MSI Faculty on the Rise: Strengthening Federal Grant Proposals through Cross-Institution Collaborations and Networking

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Introduction

Minority Serving Institutions (MSIs), such as Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), Hispanic Serving Institutions (HSIs), and Asian American, Native American and Pacific Islander Serving Institutions (AANAPISIs), are critically important higher education institutions that increase the representation of low-income and historically marginalized racial and ethnic groups in the workforce, including STEM fields [1]. Altogether, MSIs comprise 14% of degree-granting institutions in the United States (U.S.) and 28% of all undergraduates enrolled in post-secondary education [2].

Despite their value in contributing to the STEM workforce, many of these institutions remain underfunded, with limited resources available to support research activities [3]. Many MSIs are teaching-focused institutions, resulting in large teaching loads for faculty and, thus, little time to dedicate to conducting research. Many of these institutions also do not possess the infrastructure (e.g., sufficiently staffed and/or experienced sponsored program officers) necessary to support applications for large federal grants [4]. These barriers make it challenging for MSI faculty to apply for and secure federal grant funding. Coupled with the racial disparity in federal funding agencies, faculty at MSIs are awarded notably fewer federal grants than faculty at Predominantly White Institutions (PWIs) [5].

While these internal factors can pose significant challenges for MSI faculty interested in pursuing research endeavors, external initiatives can serve as a bridge for these faculty, offering support in the form of career development programs that share information about available research supports while seeding impactful and long-standing relationships with other faculty and institutions [6]. Through one key initiative–the Capacity Building for Research at Minority Serving Institutions (CyBR-MSI)–the National Science Foundation (NSF) and the American Society for Engineering Education (ASEE) are actively working towards increasing the capacity of faculty at MSIs to compete for federal funding.

The CyBR-MSI program, funded by NSF and hosted by ASEE, is designed to 1) increase MSI faculty's competitiveness in receiving federal grant funds and 2) foster collaborations among MSI researchers that can increase grant opportunities. Collaborative research is beneficial in helping faculty secure federal funding by broadening expertise, expanding resources, and growing their network [6], [7], [8]. This paper aims to explore how the CyBR-MSI program impacted collaborations and federal grant submissions of MSI faculty through the following research question: ***To what extent do collaborations between MSI researchers in computer and information science and engineering fields promote the submission of federal grant proposals?***

Study Context

The CyBR-MSI program model was designed in alignment with Bada's (2015) constructivist theoretical framework, which posits that knowledge is constructed through active engagement [9]. Additionally, an andragogical lens (Knowles, 1968) was applied to the program's design,

recognizing that adults are motivated when learning is relevant and contextualized [10]. Through this lens, CyBR-MSI was designed to be relevant to participants' work as faculty researchers at MSIs and contextualized to the topic of computer and information science and engineering. As a result, the CyBR-MSI program was structured to provide contextualized instruction, relevant application assignments, team collaborative learning experiences, opportunities for the co-creation/co-construction of knowledge, and consistent, meaningful, individualized feedback.

In February 2020, under NSF Award No. CNS-1941329, ASEE hosted the Conference on Increasing Participation of MSIs in NSF Computer and Information Science and Engineering (CISE) Core Programs in Arlington, VA, which brought together more than 90 MSI engineering faculty researchers. The conference aimed to boost the number and competitiveness of MSI proposals to CISE core programs through plenary sessions, networking sessions, breakout discussions, and opportunities for interaction with NSF representatives. Based on anecdotal and survey data, several recommendations emerged to further build capacity among MSIs to prepare and submit competitive proposals to NSF CISE core programs, namely: (1) incorporate training on best practices for proposal preparation, including content focused on NSF's Broader Impacts criterion; (2) increase opportunities for formal and informal networking among MSI faculty researchers; and (3) cultivate mentors and champions for MSI researchers [11].

