs about the advantages, (or positive impacts, problems assisted with, etc.) of being involved with the MEP and *Disadvantage* represented a student’s beliefs about the disadvantages of being involved with the MEP. An example of a priori coding is the statement “being around a whole bunch of successful people just makes you want to be successful as well” being coded as an *Advantage*. Next, the lead author open coded these statements to identify themes. An example of open coding is the statement, “I mean [MEP2] is just a great social thing, because it really is a family” being coded as *Family Atmosphere* after being coded as an *Advantage*. Through this process, we identified ten open codes, each of which is discussed in the following section: (1) *support group*, (2) *familiarity and comfort*, (3) *family atmosphere*, (4) *opportunity awareness*, (5) *networking*, (6) *student confidence*, (7) *adjusting to minority status* (8) *organizational support*, (9) *social atmosphere*, and (10) *time commitment*. Due to the structure of the focus groups, the *Advantages* and *Disadvantages* were indicative of whether or not students have a positive or

negative perception and the open codes were representative of the conversational themes that resulted from students responding to the questions and engaging in the group dialogue. Once the focus group data from each MEP were coded, thematic descriptions were developed for each open code category. To establish validity of the themes, an additional researcher that read each focus group transcript reviewed each theme description to ensure that the themes accurately reflected the opinions of the students who participated.

Results

In the following section, we present a description for each of the following thematic statements:

1. MEPs can offer students a support group.
2. MEPs can represent a familiar and comfortable place to receive support.
3. MEPs can provide students with a family atmosphere on campus.
4. MEPs can facilitate students being aware of the available opportunities.
5. MEPs can assist students networking with other students.
6. MEPs can help a student develop confidence in him or herself.
7. MEPs can help students adjust to being a minority at a predominantly white institution.
8. MEPs can support minority-serving organizations in engineering.
9. MEPs can create a social atmosphere that makes it difficult to complete work.
10. MEPs can present an additional time commitment.

Each sub-section includes a description and is denoted by the label assigned during open coding

Support Group (Sources: 2-1, 3-1, 3-2)

MEPs can offer students a support group; this impact showed up at MEP2 and MEP3 and involved both students (i.e., peer-group interaction) and MEP staff (i.e., faculty/staff interactions). First, students from MEP2 affirmed that MEP2 is directed by someone who really wants to help them and facilitates successful upperclassman being in position to help underclassman. Summarizing the support provided by the director of MEP2, a student gave the following statement: “it’s not just like her job to help you. But like she actually cares. That’s nice to feel that it’s not just her job.” Students expressed the director helping them with problems ranging from dealing with a parent having cancer to recovering from a low test-score.” Summarizing the support from other students involved in MEP2, another student made the following statement:

I got to meet my mentor. She was a senior, real smart, she had like a real strong resume, [and] she’d done a lot of stuff. That inspired me, so she was like the one that really got me on track and made me want to co-op and intern and really get hands on experience. If I hadn’t went to those meetings... I probably still would’ve had a good college career, but I don’t know what kind of track I would’ve been on compared to where I am now. That allows me to also be that to my mentees now; tell them about interning, and co-ops, and keep your grades up, and all that kind of stuff.

Second, students from MEP3 affirmed that MEP3 was a place they could go to for help whether they had academic or personal problems. Summarizing the supported provided by MEP3, a student offered the following explanation: “You don’t give up on engineering and you don’t give up on your classes because you’ve got all of these people supporting you.” Both MEP2 and MEP3 offered students a support group.

Familiarity and Comfort (Sources: 2-1, 3-1)

