Using Postdoctoral Summits to Provide Equitable Opportunities

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Introduction

As the need for innovative discoveries increases in the US, there is a concomitant increased need for postdoctoral researchers to contribute to advancing STEM [1, 2]. Postdoctoral scholar appointments have increasingly been considered informal requirements for research careers in the industry, government, and non-profit sectors [3,4]. Further, many tenure-track faculty in STEM fields were previously postdoctoral researchers [5]. Postdoctoral positions are commonly viewed in academic and non-academic research-focused areas as an ideal environment for professional research training, skill development, and mentorship in preparation for a research career. While the National Science Foundation-funded projects provided 90% of STEM postdocs in 2009, there was no centralized location for finding or advertising these positions [6]. More recently, a study at MIT reported that many postdoctoral students reported securing their postdoctoral opportunity through a personal connection or cold calling techniques [1]. Considering the significant impact of postdoctoral training on individual career trajectories and the broader research landscape, promoting equitable and inclusive access to postdoctoral opportunities is essential for advancing equity and fostering innovation in STEM. [5, 7].

Despite difficulties accessing available positions, STEM education research represents a notable, though not dominant, portion of available STEM postdoctoral opportunities. Our project team created the STEM Education Postdoctoral Opportunity Summit to bridge gaps in access and awareness. The Summit aimed to connect aspiring postdocs with postdoctoral mentors and opportunities in the STEM education field, fostering equitable access and supporting career development in this specialized domain. This paper will examine how the project team designed and implemented the Summit to achieve these goals. We will explore the challenges faced and the considerations taken during the planning and execution phases of the Summit and offer actionable recommendations for stakeholders seeking to build upon this impactful initiative.

Purpose

Academic spaces have often been guided by the belief that “if we build it, they will come.” In other words, creating opportunities is assumed to be sufficient for ensuring access, as interested parties will naturally find and take advantage of them. However, this belief reflects a meritocratic approach that overlooks disparities in access to such opportunities [8]. It absolves the opportunity holder of responsibility, placing the onus entirely on the seeker. Those who access these opportunities often do so through privileged pathways, tapping into their social capital or hidden networks that are not equally accessible to all demographic groups [1, 7]. The long-standing adage epitomizes this phenomenon, “It's not what you know but who you know.” We advocate for a move from “if we build it, they will come” to “if we build it, we need to invite them in.” For postdocs, this means actively promoting opportunities and ensuring access is not limited to those already positioned within established networks.

Professional conferences have long served as valuable platforms for delivering opportunities directly to individuals. Within many STEM fields, they are used to host job fairs, facilitate networking events, and connect attendees with career resources. These gatherings are practical tools for job attainment and professional networking in academic and professional contexts [9].

However, access to postdoctoral opportunities in STEM education research often remains limited due to structural barriers, including attending conferences (i.e., financial constraints) and information gaps, particularly for individuals from underrepresented or marginalized groups [7]. Addressing these barriers requires intentional design and outreach efforts to ensure opportunities are both visible and accessible to a diverse pool of candidates.

Overview of the Summit

The Summit, held virtually in November 2023, brought together representatives from over 25 institutions, including academic and non-profit research organizations. These institutions collectively advertised more than 60 postdoctoral positions to an audience of over 130 potential applicants. The Summit's structure facilitated direct engagement between postdoc seekers and those with available postdoc positions by allowing individuals from both groups to create personalized slides in a shared slide deck. This deck featured direct contact information and resume snapshots, creating a centralized resource for efficient networking and communication. To support the Summit's long-term impact, the project team employed an evidence-based evaluation approach to assess its effectiveness and inform future iterations. Evidence-based design enhances the Summit's effectiveness by aligning its structure with proven networking and job placement methods, ensuring meaningful connections and successful outcomes. It also provides data-driven insights to refine the intervention, increase its credibility, and support scalability, sustainability, and long-term.

Methodology

Participant Recruitment and Promotion

We designed the Summit as a national, virtual gathering event to address inequities in postdoctoral recruitment by fostering connections between underrepresented postdoc candidates and research mentors across institutions. We leveraged existing professional networks within the project team. We established new partnerships through affiliation groups such as the Society of Women Engineers (SWE), the Society for Hispanic Professional Engineers (SHPE) and the National Society of Black Engineers (NSBE) to ensure diverse participation. We also leveraged the network of awardees of the NSF STEM Education Postdoctoral Research Fellowships (STEM Ed PRF) Program (both individual and organizational awardees) by sending Summit information through our NSF program officer and publicly available lists of awardees.

Design and Implementation of the Summit

To prioritize mentorship and collaboration, we structured Summit activities around a research marketplace and mentorship-focused sessions, intentionally moving beyond traditional job fair formats. The research framework for our project centers on diversity, equity, and inclusion (DEI), and we enacted that framework by designing a welcoming environment for individuals from historically underrepresented groups in STEM.