These recommendations served as the foundation for the virtual 2021 NSF CISE Proposal Development Workshop (NSF Award No. CNS-2039244), which was hosted by ASEE in spring 2021, aligned with the launch of the NSF Computer and Information Science and Engineering Minority-Serving Institutions (CISE MSI) Research Expansion Program and its inaugural solicitation [12]. Insights and outcomes from the 2021 proposal development workshop informed the conception and launch of the expanded Capacity Building for Research at Minority Serving Institutions (CyBR-MSI) Program (NSF Award No. CNS-2139136), which serves as the focus of this paper. The purpose of the CyBR-MSI program was threefold: (1) help participants identify and co-create research ideas for NSF CISE Core programs; (2) form and develop research teams among researchers from MSIs; and (3) boost MSI faculty's ability to prepare strong grant proposals.

CyBR-MSI, which commenced in fall 2021, was comprised of four interrelated components: (1) a Networking, Ideation & Team-Building workshop (NITW); 2) a Proposal Development Workshop (PDW); 3) a Mentoring Program (MP); and 4) a Mini-Grant Program (MGP) (**Figure 1**). These four components provided robust scaffolding to MSI researchers to develop team performance and proposal competitiveness competencies.

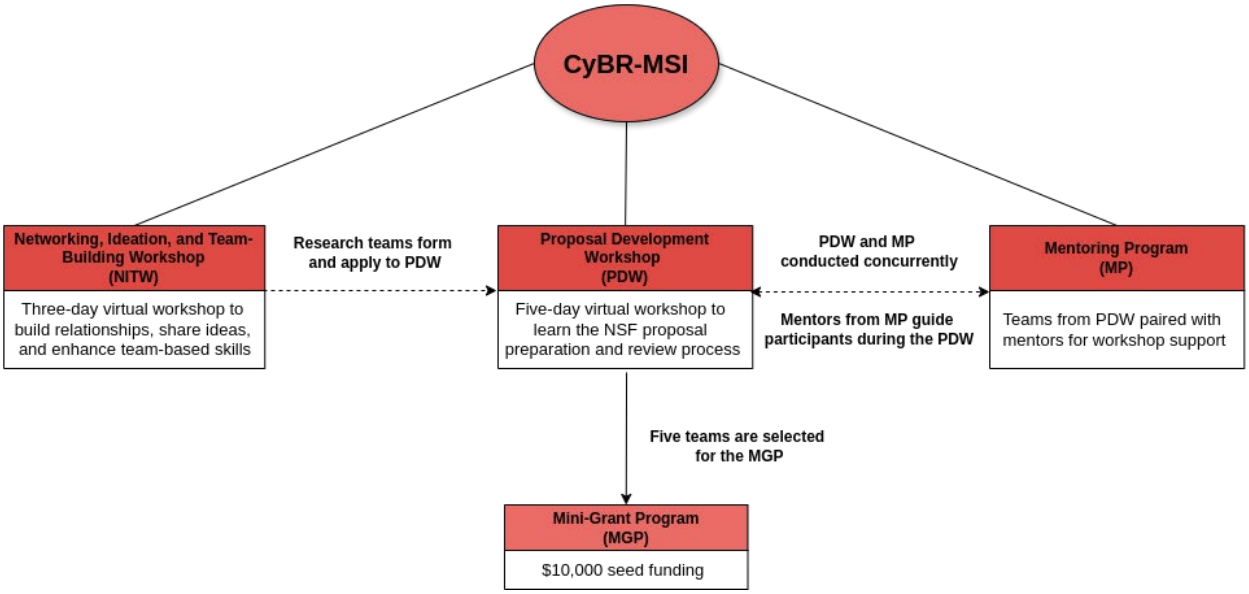

Figure 1. Structure of CyBR MSI and its four components

The Networking, Ideation and Team-building Workshop (NITW) was a three-day virtual workshop that brought together more than 140 MSI faculty to build relationships, share research ideas to seed meaningful conceptualization of CISE core team research projects, and enhance teamwork competencies and skills. One key outcome of the NITW was forming research teams that would apply to the Proposal Development Workshop (PDW).