MEPs can represent a familiar and comfortable environment; this impact showed up at MEP2 and MEP3 and involved both the physical space as well as people (i.e., peer-group interactions and faculty/staff interactions). First, students from MEP2 discussed the benefit of the physical space provided by MEP2. Students discussed the lounge providing them with a place to nap, socialize, and come for snacks during exam week. A student summarized the benefits of the physical space as follows: “This office right here is like really good. So, I don’t know if we ever touched on like the value of this [MEP2] office and how it’s really like a congregating spot and [MEP2] minus this probably wouldn’t be what [MEP2] is because people can just come here and take naps and just sit here and talk about whatever is going on in their day. So I don’t know where this fits at in that whole discussion, but this office is actually a very critical part of [MEP2]. Just having that physical spot where people can come.” Second, students from MEP3 discussed the benefits of the people: MEP3 allowed them to become more comfortable with company recruiters and receive academic assistance from people who are familiar. With regard to becoming more comfortable with company representatives and participating in the MEP3 activities that include them, a student made the following statement: “I think it’s definitely a confidence booster in how to talk to corporate reps in general. You feel a lot more comfortable knowing you can do it. They’re real people.” Echoing this sentiment, another student made a similar statement: “It makes you remember they’re just people like you... not like scary monsters or something.” With regards to academic tutors, a student made the following statement: “I think academically it improves the students overall academic ability because they offer free tutoring - like one or two hours a week - and that’s really beneficial because tutoring can be expensive. And some people are kind of shy too to go to the tutoring table but through [MEP3] you’re going to be tutored by someone through one of the orgs or somebody you’re already more comfortable with so I think it’s a good experience... being tutored by someone you already know as opposed to, I guess, a stranger kind of.” Echoing this sentiment, a second student offers the following statement about the tutors as well: “you tend to know a lot of the people, especially if you’re already integrated in [MEP3], so you’re more comfortable with them; you’re more comfortable to ask those questions you’re scared to ask in class or you think people might think you’re stupid.” Both MEP2 and MEP3 represented a familiar and comfortable environment.

Family Atmosphere (Sources: 2-1)

MEPs can provide students with a family atmosphere on campus; this impact showed up at MEP2 and involved students having a place where they were always accepted (i.e., peer-group interactions and faculty/staff interactions). Describing the family atmosphere, a student offered the following descriptions: “I mean [MEP2] is just a great social thing, because it really is a family. If you leave your engineering STEM major, you’re still a part of [MEP2]. If you’re failing your classes, you’re still a part of [MEP2]. So there’s like no kind of rejection.” Another student echoed this acceptance with the following statement: “And the thing that I love about [MEP2] is that no matter what, even if you did neglect it, even if you did ignore your mentor, no matter what it’s still here. You can always come back.” The idea of family atmosphere was not represented in our data from MEP3.

Opportunity Awareness (Source: 2-1)

MEPs can facilitate students being aware of the available opportunities; this impact showed up at MEP2 and involved information spreading amongst the students (i.e., peer-group interactions). A student who served as a mentor described this process in the following statement: “We take information from our weekly meetings [with the director] back to our mentees and they range from things such as how to study for math to how to budget... it’s really broad. They learn not only about academic life, but about life in general. And I think the impact that it has on students is preparing them for when they are on their own. So we’ll always be their mentors, but they’ll always know that they have some... that ground to back to. ‘Oh, my mentor told me this.’ And you know, they can help their peers.” In addition to the mentees helping other students with the information they were provided by their mentor, students also discussed how the MEP2 summer bridge program benefited non-participants through information sharing. Discussing those who participated in the summer bridge program, a student stated the following: “And I know, from being a [summer bridge program] counselor and I have some of them as my mentees, because they know so much and they’re so far ahead of the game... that affects the other mentees. So, if they go to [the gym], and the other mentees have never been, they know everybody, they can get to meet new people, they can help them out. And then it just... [the MEP2] network, once again.” This idea of facilitating the awareness of opportunities did not show up in our data for either MEP3 focus group.

Networking (Sources: 3-1, 3-2)

MEPs can assist students networking amongst themselves; this impact showed up at MEP3 and involved students developing friendships, finding students to study with, and meeting students from other majors (i.e., peer-group interactions). As an example of developing friendships, a student made the following statement about MEP3: “It introduced me to my future friends that I hang out with now and pretty much paved the way to friendships and connections and all that stuff.” As a testament to the impact of finding students to study with, another student offered the following example with regards to the first-year seminar program: “And it kind of helps you know people you can study with because you have at least one class together with all of those kids. And then you can start working on making study groups and learning good study habits and just make some good friendships and go on from there.” Students also provided examples concerning the benefit of meeting students from other majors: “It also gives you access to other majors because I’m a chemical engineer and technically I mean I would hang out just in the chemical engineering building... but now I see Aerospace and Mechanical and others, Civil engineering, Architectural. I can really like talk to them as engineers. But me, even though I’m a chemical, it broadens my perspective.” The theme of assisting students in networking amongst themselves was not represented in our data from MEP2.

