Title: Community-Driven Programming to Strengthen Scientific Conference Experiences: A First Look at Black In Neuro and Black In Micro Event Outcomes

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Data Availability Statement: De-identified quantitative survey data and analysis scripts are available upon request. Due to the small sample sizes in some demographic subgroups and the inclusion of open-ended responses that could compromise participant anonymity, data will be shared in aggregated form or with additional de-identification measures as appropriate. The survey instrument and codebook are available in the supplementary materials.

Abstract

This study establishes a program evaluation design for Black scientist-led community-driven programming. Black In Neuro and Black in Micro collaborated to develop an assessment to benefit future BlackInX programming and measure their outcomes. Black scientist-led events, including BlackInX conferences, broadly aim to address persistent marginalization in STEM conferences and foster professional development. Here, we assessed five BlackInX events (Black In Neuro Week 2023, Black In Micro Week 2023, and sessions at Society for Neuroscience, American Society for Microbiology, or American Society for Virology) using post-event surveys (N=191) to examine belonging, inclusion, accessibility, and career value. Mixed-methods analysis combined Likert-scale ratings with inductive thematic coding. Both hybrid/online and in-person events achieved high belonging ratings (>4/5), with no significant differences for sense of belonging, resource awareness, or community connections. In-person events showed advantages in inclusiveness (M=4.62 vs 3.98, p=.006) and team responsiveness (M=4.44 vs 3.95, p=.029), while hybrid/online events received higher recommendation likelihood (M=4.91 vs 4.70, p=.022). Variation within Black groups proved as meaningful as variation across racial groups. Black/African participants rated inclusiveness, belonging, and responsiveness significantly lower than Black/Caribbean and Black/African American participants. Qualitative analysis revealed knowledge gained, community connection, and identity representation as primary themes. This study provides pilot methodology for systematic program evaluation. Overall, Black scientist-led community-driven programming positively impacts attendee conference experiences, regardless of race.

Keywords: education, community participatory research, early career, professional development, neuroscience, microbiology

Introduction

Professional Development at Scientific Conferences

Scientific research conferences are invaluable spaces for the professional growth of scientists. Conferences are venues to network on an international scale, establish collaborations, share one's own research findings, gain insight into the novel directions the field is headed, as well as bolster one's professional development (PD) (Atkas & Demirel, 2019; Wenger, 2025). However, not everyone feels equally welcomed into all scientific spaces (Sarabipour et al., 2021). Whether it is due to the conference having significant gender disparities, a lack of disabled scientist representation and accommodations, or being able to count on one hand the number of scientists present from a specific racial/ethnic identity, a lack of inclusivity can diminish one's sense of belonging in the space (Carroll, 2022). Particularly for trainees and early career researchers, this can reduce their access to opportunities as conferences serve as informal learning spaces (Hauss 2020).

Most major scientific conferences such as the Society for Neuroscience (SfN) Annual Meeting and the American Society for Virology (ASV) Annual Meeting host PD sessions in addition to scientific talks. These PD sessions and social events serve as important formal and informal mentoring spaces where essential professional wisdom is imparted onto the next generation of scientists (James, 2020). Examples of these sessions include *Navigating Your Career Roadmap in a Changing Landscape*, *Leadership at Every Step of the Journey,* and *Telling Your Story to the Public: Tools to Make Your Science Visible* (SfN 2025, ASM Microbe 2025). During these events, longer-lasting connections and mentoring relationships can arise as attendees

exchange social media and other contact information. Recently, these PD sessions increasingly discuss diverse perspectives of pursuing a scientific career, including as an LGBTQ+ person, a person of color, as a disabled person, a parent, or other intersectional identities (Maringer, 2025; Segarra 2017; Segarra, Batch et al 2020).

Reaching across multiple disciplines in STEM, conferences organized by the Annual Biomedical Research Conference for Minoritized Scientists (ABRCMS) and the Society for the Advancement of Chicano/Hispanic and Native American Students (SACNAS) have integrated identity-based experiences as a central component of their PD sessions. For over two decades, they have supported trainee career development, through workshops such as *Mentoring Matters! Inclusive Strategies to Increase Diversity in the STEM Workforce, Lessons from Disabled Scientists,* and *Un Paso Pa'lante: Putting Hispanic/Latinx STEM Doctoral Students on the Path to Teaching at Community Colleges* (ABRCMS 2024, SACNAS 2022). These PD sessions are prime examples of community-driven programming.