The subsequent PDW took place virtually across five weeks. It sought to increase the capacity of 12 teams (2-3 people each) to produce competitive proposals through a program of instruction, practice, and review. The workshop equipped participants to (1) understand the NSF merit review criteria, (2) prepare various elements of a full proposal (i.e., project summary, project description, budget, and budget justification), and (3) understand the proposal review process. The Mentoring Program (MP) took place concurrently with the PDW and paired each research team with a lead mentor and supporting mentor, who provided individualized guidance and support throughout the workshop. PDW teams had the opportunity to apply for a mini-grant through the Mini-Grant Program (MGP), which provided $10,000 in seed funding to a select number of teams to maintain the momentum of their projects. Five teams were selected to receive mini-grant funding; four out of five teams were later awarded an NSF CISE-MSI grant.

Feedback from CyBR-MSI participants indicated a desire for training opportunities specific to increasing institutional research infrastructure, which resulted in the conceptualization and launch of the Minority Serving Institutional Readiness for Federal Grant Preparation Workshop (MSI-RFP) (CNS-1941329), a collaborative virtual workshop and Community of Practice (CoP) focused on institutional research readiness, was held in June 2022 for 21 participants representing 9 MSIs. A key outcome of the workshop was the development of a pilot Research Infrastructure Assessment Tool (RIAT), a self-assessment of an individual's understanding of Sponsored Research Office (SRO) services available at one's institution. MSI-RFP was scaled up into the CyBR-MSI: Infrastructure Research Readiness (CyBR-MSI:IRR) (CNS-2233087) that sought to (1) help participants assess campus research infrastructure and prioritize improvements; (2) form a community of practice among researchers and research infrastructure

administrators from MSIs focused on capacity building of research infrastructure; and (3) co-create, with campus leadership, an action plan for research ready infrastructure for strong grant proposals for NSF CISE core programs, through a Community of Practice (CoP) model.

To date, ASEE's CISE-MSI initiatives have reached close to 400 individuals across more than 150 unique institutions.

Positionality

The authors acknowledge our positionality in analyzing statements and data from MSI faculty. All authors worked closely on the evaluation of the CyBR-MSI program. Each author has a variety of experience in educational evaluation and research; however, only one author has experience at an MSI institution. While we attempted to combat this by working closely with CyBR MSI program directors, it is possible that our positionality led to biased, outsider perspectives in the data analysis and interpretations.

Data Collection

Data were collected and analyzed by Quality Evaluation Designs, under human subjects protocol Salus IRB Number: 24055-01. Quantitative data were obtained from a short survey sent to CyBR-MSI program alumni in April-May 2024. The survey was received by program alumni between 12-20 months after program participation, depending on which workshop(s) an alumnus attended. The survey was sent to 248 individuals—6 participated as program mentors or session facilitators, 2 reportedly signed up for an information session but did not participate in a program, 8 had undeliverable email addresses, and 3 had outside circumstances that made it challenging to reach them (e.g., retired, on family/medical leave)–leading to a sample of 229 program alumni. Seventy-two program alumni (~31%) completed the survey (see **Table 1** for demographic information).

Survey instrumentation explored the number of collaborations formed, frequency of engagement with collaborations, resources and exposure to federal grant opportunities due to CyBR MSI, confidence to and changes in preparing federal grants, value of CyBR MSI mentoring, and institutional changes due to the CyBR MSI program.

Table 1. CyBR MSI Program Demographics

	N (%)		N (%)
Gender		**Programs Attended**	
Male	39 (54%)	1	50 (71%)
Female	30 (42%)	2	12 (17%)
Prefer not to state	2 (3%)	3+	9 (13%)
Race		**Institution Type**	
White	14 (19%)	AANAPISI	3 (4%)
Black	16 (22%)	HBCU	23 (32%)
Hispanic	9 (13%)	HSI	38 (53%)
Asian	24 (33%)	PBI	2 (3%)
Native American	1 (1%)	TCU	1 (1%)
Multiracial	3 (4%)	PWI	4 (6%)
Prefer not to state	4 (6%)		
Role			
Asst. Professor	16 (22%)		
Assoc. Professor	12 (17%)		
Full Professor	10 (14%)		
Adjunct Professor	2 (3%)		
SRO Staff	2 (3%)		
Department Chair	12 (17%)		
Dean/Provost/VP	7 (10%)		
Administrative Staff	7 (10%)		
Postdoc/Other	3 (4%)		

Follow-up interviews were conducted to understand trends observed in the survey data: differences in collaborative networks, mentorship experiences, and perceived institutional support by institution type. Between June and July 2024, one to three email requests were sent to 18 survey respondents from HBCUs or HSIs who expressed interest in a follow-up interview and all 13 alumni from TCU/AANAPISI/ANNH institutions. Interviewees (n=5) hailed from a HSI (1), HBCUs (2), a TCU (1), and an AANAPISI (1). Capturing the voices of program alumni from these differing MSI types provided elaborated and enriched survey results.

