THE MEP CENSUS: CHARACTERIZING ESSENTIAL PROGRAMMATIC AND INTRASTRUCTURAL ELEMENTS OF MINORITY ENGINEERING PROGRAMS (MEP) NATIONWIDE

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INTRODUCTION

While students of color are broadly underrepresented in higher education, the issue is particularly acute in undergraduate engineering programs, where historically underrepresented students (URM, def: non-white, non-Asian) compose approximately 12-16% of the student body (1). Lack of diversity limits the talent base and creative capital of the entire engineering profession (2). For this reason, institutions have been investing in Minority Engineering Programs (MEPs) within their undergraduate engineering colleges (3,4). MEPs serve as umbrella organizations that offer financial, academic, and social support, with overarching objectives of improving representation and retention of URM undergraduate students in engineering programs (3-7).

Although programmatic elements and administrative infrastructure may vary by institution, there is no question that MEPs in general are effective in URM student retention and success (4-13). A whitepaper study conducted by the National Society of Black Engineers (NSBE) (4) studied four top-ranked MEP programs and recommended nine interventions for institutions to boost minority enrollment and retention. Six of the nine interventions traditionally fall in the purview of MEPs, namely, summer bridge programs, living-learning communities, facilitated study groups, scholarships, and positive development of self-efficacy and engineering identity. The success of these interventions in boosting minority enrollment and retention in engineering programs of study has been proven repeatedly in the literature (5, 10-13), with particularly strong evidence to support summer bridge programs (12) and intensive mentoring and academic supports (5, 10-14).

MEPs are loosely networked and may vary in terms widely across institutions. Professional organizations, such as the National Association of Multicultural Engineering Program Advocates (NAMEPA), and federally funded efforts like the Louis Stokes Alliances for Minority Participation (LSAMP), create an overlapping network for MEP administration and funding that includes approximately 60 institutions, representing only 20% of accredited engineering undergraduate programs (15). Even within these loose networks, MEPs operate independently of each other across institutions, with each having its own origins, unique programmatic offerings, and financial and administrative support structures (5). Beyond the few, model institutions studied by prior investigators (4,5), there is little information on current MEP practices and the variation in MEP structure across institutions. Such information would be inherently valuable in properly resourcing any national effort to encourage MEPs to adopt proven best practices (4, 5).

The goal of this study is to fully characterize the programmatic offerings and resourcing for MEPs nationwide. To truly understand the current landscape for MEPs, we employed a "census" approach, including in our study all sufficiently-sized, accredited, predominantly white (PWI) institutions in the US. We collected information about whether an MEP existed at a particular institution and, if so, what were its administrative structure and programmatic offerings. We further examined the correlation between these outcomes and URM representation in the undergraduate student body, hypothesizing that the existence and resourcing of MEPs will positively correlate with greater URM representation. The results of our census will be valuable in future efforts to better network and disseminate established best practices (4, 15) across all MEPs nationally.

METHODS

We employed a triangulated research approach that consistent of a core data set built from a web-based search of publically available information for particular institutions that we then cross-checked with voluntary surveys of MEP administrators. A single, validated instrument was used for both data collection arms (Table 1). This instrument was derived from two instruments used in prior studies that involved self-reported data from a small subset of MEPs (4, 15). Search terms for the web-based search included institution name, "minority," and "engineering." Three coders separately applied the search terms and instrument to 3% the institutions studied and achieved κ= 0.6, which suggests moderate agreement. A single coder was then used (intra-rater κ= 1.0 for 3% subset) for the remainder of the data collection.

Table 1: Common instrument used in web-based searches and surveys.

Item No.	Outcome	Levels
1	Name of Institution	
2	Total No. Engineering Graduates[1]	
3	% URM Engineering Graduates[1]	
4	Presence of MEP Program[2]	Yes / No
5	MEP Program Name	
6	No. Years in Operation for MEP	Integer
7	No. Full Time Staff for MEP	Integer
8	Dedicated Student Space for MEP	Yes / No
9	Living Learning Community for MEP	Yes / No
10	Academic Support Services (tutoring, study hours) for MEP	Yes / No
11	Peer Mentoring Program specific to MEP	Yes / No
12	Staff / Faculty Mentoring Sessions for MEP	Yes / No
13	Scholarships for MEP	Yes / No
14	MEP-Specific Workshops & Networking Sessions	Yes / No
15	Summer Bridge Program for MEP	Yes / No
16	K12 Outreach Specific to URM and/or MEP	Yes / No
17	No. Programmatic Offerings[3]	Integer

[1]Data source is ASEE Data Mining Tool, accessed October 2017 (16).