Community-driven programming is a bottom-up approach that empowers members of a community to identify their own needs and develop interventions that can best meet those needs (Wallerstein & Duran 2006). It entails leveraging community knowledge and adjusting event topics to suit the current climate. In STEM higher education, it is often senior scientists from marginalized groups who develop PD workshops to enhance the professional growth of trainees from those same communities (Jimenez, 2019). Historically marginalized scientists have been leading the charge to have more intentionally inclusive community-driven programming at field-specific conferences like SfN and ASV.

Black Scientist-Led Events for the Broader STEM Community

There are many different groups of historically marginalized scientists that develop community-driven programming in order to better support others with similar identities (Maringer, 2025; Segarra 2017; Segarra, Batch et al 2020). This publication specifically focuses on the efforts of the Black scientific community. Historically, Black scholars have organized collective action to provide PD opportunities and broaden participation in science fields. As examples, the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE), National Society of Black Engineers (NSBE), and the National Society of Black Physicists all emerged in the early 1970s. These organizations sought to highlight the research being done by Black scholars in their respective fields, increase the number of Black researchers in STEM, and provide PD workshops to support their success (Davis 2004; Fletcher et al., 2024; Monique & Ross, 2016). In the 2010s as technology evolved and social media became a much more widely used tool to connect people, hashtags such as #BlackandSTEM and #VanguardSTEM were used to build online communities for scientists of color (Adams et al., 2022; DNLee 2014). These communities formed a network of scientists across all STEM subdisciplines and laid the foundation for future affinity groups.

In 2020, the need to strengthen communities of support was amplified by concurrent society-altering events. The COVID-19 pandemic caused higher Black death rates and coincided with frequent murders of Black Americans by the police, sparking global protests and non-stop media coverage (Yancy, 2020; Peeples, 2020). Affinity groups emerged specifically from an incident in New York Central Park in which a white woman called the police on a Black male birdwatcher. This situation led to the formation of an online movement called #BlackBirdersWeek, which highlighted Black people in nature (BBC, 2020). Although people were confined to their homes due to the pandemic, they were able to connect virtually on a global scale via social media and see the positive impact of Black people in the natural space (Babdor 2021). Following #BlackBirdersWeek, there was a cascade of 76 field-specific "Black In ___" weeks that celebrated Black people in various academic disciplines such as #BlackInAstro, #BlackInNeuro, #BlackInCancer,

#BlackInMarineScience, #BlackInMicro, #BlackBotanists, #BlackInGenetics, #BlackWomenInCompBio, #BlackInImmuno and #BlackInChem. Colloquially termed "BlackInX" organizations, each group organized their own online conference that increased the visibility of Black researchers, connected members in their community, and furthered the PD of all attendees via community-driven programming (Norton 2020; Gewin 2021). Although the goals of these weeks were to emphasize the work being done by Black scholars and build community amongst them, the majority of the events were not restricted to only Black-identifying individuals. All people, regardless of identity, were invited to learn and grow both personally and professionally (Murray, 2021; Johnson, 2020)

Black In Neuro (BIN) was one of the first of these weeks and began in July 2020. The inaugural #BlackInNeuroWeek was seven themed days that consisted of six panels, a podcast, a journal club, a dance class, and a virtual social (Murray et. al. 2021). Panel topics covered the realities of racism in neuroscience, ethically conducting outreach to marginalized communities without perpetuating further harm, as well as advice for successfully navigating the various stages before and after graduate school. Over 2,000 registrants of all identities attended the live events. The BIN team also created a database of ~300 Black scholars in neuroscience-related fields that anyone could use to find potential mentors, speakers for events, and research collaborators (Black In Neuro, 2025). After the initial week, the team realized the need to maintain this community. In 2021, Black In Neuro grew from a grassroots project into a formalized 501(c)(3) non-profit organization with the mission of diversifying the neurosciences by building a community of over 1,500 Black scholars from 40+ countries that celebrates and empowers Black scientists and professionals in neuroscience-related fields.

Black In Micro Week emerged within the BlackInX movement in September 2020. 30+ scientists collaborated to launch this online conference that connected people across 49 countries and four social media platforms (Johnson, 2020). Five themed days celebrated the visibility of Black scientists using #BlackInParasitology, #BlackInMycology, #BlackInVirology, #BlackInMicrobiome, and #BlackInBacteriology hashtags to represent sub disciplines in microbiology (Cordy, 2021; Black Microbiologists Association, 2020). Driven by a team composed largely of graduate students and postdocs, this inaugural event was designed with needs of the community and early career scientists in mind. It attracted 2,500 registered participants to engage in discussions with keynote speakers and invited panelists on STEM education, careers in microbiology, public health, community engagement, and the history of Black microbiologists (Donovan-Banfield, 2025). As a result, Black In Micro Week has continued as a recurring celebration, planned and organized by the Black Microbiologists Association (BMA), which formed in 2021 (Taylor, 2021; Black Microbiologists Association, 2020).