Data Analysis

Survey data were analyzed through descriptive and inferential statistics, which included ANOVAs for multi-factor group comparisons and linear regressions for relational data [13], [14] All data were cleaned in Excel and analyzed using R version 4.4.2. We also used conventional

thematic analysis to identify themes within the data from the follow-up interviews [14], [15]. After a broad analysis, further investigation was applied to the demographic groups to understand whether and how the attendees in the various groups experienced certain aspects of the program.

Results

Collaborations from CyBR MSI programming lead to motivation and confidence in submitting federal grant opportunities

Survey results indicate the value of CyBR-MSI in supporting participants' confidence and motivation to submit federal grant proposals. Descriptive results show that participants *agreed* to *strongly agreed (1 = strongly disagreed, 2 = disagreed, 3 = agreed, 4 = strongly agreed)* that participation in a CyBR-MSI program exposed them to new federal grant opportunities ($\bar{x}$ = *3.14/4.00*) and encouraged them to apply for federal funding ($\bar{x}$ = *3.27/4.00)*. These faculty also felt more confident in their ability to write grant proposals (*1 = not at all confident, 2 = minimally confident, 3 = moderately confident, 4 = extremely confident)* overall ($\bar{x}$ = *3.14/4.00*) following engagement in a CyBR-MSI program. This pattern of confidence in writing grant proposals held strongly for alumni who attended 3+ programs ($\bar{x}$ = *3.80/4.00*) as they were significantly more confident about aspects of grant writing and submitting than those who attended only one program ($\bar{x}$ = *3.00/4.00*; $\boldsymbol{p = 0.024}$).

Faculty also showed a significant increase in perceived grant experience (*1 = no experience, 2 = minimal experience, 3 = moderate experience, 4 = extensive experience)* before ($\bar{x}$ = *1.94/4.00*) versus after ($\bar{x}$ = *3.13/4.00)* participating in a CyBR-MSI program ($\boldsymbol{p < 0.0001}$), suggesting that most actively pursued federal grants after program participation.

Survey data revealed that individuals who indicated they expanded their network through the CyBR-MSI program obtained more grants after participating (**Figure 2**). This relationship was significantly correlated ($\mathbf{r^2 = 0.069; p = 0.038}$). While the explanatory power may appear low, the tested effect size ranges around *medium* ($\boldsymbol{f^2 = 0.07}$). The low correlation results from high variability around the mean due to the data containing relatively few cases, while the number of grants submitted by respondents ranged from one to eleven. Yet because the correlation is significant and the effect size medium, we can conclude a positive relationship between respondents' perception of expanded network and increased grant activity.