[2]Presence of MEP Program assessed by a non-zero response to Item No. 5 through 9 or "Yes" response to one or more programmatic elements from Item No. 10 through 16.
[3]No. Programmatic Offerings is equal to total number of "Yes" responses for Item No. 10 through 16.

This census study was designed to collect information about MEP practices from domestic PWIs of sufficient size such that small fluctuations in the number of URMs present in these programs would not drastically affect percentile representation. Inclusion criteria for the web-based search were as follows (see also Figure 1): (1) ABET-accredited engineering program; (2) sufficiently large graduating class size (>25th percentile nationally); (3) moderate to high academic caliber (top 100 USNWR for doctoral-granting, top 50 for non-doctoral); and (4) neither historically black colleges and universities (HBCU) nor a Hispanic serving institutions (HSI). Institutions not meeting the third criteria but demonstrating top-quartile performance %URM in their engineering programs were re-admitted to the study population. The web-based data set was cross-checked with a survey that was administered online or in-person using the common instrument (see Figure 1, right). The online surveys were sent to all MEP administrators within the NAMEPA network (ca. 60 institutions), and they were also administered in-person to individuals who did not complete the online survey at the 2017 NAMEPA annual conference.

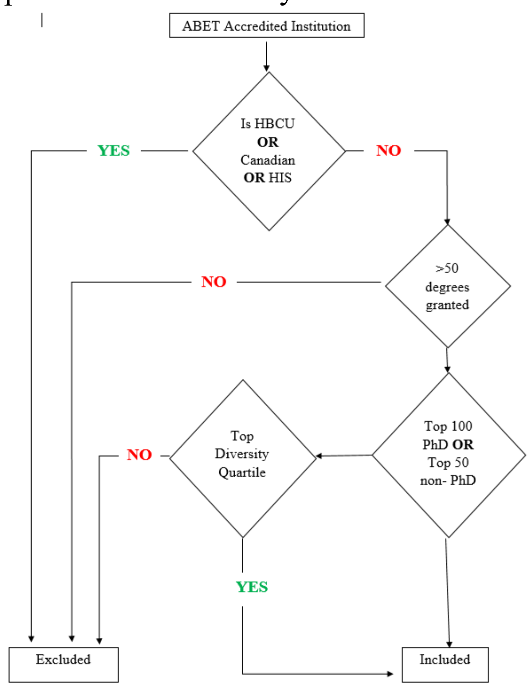

Figure 1: Schematic of inclusion criteria for institutions in web-based data collection.

RESULTS

Applying our screening criteria (see Figure 1), a total of 186 institutions (out of 275 total) were included in the web portion of this census. 15 MEP administrators completed the survey (25% response rate from NAMEPA members), with 9 completing online and 6 in-person. Agreement between web and survey outcomes was modest, ranging from 30-70% by institution. In general, web-based data collection underestimated programmatic offerings but accurately assessing resourcing levels compared to the surveys.

Of all the institutions in our census, 52.4% (n=97) had infrastructure and programmatic activities characteristic of an MEP. At institutions with MEPs, 3.9±3.3 (mean±st.dev) full-time staff were dedicated to the program; 19.5% had dedicated student space for their MEP; and 11.3% had an associated living learning community. With regards to programmatic activities (Figure 2), MEPs most commonly offered academic support services (56.7%) and workshops and networking sessions (54.1%) and least commonly offered peer (33.0%) and faculty/staff mentoring (25.8%). MEPs offered 3.1±1.9 programs (out of 7 evaluated, see Table 1). Only 7.2% of all MEPs (n=7) offered both summer bridge programs and living learning communities, as recommended by NAMEPA (4).