In 2025, both BIN and BMA celebrated five years since their emergence. This study represents the first collaboration between both groups, designing a pilot study to strengthen assessments for the potential reuse from the broader BlackInX community. Taken together, BIN and BMA have organized a total of ten hybrid/online conferences, which offer scientific programming, networking, and career development opportunities for the STEM community. Although they focus on different STEM disciplines, both BIN and BMA along with the other BlackInX groups have leveraged community-driven programming to accomplish their goals of increasing the concentration of historically marginalized scientists in their fields, providing access to resources for successfully navigating STEM careers, sharing knowledge of the hidden curriculum, and building supportive communities. To maintain maximum access to this programming, BIN and BMA initially only hosted virtual events with some smaller in-person local meetups. But with post-COVID pandemic shifts to return to fully in-person events, BIN and BMA have sought to incorporate some PD sessions at larger in-person scientific conferences with international attendance. Examples of these sessions

include *How I Survived Grad School: Perspectives from Black In Neuro* (SfN 2023) and *Fireside Chat - A Needed Talk about Black Scientists in Microbiology* (ASM 2023). As mentioned earlier, the lack of diversity and intentional inclusivity can hinder an attendee's desire to participate in conference events. Thus, these Black scientist-led community-driven sessions have been cultivated into welcoming spaces where all scientists can connect and grow their professional skills.

Measuring Outcomes of Community-Driven Programming

There is growing evidence for the influence of community-driven identity-based programming on informal mentoring, professional development, and scientific conference experiences. Research on synchronous online professional development demonstrates that virtual formats can successfully foster community building and reflective learning for graduate students and postdocs when designed intentionally (Hokanson et al., 2019; Skiles et al., 2022). However, the capacity for systematic investigation using qualitative and quantitative evaluation methods has been underserved. Community-driven programming that occurs in-person may have differing perceptions from and impacts on attendees as compared to online/hybrid conferences. There are unique strengths and weaknesses of each; namely that in-person conferences can allow for more informal interactions and personal connections from being in the same physical space whereas hybrid/online allows for maximal participation from people in extensive geographical areas (Foramitti et al. 2021; Niner & Wassermann, 2021). Moreover, sessions at in-person conferences are more expensive as attendees have to pay for conference registration, travel, visas, and lodging whereas hybrid/online can be much cheaper for both the organization and attendees (Sarabipour et al. 2021). Additionally, virtual sessions are extremely reliant on technology working properly, but in-person sessions can pivot much more easily. Thus, this paper assesses the impacts of Black scientist-led community-driven programming at both in-person and hybrid/online scientific conferences. Evaluations of these conference events are imperative to continuously improve programming and allow attendees to have their professional needs met during these sessions. The evaluation measures being assessed include program accessibility, sense of belonging and community, as well as overall conference/event satisfaction.

Previous initiatives have leveraged program evaluation methods to assess outcomes for mentoring and professional development programs in historically marginalized populations. (Flores et al., 2021; Marshall et al. 2022; Moreira et al., 2019). Moreover, perceived belonging and inclusion has been consistently documented to vary by race, ethnicity, gender and sexual orientations in STEM learning spaces (Ong et al., 2011). The present work aims to understand what methodologies can be used to assess outcomes for multi-modal, multi-ethnic and gender inclusive programming for scientific trainees and professionals. Therefore, we aim to investigate the extent to which these experiences can be measured systematically to assess program outcomes and impact on participants.

Methods

Survey Design and Distribution

To evaluate the impact of BlackInX program events and collaborations, we conducted five post-event surveys following various conferences. Feedback was collected from two events that were held online or as hybrid events: BlackInNeuro (BIN) Week 2023 and BlackInMicro (BIM) Week 2023. In addition, three surveys collected information from BlackInX events that occurred in-person during external conferences: BlackInNeuro at Society for Neuroscience (SfN) in 2023; BMA at American Society for Microbiology (ASM) in 2023; BMA at American Society for Virology (ASV) in 2024. Survey responses were collected

anonymously through an online questionnaire in Qualtrics and distributed via event mailing lists, social media, or using QR codes for in-person attendees. The surveys measured multiple dimensions, including demographics, accessibility, participant interactions, community engagement, program satisfaction, and personal reflection. Each survey contained both quantitative and qualitative measures, described further below.