Student Confidence (Sources 3-1, 3-2)

MEPs can help a student develop confidence in him or herself; this impact showed up at MEP3 and involved helping students get out of their shell (i.e., academic performance, extracurricular activities, and peer-group interactions). Explaining this impact, a student provided the following example: “I think it really impacted me in leadership and just making us be more assertive; it helped me come out of my shell a lot. Because coming in freshman year I was also just staying to myself; I didn’t want to talk to anyone. I joined a [first-year seminar], and the first-semester I was like, ‘I don’t really know you guys; I can’t really speak up.’ Second semester got a lot better:

I met my future roommates and all of that so it was great. And through all of the events that we do, that we talk to corporate people or just like others, where we're forced to kind of talk to others, I felt it helped like just pulled me and others. I've seen it in others too, where it just pulls them out of their shell and they just show you how to be a good leader and how to step up your game." Echoing this experience, another student offered a similar example: "It was a dread to come to school. I would even doubt myself; I would question if I was even going to make it. And then it wasn't until that second semester that I started getting involved; I started talking to my [first-year seminar classmates] more often, and then so we started hanging out. I joined [two of the organizations]. I started meeting more people, so that feeling of lonesomeness faded. And then I started studying with a group and it had a tremendous impact on my academics. And then after that, not only that, but after I got involved in [an organization] I gained leadership roles and it helped build my leadership. And so now I actually like college." Developing confidence was not represented in our data for MEP2.

Adjusting to minority status (Source: 2-1)

MEPs can help students adjust to being a minority at a predominantly white institution; this impact showed up at MEP2 and involved addressing misconceptions students have coming into the university (i.e., peer-group interactions), particularly through interacting with students during a preview weekend. Multiple students discussed having the opportunity to see what the university was like before officially enrolling and the experience helping them decide whether or not they wanted to attend once admission was offered. One student described the impact as follows: "So you get a real good flavor of [the university] before you get here. And like, kind of like the mystery and the unknown parts about college life are cleared up for you as a freshmen, incoming freshmen. And also, you know whether you want to come to [the university] or not. If you believe that [the university] is majority black, that kind of goes out the window: you see that that's not true." Another student echoed his sentiment but spoke to the opposite scenario: "The flip side of something that he mentioned, if you think that [the university] is too white for you, but you get to come here and be hosted by a minority, you're around minorities basically the whole weekend because of the social events... I think that turns the tide for a lot of people in their decision making." The preview weekend also allowed students to talk to current students about "how you feel being a minority here at [an] all-white campus" and one student stated that the experience "gave me more insight into what I should expect once I got here in the fall." Helping students adjust to being a minority at a predominantly white institution was represented in the MEP2 but not MEP3 data.

Organizational Support (Source: 3-1)

MEPs can support minority-serving organizations in engineering; this impact showed up at MEP3 and involved the MEP staff providing organizations (i.e., extracurricular activities) such as NSBE and SHPE with advisory support. Explaining the importance of this support, a student made the following statement, "I think it's important because it really keeps us in check and keeps the unity between the organizations... because if we didn't have that, it would be easy for an organization to be like, 'Alright, we're just going to start taking this path' and you just start diverging. Whereas [Student Leadership Conference] brings you back, 'Ok, what are you doing?' You talk it out and it's understanding; they don't tell us what to do, we talk it out and see what's best for all of the organizations." Another student echoed this sentiment and believed MEP3 was a "good way to unite all of the three orgs.... instead of competing as three individual

organizations.” Lastly, a student who served as an officer in one of the orgs believes that the support provided by MEP3 was very helpful: “it helps us see what [the three organizations] are doing at the same time so we can all work together and we don’t overlap on certain dates, on events, on meeting. So they kind of help us synchronize all of the three orgs better. They provide us with support if we ever need it. Any events that we need help with they’re there, so I feel like that’s the most helpful.” We did not see this same support for minority-serving organizations in the data for MEP2.