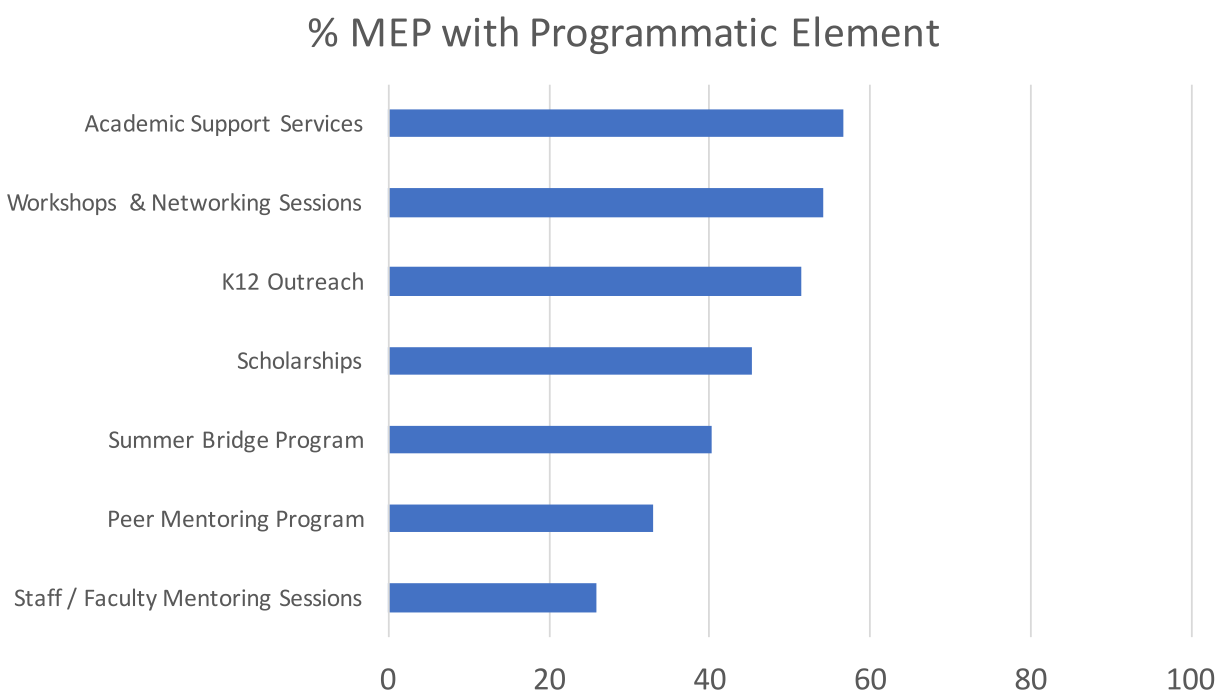

Figure 2: Percentage of MEPs nationwide offering particular programmatic elements.

The number of engineering graduates from the institution was moderately and positively correlated with the number of full-time MEP staff ($r(97)=0.40$, $p=0.001$) and weakly and positively correlated with the number of programmatic offerings ($r(97)=0.20$, $p<0.001$). Interestingly, there was a modest negative correlation between number of programmatic offerings and percentage URM in the undergraduate population ($r(97)=-0.36$, $p=0.003$). No other statistically significant correlations were observed between numerical outcome measures.

CONCLUSIONS

The results of this study indicate MEPs are only offered at half of the accredited engineering programs nationwide. For those programs with MEPs, staffing levels may be low and dictated more by the size of the overall undergraduate student body than the representation of students of color at the institution. Few MEPs provide program infrastructure other than staff support, with low rates of dedicated student work space and living learning communities. Academic support services and workshops are most commonly offered, with more costly programming, like summer bridge programs, being less common. Few of all MEPs, even those within professional networks like NAMEPA, are offering the entire suite of programmatic elements recommended in the literature (4,15).

There are both strengths and limitations to this census study that must be taken into account in interpreting and taking action based on this work. First, our common assessment instrument (see Table 1) was constructed based on common MEP characteristics from the literature (4, 15). However, we recognize that no instrument can capture all programmatic elements, especially those that are custom-designed to address the needs of a particular institution, e.g., special sections of particular STEM coursework and/or articulation agreements with local HBCUs. This study was designed as a first-pass effort to broadly characterize the activities of MEPs and to assess alignment of common practices with accepted guidelines (4, 15). Secondly, the accuracy of methodology must be addressed. While we observed moderate to high inter and intra-rater reliability in web-based data collection, there was relatively poor alignment between web-based and survey data, with web data underestimating the number and variety of programmatic offerings. We attribute this discrepancy to a time lag in web updates for MEP programs; and anecdotally, we noticed that better resourced MEPs with a greater number of programmatic offerings had higher agreement between web and survey data.

Overall, this study provides strong evidence that few MEPs nationally are offering the recommended interventions to support underrepresented students within their programs, which may be due to insufficient resourcing. Future efforts should be directed towards institution and national-level advocacy for an infusion of resources into MEPs and guidance for these organizations to offer the recently recommended student interventions.

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