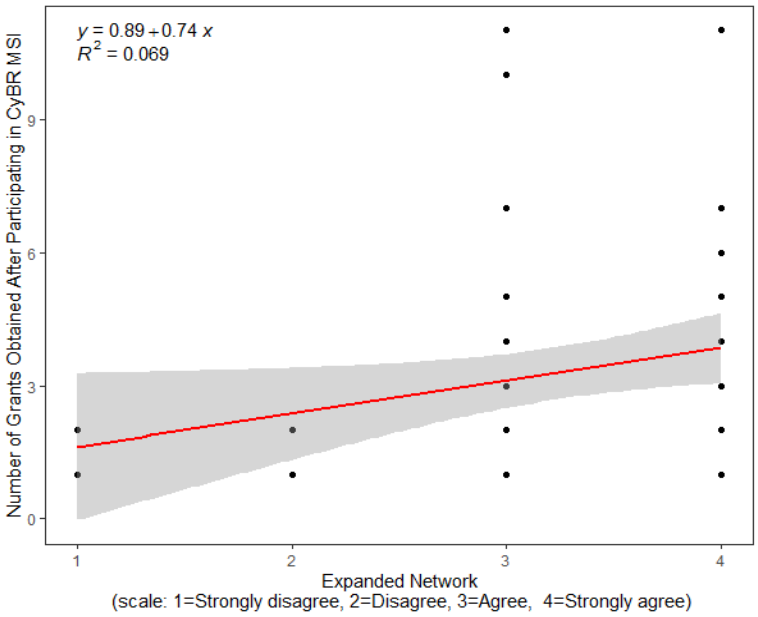

Figure 2. *Correlation between the level of agreement that participants expanded their network due to the CyBR MSI program and the total number of grants obtained AFTER participation in the CyBR MSI program*

Further support for the program's impact on grants obtained was evident from the number of programs faculty attended. Individuals who attended three or more (3+) CyBR-MSI programs had significantly more (***p* = 0.03**) grants *($\bar{x}$ = 5.29)* they were PIs on after attending CyBR-MSI programs than those who attended just one program *($\bar{x}$ = 2.87; effect size,* $\eta^2 = 0.10$, falls *between medium-large*) (**Figure 3**).

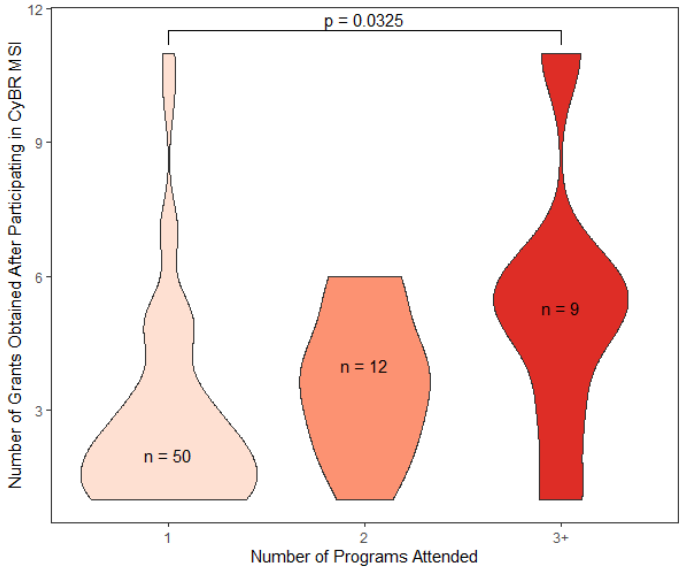

Figure 3. *Number of Grants Obtained after Participating in CyBR-MSI Programs by Number of Programs Attended*

Interview results indicate that preparation, understanding, and the ability to navigate federal grant proposals led to higher confidence and motivation to submit these proposals. One faculty member explains the impact of CyBR MSI on supporting this understanding:

> "*We are near the end of our [CyBR] MSI journey on that project. But we're planning* ***to go for a bigger grant****. From my perspective, the CyBR MSI Program really helped me to bootstrap my research group and also helped me to* ***understand and navigate [grant proposals].***" *- AANAPISI*

The faculty member notes the importance of understanding and navigating the proposal process in this quote. The sentiment of a better understanding of the overall grant proposal process was a strong outcome, particularly when faculty members referenced their mentors:

> *I really like that [the mentors]* ***guide you*** *from the very beginning* ***inception of ideas*** *into what's a good idea that may* ***get eventually funded****. They give you g****ood, specific advice*** *related to your field on* ***how to prepare your research proposals****. - HSI*

This faculty member states that mentors guide their mentees from start to finish in the proposal process. Specifically, they note that their mentor helped them build their initial ideas into one that will eventually be funded. Other faculty members mentioned that mentors give feedback on more than just how ready an idea is; they also give feedback on how ready the faculty member is.

> *"We [the mentee and their mentor] assess our situations like* ***how ready we are*** *to apply for a grant… We are working to* ***draft some proposals*** *right now." - HBCU*

This faculty member explains the role that their mentor had in helping them determine the extent to which their proposal was ready to submit. This faculty member mentioned that mentoring led to a collaborative effort between mentors and mentees to submit multiple proposals.

From a collaborative perspective, participation in CyBR-MSI programs expanded program alumni's professional networks (**Table 2**).