Before the Summit, we sent out the information and links through our personal and professional contacts and professional list-serves; however, we do not claim to have successfully invited everyone who might have been interested in attending. We cannot be sure that word reached everyone despite our best efforts. The online application allowed anyone interested in attending to pre-register through a form they could submit and ultimately share their information. The form allowed opportunity seekers to review program details and for postdoctoral opportunity holders

to review basic info (name, institution, research areas) about potential applicants. Basic contact information and areas of research interest were shared with all registered participants, and we encouraged potential postdoc applicants to identify their top programs of interest before the Summit. Other information gathered through the pre-registration portal was access needs. These methods allowed us to meet the needs of a diverse group of participants. For example, based on the stated needs of one or more participants who identified with the deaf and hard of hearing community, we secured the services of an American Sign Language (ASL) interpreter during the Summit and provided closed-captioning through the online platform.

During the two-hour Summit, we leveraged the capabilities of the online meeting platform, specifically breakout rooms, a live "chat" window and a central gathering room, to create customized spaces and interaction mechanisms to allow participants to foster personal connections. Summit activities and formats are summarized in *Table 1* below. We opened the Summit with a brief explanation of how the Summit would work and an overview of different types of STEM education research postdocs and what those positions typically entail. The next portion of the Summit allotted up to two minutes for each opportunity holder to introduce themselves, describe the nature of their available postdoc positions, and share something interesting about the setting where the postdoc(s) would work.

Activity	**Duration**	**Format and notes**
Welcome and overview of the Summit format and goals	5 minutes	Whole group; main room
What is a postdoc? What is STEM education research?	10 minutes	Whole group; main room
Available Postdoc Opportunities (postdoc hirers)	30 minutes (2 minutes per participant)	Whole group; main room; Summit facilitator advanced through Google slide created by each participant
Transition to breakout rooms	5 minutes	
Participant introductions and elevator pitches (postdoc seekers)	20 minutes (1 minute per participant)	Breakout rooms organized by discipline/focus area; Summit facilitator in each room advanced through Google slide created by each participant
Speed networking (rotating through multiple rooms)	45 minutes; prompt participants to rotate every ~10 minutes	Breakout rooms organized by discipline/focus area
Closing remarks	5 minutes	Whole group; main room

Table 1. Outline of Summit activities and formats.

We then formed multiple breakout rooms and assigned those with available postdoc positions into small groups (3 - 5 per room) roughly by disciplinary background or focus area (i.e.,

mathematics education, computer science education, K-12 STEM education, etc.). The breakout room assignments were posted on a slide in the main room, and participants who were seeking postdoc positions ("postdoc seekers") were encouraged to visit rooms that aligned with their interests or just piqued their curiosity. About every 10 minutes, we prompted postdoc seekers to see different rooms. We also offered the option of creating additional breakout rooms for individual conversations; however, none of our participants requested this option. The Summit ended with a period for general questions about sharing information with participants and those who wanted to participate but could not attend.

About a week after the Summit, the project team shared the final list of participants and their information with all participants and those who registered and shared their information but could not attend the Summit. The shared information was available upon request from postdoc seekers and those with available positions who did not participate in the Summit (for example, those who received funding to hire a postdoc after the Summit took place).

Data Collection

To evaluate the impact of the Summit, we employed multiple data collection methods to capture comprehensive insights from participants and stakeholders:

- *Surveys:* We administered pre- and post-Summit surveys to collect quantitative and qualitative data on participants' experiences, perceptions, and outcomes.
- *Attendance Metrics:* We analyzed registration and attendance records to assess the Summit's reach and participant demographics.
- *Interviews:* We used a semi-structured interview protocol to capture the in-depth perspectives of research mentors and project team members. These interviews explored themes such as structural barriers, mentee needs, and DEI-related challenges.

Data Analysis

We employed a mixed-methods approach to analyze the data and evaluate the Summit's outcomes:

- *Thematic Analysis:* We analyzed qualitative data from surveys, feedback sessions, and interviews to identify recurring themes and unique insights on participants' experiences with mentorship, professional development, and the Summit's DEI-centered design.
- *Descriptive Statistics:* We summarized attendance metrics and survey responses using descriptive statistics to evaluate participant demographics, engagement levels, and satisfaction rates.
- *Comparative Analysis:* We compared pre- and post-Summit survey results to measure changes in participants' perceptions, knowledge, and professional readiness, focusing on mentorship effectiveness and the Summit's DEI framework.

During structured feedback sessions, we shared the results of these analyses with our advisory board and project team. This iterative process enabled us to refine the design of future Summits. It informed the development of transferable models and policy recommendations to promote equity in postdoctoral recruitment and professional development.