Social Atmosphere (Source: 2-1)

MEPs can create a social atmosphere that makes it difficult to complete work; this impact showed up at MEP2 and involved the social environment making it difficult to get work done (i.e., academic performance) in the study hall organized by MEP2. Addressing the benefits of study hall, a student stated: “It’s a lifesaver... I didn’t use it freshmen year that much, like first semester, because I was not involved with [MEP2]. But like just after I started going and like getting help, you don’t have to spend 3-hours trying to go to [supplemental instruction] for math, [supplemental instruction] for calculus, [supplemental instruction] for... I mean chemistry and like different subjects, you can get all of your answer at once. It’s like perfect.” On the contrary, students felt like study hall was only beneficial if a student knew exactly what they needed help with and would not recommend it for someone who just needed to study or get work done in general. A student summarizes this disadvantage as follows: “Unless you have a purpose, it’s not useful. You go in saying, ‘Ok, I need to get this homework done for these three questions,’ you can find a tutor that’s going to help you out. But if you go in saying, ‘I’m just going to go because I need to get some work done,’ and unless you’re like sitting there listening to music, it’s not going to get done.” She expressed the need to be listening to music due to the fact that students believed the “social nature of [MEP2] in itself” results in people talking to one another. “Because when you get all of those people in the room, usually all these people are friends... So it’s not just like you’re going to sit there and do work; you’re going to talk.” MEP2 created a social atmosphere that makes it difficult to complete work during study hall but this was not mentioned at MEP3.

Time Commitment (Sources: 3-1, 3-2)

MEPs can present an additional time commitment; this impact showed up at MEP3 and involved the time required to participate in MEP3 activities (i.e., extracurricular activities). For example, a student made the following statement: “I think one disadvantage would be that since you are so heavily involved maybe you don’t give as much time to your academics as other people do who aren’t involved. But I just think it’s a balance that you have to find.” As a follow up, another student stated, “I’d say that’s probably what people think as well when they hear that you’re going to all of these meetings and dinner and all that. It’s like, ‘When are you studying?’ Whereas MEP3 presented an additional time commitment for the students who were actively involved, we did not see this in the data for MEP2.

Discussion

Based on the focus groups, we were able to identify ten impacts that an MEP can have on the student experience from the perspective of undergraduate engineering students (see Table 2). We set out to understand how students perceive MEPs as a source of co-curricular support to improve our understanding of how students are impacted by these support systems.

Table 2 - MEP Student Perspectives

Perspectives	MEP2	MEP3
Support Group	+	+
Familiarity and Comfort	+	+
Family Atmosphere	+	
Opportunity Awareness	+	
Networking		+
Adjusting to Minority Status	+	
Student Confidence		+
Organizational Support		+
Social Atmosphere	+/-	
Time Commitment		-

Based on the trends in Table 2, we found that MEPs may commonly offer students a support group and represent a familiar and comfortable place to receive support. In previous literature, researchers have demonstrated how abruptly changing the structure (i.e., personnel, physical location, and mission) of an MEP can disrupt the student experience—particularly with regards to familiarity and comfort [8]. Our study expands this finding and suggests that a prevalent impact of MEPs is creating a familiar, comfortable, and supportive environment where students can have positive interactions with members of their peer-group as well as faculty/staff who are involved in the MEP. We also identified less-common impacts (i.e., those that showed up at only one of the MEPs) that should be considered by MEP administrators as well. For example, while providing minority-serving organizations in engineering with support was not a revealed impact of MEP3, it did show up at MEP2 and represents a potential impact for other MEPs. This suggests that MEPs can positively impact student involvement in extracurricular activities by helping organizations such as NSBE and SHPE operate as efficiently as possible. Lastly, we revealed negative impacts that should be given attention: creating a social environment that can sometimes make it difficult to complete work or an additional time commitment that interferes with students’ involvement in other student responsibilities. This suggests that MEPs can negatively impact extracurricular involvement and/or academic performance.

Conclusion

In conclusion, our research demonstrates that MEPs can have positive and negative impacts on the undergraduate experience. While students did report primarily positive impacts, they also reported some negative impacts. The combination of these positive and negative perspectives revealed pertinent lessons with regard to the impact an MEP can have on the student experience. Overall, MEPs can influence a student’s academic performance, interaction with peers, interaction with faculty/staff, and involvement in extracurricular activities. These findings will assist engineering colleges with offering student interventions that positively influence the undergraduate experience while mitigating unintended negative impacts. This study is a step towards better understanding the use of co-curricular support to improve the institutional experience of undergraduate engineering students.

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