Table 2. *Professional Networking Resulting from CyBR-MSI Program Participation*

Item	Average Rating
Number of CyBR-MSI participants with whom respondents collaborate(d) due to program participation.	2.62*
Frequency of ongoing engagement in collaborations formed through CyBR-MSI	At least monthly to at least quarterly
Level of agreement that CyBR-MSI participation expanded professional networks*	3.21*
Level of agreement that CyBR-MSI participation helped team formation*	3.12*

**1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree*

The number of CyBR-MSI programs that individuals attended impacted outcomes related to expanding networks and forming teams. Individuals who attended two or more programs felt significantly more strongly that attendance in CyBR-MSI activities helped them expand their professional network (***p* = 0.002**) and form teams (***p* = 0.022**) than those who only attended 1 program. Interview findings reveal the intrinsic value of peer and mentor collaboration. One faculty member from a Hispanic-Serving Institution (HSI) discussed collaborations made within his own institution during his time in the CyBR MSI program:

> "*The grant we got as part of the MSI program allowed me to* ***establish a collaboration with three other faculty in my own schoo****l." - HSI*

Here, the faculty member explains the value of the internal collaborations he leveraged within his MSI to drive greater productivity. He describes the program to others who might be interested:

> "*I was able to mention [that] I participated in this other program for MSIs, which will eventually serve as a* ***preparation for me to go and apply for this bigger program*** *with the big guys… and it did already* ***open several doors***." *- HSI*

This faculty member shares the importance of CyBR-MSI in helping him develop collaborations and preparing him for ongoing support in applying for larger grants. The importance of the program in both developing collaborations at his home institution and supporting his development beyond the program provides evidence of how extrinsic programs and social supports have impacted this individual's professional development. Later in the interview, he notes that these collaborations have spanned institutions and helped him discover the quality of his research compared to those at larger institutions:

> "…[*Y]ou also discovered that, well, your research is* ***not actually far away from other bigger schools***." *- HSI*

Overall, the development of collaborations through CyBR-MSI helped to support the submission of federal grant proposals through the pooling of expertise and knowledge. This pooling eventually led to the development of confidence and motivation for CyBR-MSI faculty members. Broadly, CyBR-MSI helped to provide external environmental support through building collaborations for faculty professional development.

Expanded networks due to CyBR-MSI programming are positively related to more federal funding

Across interviews and MSI types, faculty note the resource scarcities for proposal preparation and submissions present within their MSI institutions. One faculty member from an HSI discussed resource disparities and the importance of the CyBR-MSI program in combating these issues. This faculty member acknowledges the disparity that exists between their MSI and other R1 institutions. Specifically, they discuss the dearth of resources present at their institution. They later state specifically what gaps collaborations from the CyBR-MSI program go on to fill:

> *"We **don't have as many resources, research expertise or research capabilities** as other **major R1 institutions**... [Through the CyBR-MSI programs], you get experience in **grant writing, managing funds, managing a project, and having to deal with administrative tasks**. That's good experience to be able to compete for funding. I would say it's a **more balanced affair** when having to compete with major players." - HSI*

This faculty member highlights the CyBR-MSI program as a method of helping obtain information on managing federal grants from proposal to project. Most importantly, the interviewee highlights how programs like CyBR-MSI help to level the playing field against other R1 institutions. The program's major goal is to create a "more balanced affair" in federal grant submissions for MSI faculty. Inter-institutional collaborations developed through the CyBR-MSI program were considered extremely valuable for submitting federal grant proposals and a central theme throughout interviews with each MSI type. The extent to which these collaborations spanned institutions is well captured in this quote by an AANAPISI faculty member:

> "*I met a co-investigator [through CyBR-MSI], and I found out that we work on similar sorts of problems…the next offering of the NSF proposal submission, **we submitted one proposal with six [other] universities**.*" - *AANAPISI*

This faculty member notes that their collaboration through CyBR-MSI snowballed into a grant proposal submission that spanned multiple universities.