Quantitative Data Analysis

Data cleaning included removal of surveys that contained all blank answers (no responses). Both complete and incomplete responses were included in the dataset: any surveys with at least one non-demographic question answered. The survey consisted of four demographic questions (see Table 1), with specific categories selected and refined based on feedback from BlackInX members. 11 Likert-scale questions were included and rated on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree; Supplementary Table 1), assessing program accessibility (4 items: ease of access, event length, inclusiveness, team responsiveness), belonging and community gains (4 items: sense of belonging, resource awareness, community connections, exposure to Black scientists), perceived value (1 item: career value), and overall program satisfaction (2 items: overall satisfaction, likelihood to recommend). Additional questions assessed opportunity pursuit intentions (4 items with Yes/No/Maybe/Does not apply response options: applying for academic programs, funding, jobs, and feeling empowered to explore opportunities), networking intentions (multiple selection: collaborate, invite to speak, keep in touch, learn about others' work, discuss own work), and perceived innovation (Yes/No/Maybe/Does not apply response option). Responses of "6" (indicating non-attendance) were treated as missing data and excluded from analyses. Comparative analyses were conducted to assess differences in satisfaction, networking outcomes, and perceived inclusiveness across event types.

Survey responses were analyzed using R statistical software (version 4.4.1). Descriptive statistics, including means, standard deviations, and frequency distributions, were calculated for all outcome measures. Independent samples t-tests (Welch's t-test, which does not assume equal variances) were conducted to compare Hybrid/Online events versus In-Person events across Likert-scale measures. Cohen's d effect sizes were calculated to assess the magnitude of differences (e.g. 0.2 = small, 0.5 = medium, 0.8 = large effect). Chi-square tests of independence were conducted to compare categorical outcomes (e.g. opportunity pursuit intentions) between event types. Statistical significance was set at $\alpha = .05$. For networking intentions, which allowed multiple selections, descriptive statistics (percentages) were calculated for each networking type by event category.

Qualitative Data Analysis

To assess overall program satisfaction, two open-ended questions were included at the end of the survey. This was chosen to center the voices of community members, as well as reduce bias, by not limiting the range of possible responses. Participants were asked to describe their overall experience, "How would you describe your experience interacting with [BlackInX] during [conference]?" Additional feedback was collected for "Is there anything we could improve?". An inductive analysis was conducted, identifying recurring patterns in open-ended responses. Outcomes were compared across hybrid/online and In-Person events to assess commonalities, as well as unique experiences.

We implemented a two-phase sequential analysis approach combining collaborative exploratory analysis with systematic coding validation. **Phase 1: Exploratory Thematic Analysis.** Responses for each

question were visualized in MURAL. Two researchers independently reviewed all open-ended responses and collaboratively developed an inductive approach. Participant responses were first grouped by event (e.g., BlackInNeuro week, BlackInMicro week, SfN, ASV, ASM). Recurring patterns were identified and similar comments grouped together into themes. Themes were discussed and refined iteratively until consensus was reached. Each participant's response was assigned to one theme. **Phase 2: Confirmatory Thematic Coding.** A third researcher developed an initial codebook by assigning each previously identified theme as a code or subcode. Definitions were written for each, to ensure consistency during coding. To revise and finalize the codebook, 10% of participant responses were viewed individually using MURAL. As a result, new codes or subcodes were added and definitions updated to provide clarity. During manual coding, all free-text answers were viewed using MAXQDA data analysis software. Multiple codes or subcodes were frequently assigned: one or more for different parts of a participant's response. To group results by survey question, the subcode co-occurrences were identified based on intersection within a segment. To do so, the Code Relations Browser tool in MAXQDA was utilized.

Ethics Statement

The IRB protocol (#23-1458) for this study involving human participants was reviewed by the Office of Human Research Ethics and determined as Non Biomedical NHSR. Participants were informed about the study via email or as advertised during conference events. All participation was voluntary.

Results

Graduate students comprised the largest career stage among respondents. For gender, women represented the majority of participants across all events (Table 2). The greatest number of responses were collected for in-person Black Microbiologists Association (BMA) events, particularly the gathering at ASV. The likert-scale questions collected data from 191 respondents, after data cleaning. This examined participant views on program satisfaction, perceived value, impact on networking, belonging and community, program accessibility, change in knowledge, and likelihood to pursue an opportunity (see Supplemental Table 4 for all survey items). All ratings were positive (scored between 3.8 - 4.0, on scale of 5.0), with some differences noted (see Figure 1, Supplemental Table 1). Focusing on career stage, no significant differences emerged between students (n = 80) or professionals (n = 76) across any outcome measures (all $p > .05$). Both groups reported similar levels of satisfaction ($M = 4.53$ for both), likelihood to recommend (Students: $M = 4.74$, Professionals: $M = 4.80$, $p = .504$), and inclusivity (Students: $M = 4.43$, Professionals: $M = 4.46$, $p = .873$). While professionals showed a trend toward higher ratings on career exposure ($M = 4.33$ vs 3.98, $p = .073$), this difference did not reach statistical significance.