Findings

We focused on key goals in preparation for the Summit, including making postdoctoral opportunities more accessible and fostering inclusivity. This section will discuss our findings on building partnerships, structuring activities, centering diversity, equity, and inclusion, and addressing challenges and institutional barriers.

Building Partnerships and Networks

To ensure a broad reach and a diverse applicant pool, we leveraged existing networks within the STEM education community and fostered new collaborations. We reached out to professional organizations and relied on the expertise and connections of our project team members. This collaborative approach allowed us to connect with potential postdocs and faculty mentors from various backgrounds and institutions. One faculty member highlighted the importance of the collaborative approach in an interview, describing a "sense of camaraderie of the team and the project; this camaraderie built around this shared interest of diversity, equity, and inclusion, right? And that this is what we do, and part of that is how we enact it in our daily lives and interactions."

Structuring Summit Activities

Recognizing the limitations of traditional job fairs offered at professional conferences, we designed the Summit to be interactive and engaging. Activities included a "marketplace" style format, where participants could share their research interests and connect with potential mentors. This intentional move away from a prescriptive research agenda facilitated meaningful conversations and fostered a sense of shared ownership. One faculty member noted that they wanted to convey "the idea that we're not bringing in postdocs to do prescriptive grunt work for us, but rather seeing this as having the privilege of being part of the professional life of somebody who's starting that journey as an applicant, and that we're going to be learning at least as much from them as they learn from us." This approach intentionally moved away from the traditional hierarchical power dynamic often present in academia, aiming to create a more equitable and inclusive environment.

Centering Diversity, Equity, and Inclusion

To attract a diverse pool of postdocs, we implemented targeted recruitment strategies focused on reaching out to individuals from underrepresented groups. We also created a welcoming and supportive environment by providing resources and mentorship opportunities specifically tailored to the needs of postdocs from marginalized backgrounds. For example, we provided information on navigating university policies, advocating for postdoc needs, and addressing potential challenges related to identity and inclusion. One faculty member emphasized the importance of "meeting people where they're at" and acknowledging the unique experiences and challenges that postdocs from diverse backgrounds may face.

Missed Opportunities & Addressing Challenges and Institutional Barriers

While we strove to create an inclusive and equitable experience, post-Summit feedback revealed missed opportunities to address specific access needs. For example, some participants highlighted the lack of structured networking opportunities, making it difficult for individuals who thrive in more organized settings to connect with potential mentors during the Summit.

Through discussions during the Summit, we encouraged participants to explore institutional barriers that could hinder their growth in a postdoc position. For example, we encountered conflicting university and college policies regarding postdocs serving as principal investigators on external grant proposals. We shared our experience as faculty mentors at our institution who advocated for the postdocs' right to pursue funding opportunities and challenged restrictive policies limiting their professional growth. Additionally, we encouraged participants to inquire about increased institutional support for postdocs beyond their initial appointment, advocating for policies that address their unique needs and facilitate their transition into faculty positions.

We also encouraged postdoc seekers to be aware of the sociopolitical contexts of the institutions they were considering applying to, sharing our context and the potential impact of these dynamics on our postdocs' experiences.

Discussion and Lessons Learned

The STEM Education Postdoctoral Opportunity Summit demonstrates the transformative potential of intentionally designed activities in addressing systemic inequities within postdoctoral recruitment. Through careful analysis of the summit's implementation and outcomes, we identified several key dimensions that contribute to creating more equitable postdoctoral pathways while recognizing areas requiring further development to ensure comprehensive accessibility.

Our findings indicate that the Summit's structure disrupted traditional postdoctoral hiring practices that often perpetuate existing inequities through reliance on informal networks and personal connections. The marketplace format, which emphasized collaborative engagement over hierarchical interactions, created an environment where participants from diverse backgrounds could meaningfully connect with potential mentors. This structural innovation represents a significant departure from conventional job fairs, fostering a sense of shared ownership and agency among all participants.

The Summit's emphasis on mentorship and mutual learning proved particularly effective in addressing power dynamics that impede equitable participation in academic spaces. Faculty mentors reported valuable experiences engaging with postdoctoral candidates as collaborative partners rather than subordinates, challenging traditional hierarchical relationships that can particularly impact scholars from marginalized backgrounds. Participant feedback revealed essential considerations for enhancing accessibility, specifically the need for more structured networking opportunities to accommodate diverse communication preferences and interaction styles.

Institutional barriers emerged as significant potential challenges for some of the participants. These included inconsistent policies regarding postdoctoral researchers' eligibility for principal investigator status and limiting career advancement opportunities for emerging scholars across different institutions at the Summit. Postdoc seekers should be aware that they must navigate complex sociopolitical contexts within academic institutions and pay careful attention to ensure they will be adequately supported and validated in their postdoc experiences. It is also essential to consider that institutions have variable practices and rules governing postdocs; faculty may

not always be aware that their postdoc experience and advice informed by it are not necessarily transferable to all postdoctoral situations.