In summary, collaborations are one of the most prominent outcomes of the CyBR-MSI programs, with participation in more programs leading to higher rates of collaborative opportunities and engagement. Both survey and interview data highlight the importance of these collaborations in developing grant proposals and networking among individuals. While we posit that collaborations and networking formed through CyBR-MSI are related to higher levels of federal grant activity, we know that increased grant activity could also be explained by having more time in the field. However, nearly all participants took the programs across the span of 8-16 months; therefore, time in the field would not be very different for those with low vs. high grant activity, regardless of total years in the field.

The overall importance of programs such as CyBR-MSI in supporting collaborations and mentoring is well summarized by this quote from a TCU faculty member: "*I couldn't have had those connections without this* ***project bringing us together***." - TCU

Limitations

Only five alumni were interviewed, with just one from an AANAPISI, TCU, and HSI and two from an HBCU. While we believe their interviews to be extremely rich, MSIs are not ubiquitous, and this interview set would have benefited from additional perspectives from faculty at different institution types.

Discussion

This study investigated the importance of the CyBR-MSI program in empowering MSI faculty through collaboration. We investigated the research question: ***To what extent do collaborations supported by CyBR-MSI between MSI researchers in computer and information science and engineering fields promote the submission of federal grant proposals?***

Our results suggest that collaborations facilitated between MSI faculty members by the CyBR-MSI program support submitting and obtaining federal grants. From our qualitative and quantitative results, we find that collaborations formed during the CyBR-MSI program support the submission of federal grants by MSI faculty in two ways.

First, MSI faculty gained familiarity and confidence in the grant submission process through participating in the CyBR-MSI program. This confidence was seen in the writing and submitting of a federal grant. Additionally, the program helped expose faculty to new grant opportunities and encouraged faculty to pursue them. This knowledge is crucial because it empowers faculty to navigate the complex and competitive grant landscape more efficiently and effectively [16]. By understanding tacit knowledge of grantsmanship, including requirements and expectations of federal funding agencies, faculty are better positioned to develop compelling proposals that align with agency priorities [16].

Second, collaborations lead faculty to prepare more federal grant proposals by mitigating resource scarcities and promoting mentoring. Resource scarcities, oftentimes present at MSI institutions, are combated by pooling resources. Knowledge bases and workloads are distributed by collaborating with individuals and sponsored project departments from other MSI institutions. This distribution of resources allows for support for all collaboration members, filling in resource gaps at their home institutions. Even when collaborating with individuals from the home institution, faculty are better positioned to submit and obtain competitive grants than when working alone. Much research on how collaboration benefits MSIs in grant submissions focuses on partnering with larger institutions, often PWIs [8]. While these are certainly meaningful collaborations, the CyBR-MSI program is unique in its goal to build capacity by fostering inter-MSI collaborations. This approach supports their growth and development and ensures that the voices, perspectives, and needs of communities often overlooked are included [17]. By building capacity within MSIs, these collaborations create a more inclusive, diverse, and equitable research landscape, essential for addressing complex, multifaceted issues affecting all

populations. These programs likely help faculty submit successful federal grants by building their social capital by expanding their network and collaboration opportunities [18].

Our findings support programming such as CyBR-MSI to promote federal grant submissions for MSI faculty. Collaborative programs that include tangible and intangible support through mentorship and resource-sharing can be used to help combat resource scarcities at institutions such as MSI and ultimately support faculty within these institutions. Broadly, we hope these findings motivate more programs to support faculty at institutions that continue to battle with constraints caused by historic inequities.

Future Directions

ASEE will host a CISE-MSI Proposal Development Workshop in the summer of 2025. The workshop will take place in five virtual sessions and equip up to 12 research teams to (1) understand the NSF merit review criteria, (2) prepare various elements of a full proposal, and (3) understand the proposal review process.

References

[1] G. J. Cole and S. A. Marshall, "Highlighting the contributions of Minority Serving Institutions to neuroscience," *J. Neurosci. Res.*, vol. 100, no. 8, pp. 1527–1528, Aug. 2022, doi: 10.1002/jnr.25064.

[2] H. Rivera, "HBCU and MSI Facts and Statistics | Bankrate," Bankrate. Accessed: Jan. 14, 2025. [Online]. Available: https://www.bankrate.com/loans/student-loans/hbcu-and-msi-statistics/

[3] M. Escobar, M. Qazi, H. Majewski, C. Kotoye, and J. Barfield, "Barriers and Facilitators to Obtaining External Funding at Historically Black Colleges and Universities (HBCUs)," *J. STEM Educ. Innov. Res.*, vol. 24, no. 1, Sep. 2023, Accessed: Jan. 14, 2025. [Online]. Available: https://jstem.org/jstem/index.php/JSTEM/article/view/2606

[4] G. Lichtenstein and T. Ta, "The Research Infrastructure Assessment Research Tool (RIAT): Pilot Results & Findings," Quality Evaluation Designs, Unpublished Technical, Aug. 2022.

[5] I. A. Toldson, "Drivers and Barriers of Success for HBCU Researchers Submitting STEM Proposals to the National Science Foundation (Editor's Commentary)," *J. Negro Educ.*, vol. 86, no. 4, pp. 415–421, 2017.

[6] Y. Jalali, C. Tysor, V. Lohani, and C. Matheis, "Diversity and Inclusion and Research Partnership Development: Can Seed Investments Really Help Promote Trans-institutional Collaborations?," in *2019 CoNECD - The Collaborative Network for Engineering and Computing Diversity Proceedings*, Crystal City, Virginia: ASEE Conferences, Apr. 2019, p. 31756. doi: 10.18260/1-2--31756.

[7] L. Yousoubova and L. McAlpine, "Why is the proposal alone not sufficient for grant success? Building research fundability through collaborative research networking," *Innov. Educ. Teach. Int.*, vol. 59, no. 1, pp. 93–103, Jan. 2022, doi: 10.1080/14703297.2021.1997784.

[8] L. L. Espinosa, Hallmark Tyler, and K. S. Baxter, "Improving MSI Pathways to STEM Graduate Education Through Grantmaking: Lessons for the Field," *Change Mag. High. Learn.*, vol. 54, no. 4, pp. 31–37, Jun. 2022, doi: 10.1080/00091383.2022.2078152.

[9] S. O. Bada and S. Olusegun, "Constructivism learning theory: A paradigm for teaching and learning," *J. Res. Method Educ.*, vol. 5, no. 6, pp. 66–70, 2015.

[10] M. Knowles, "Andragogy, not pedagogy," *Adult Learn.*, vol. 16, no. 10.

[11] "2020 Conference on Increasing Participation of Minority-serving Institutions in NSF CISE Core Programs," American Society for Engineering Education, Washington, D.C, Meeting Report, 2020.

[12] "NSF 22-518: Computer and Information Science and Engineering Minority-Serving Institutions Research Expansion Program (CISE MSI) | NSF - National Science Foundation." Accessed: Jan. 14, 2025. [Online]. Available: https://new.nsf.gov/funding/opportunities/cise-msi-computer-information-science-engineering-research-expansion/nsf22-518/solicitation

[13] *Scientific Research in Education*. Washington, D.C.: National Academies Press, 2002, p. 10236. doi: 10.17226/10236.

[14] J. W. Creswell, *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*, 4th ed. Boston, MA: Pearson Education, 2012.
[15] C. Glesne, *Becoming qualitative researchers: an introduction*, Fifth edition. Boston: Pearson, 2016.
[16] L. C. Windsor and C. Kronsted, "Grant Writing and the Hidden Curriculum: Mentoring and Collaborating Across Disciplines," *PS Polit. Sci. Polit.*, vol. 55, no. 2, pp. 313–323, Apr. 2022, doi: 10.1017/S1049096521001827.
[17] M. Givens, B. Dabson, H. Joyner, and O. Little, "Connecting Minority-Serving Institutions and Rural Research," Aspen Institute, Aug. 2023. Accessed: Jan. 14, 2025. [Online]. Available: https://www.aspeninstitute.org/publications/connecting-minority-serving-institutions-and-rural-research-2/
[18] K. Jensen, I. Miller, D. Suresh, and J. Martin, "Beyond skills: building research capacity through cognitive apprenticeship and social capital," *Australas. J. Eng. Educ.*, vol. 28, no. 1, pp. 97–109, Jul. 2023, doi: https://doi.org/10.1080/22054952.2023.2230068.