The broader implications for diversity and inclusion in academia extend beyond immediate postdoctoral recruitment. The Summit created a model for systemic change in academic hiring practices by centering equity through intentional design and targeted outreach efforts. This approach demonstrates how thoughtful structural modifications can create more welcoming and supportive environments for scholars from historically underrepresented groups, ultimately contributing to a more diverse and innovative STEM workforce.

Future iterations of the Summit should address several key areas for enhancement:

- Implementing more structured networking opportunities that accommodate diverse communication needs and preferences
- Developing sustained support and networking mechanisms for participants beyond the Summit experience
- Advocating for policy reforms to address institutional barriers that limit postdoctoral advancement
- Strengthening partnerships and networks to ensure long-term impact and sustainability

These findings underscore the critical importance of approaching academic recruitment through an equity-centered lens that recognizes and validates diverse experiences and perspectives. The summit's success in creating more accessible pathways to postdoctoral opportunities provides valuable insights for future initiatives to transform academic hiring practices.

Recommendations

Drawing from the Summit's outcomes and participant feedback, we present a structured framework of recommendations to transform postdoctoral recruitment practices in STEM education. These recommendations emphasize creating accessible pathways while acknowledging and accommodating diverse needs and communication styles.

Summit Design and Implementation

To effectively replicate and enhance the Summit model, we recommend the following evidence-based strategies:

Structural Framework

Organizations should develop comprehensive information-sharing opportunities that prioritize accessibility and universal design principles. These resources should facilitate equitable access to postdoctoral opportunities through transparent navigation systems and multiple modes of engagement. The Summit structure should move beyond traditional job fair formats, incorporating interactive research marketplaces and collaborative learning spaces that accommodate diverse interaction preferences.

Inclusive Outreach Strategies

Implementation requires careful attention to recruitment practices that reach historically marginalized communities in STEM education. These practices include:

- Developing targeted communication strategies that resonate with diverse academic communities
- Establishing partnerships with professional organizations serving underrepresented scholars
- Creating multilayered mentorship opportunities that recognize varying support needs
- Implementing flexible networking formats that acknowledge and validate different communication styles

Addressing Systemic Barriers

To promote lasting institutional change, we propose several structural interventions:

Policy Development

Institutions must advocate for and implement policies that enhance postdoctoral advancement opportunities, including:

- Establishing clear pathways for postdoctoral researchers to serve as principal investigators on research grants
- Creating standardized, equitable guidelines for postdoctoral recruitment and hiring
- Developing comprehensive professional development programs that recognize diverse career trajectories

Resource Allocation

We recommend creating sustainable support mechanisms through the following:

- Establishing a national, publicly accessible database of STEM education postdoctoral opportunities
- Developing comprehensive toolkits for hosting inclusive summits
- Implementing ongoing mentorship programs that extend beyond initial recruitment

Future Directions

To ensure continued progress toward equitable postdoctoral pathways, we recommend:

Research Initiatives

- Conducting systematic studies to identify and address barriers to equitable access
- Evaluating the long-term impact of inclusive recruitment practices
- Developing evidence-based frameworks for measuring institutional progress toward equity goals

Community Building

- Fostering networks of practice among institutions committed to equitable hiring
- Creating sustained dialogue spaces for sharing effective strategies
- Building collaborative partnerships across institutional boundaries

The success of these recommendations depends on sustained commitment from institutional stakeholders and continuous evaluation and refinement based on participant feedback and emerging needs. By deliberately implementing these strategies, we can work toward dismantling systemic barriers and creating genuinely inclusive pathways for postdoctoral scholars in STEM education research.

Conclusion and Call to Action

The STEM Education Postdoctoral Opportunity Summit demonstrated how thoughtfully designed activities can challenge inequitable recruitment practices by fostering collaboration and equitable engagement among diverse participants. By emphasizing mentorship as a mutual learning process, the Summit disrupted traditional hierarchical structures, creating space for marginalized scholars to build more collaborative and supportive relationships with potential research mentors.

Participants were encouraged to address systemic issues, such as inconsistent opportunities for postdoctoral advancement and limited principal investigator (PI) status eligibility, underscoring the need for institutional policy reforms. To enhance future Summits, we provide recommendations that include implementing more structured networking opportunities, providing sustained support after the event, advocating for policy changes, and building stronger partnerships. These efforts aim to create long-term impact, broaden access to professional advancement opportunities, and establish equity-centered recruitment models that promote diversity and inclusion in STEM postdoctoral pathways.

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