Table 1. Participant Response Rates

Survey	Cleaned Responses	Total Responses	Registrants	Response Rate
BIN at SfN	31	46	200*	23.0%
BMA at ASV	71	82	124	66.1%

BMA at ASM	27	53	175	30.3%
BlackInNeuro Week	20	29	625	4.6%
BlackInMicro Week	42	56	648	8.6%
Total	**191**	**266**	**1,772**	**15.0%**

Table 1. **Post-survey response rates for all hybrid/online and in-person events** (n=266). Symbols: * = ticketed registration not required for attendance, participant numbers are estimated. Response rate is calculated as total responses/all registrants.

		N (%)
Total Sample	All Surveys	191
Event Type	In-Person	129 (67.5%)
	Hybrid/Online	62 (32.5%)
Gender Identity	Woman	120 (64.5%)
	Man	60 (32.3%)
	Non-binary	3 (1.6%)
	Prefer not to say	1 (0.5%)
	Prefer to self-describe	1 (0.5%)
	Unsure/Questioning or Exploring	1 (0.5%)
Career Level	Graduate student	70 (37.6%)
	Faculty	34 (18.3%)
	Postdoctoral Fellow	27 (14.5%)
	Undergraduate Student	11 (5.9%)
	Post-Bacc (Postbaccalaureate) scholar	10 (5.4%)
	Research Associate or Staff	9 (4.8%)
	Healthcare Professional	6 (3.2%)
	Industry Professional	6 (3.2%)
	Academic Administrator	3 (1.6%)
	Government Professional	3 (1.6%)
	Medical Resident or Fellow	1 (0.5%)
	Medical Student	1 (0.5%)

	Non-Profit or Foundation Professional	1 (0.5%)
	Not listed above	4 (2.2%)
Role at Event	Participant/Attendee	166 (85.3%)
	Organizer	11 (5.8%)
	Invited speaker	6 (3.2%)
	Did not interact with or attend a [BlackInX] event this week	11 (5.8%)
Race/Ethnicity	White	51 (27.6%)
	Black/African American	47 (25.4%)
	Black/African	46 (24.9%)
	Black/Caribbean	18 (9.7%)
	South Asian	17 (9.2%)
	Hispanic or Latinx	14 (7.6%)
	East Asian	8 (4.3%)
	Native American, First Nation, Alaska Native, Inuit, or Métis	3 (1.6%)
	North African, Middle Eastern or Arab	3 (1.6%)
	Prefer to self-describe	3 (1.6%)
	Prefer not to say	1 (0.5%)

Table 2. Demographics of Survey Participants. Reported for post-survey participants across all events (n = 191). Respondents could select multiple race/ethnicity categories; percentages may sum to >100%.

Self-Reported Participant Gains and Opportunities

Descriptive analyses indicated high rates of positive responses across both event types for categorical outcomes. For innovation and insight, 76% of hybrid/online and 78% of in-person respondents reported gaining new knowledge or perspectives from the event. Networking intentions were comparable across modalities: keeping in touch (73% hybrid/online, 76% in-person), learning about others' work (79%, 81%), discussing own work (68%, 71%), collaborating (57%, 62%), and inviting to speak (45%, 47%). Opportunity pursuit showed similar patterns: feeling empowered to explore opportunities (61%, 62%), applying for funding (36%, 43%), academic programs (29%, 36%), and jobs (24%, 36%). Opportunity pursuit variables showed comparable rates across modalities, with 36-62% of respondents reporting they had applied or felt empowered to pursue academic programs, funding, or career opportunities. However, small sample sizes, distributions heavily skewed toward positive responses, and predominance of "Does not apply" responses precluded formal statistical testing.

Career Stage Analysis

No significant differences emerged between students (n = 80) and professionals (n = 76) across any outcome measures (all $p > .05$), suggesting BlackInX programming serves both early-career and established scientists effectively. Both groups reported similar levels of satisfaction ($M = 4.53$ for both), likelihood to recommend (students: $M = 4.74$, professionals: $M = 4.80$, $p = .504$), and inclusivity (students: $M = 4.43$, professionals: $M = 4.46$, $p = .873$). While professionals showed a trend toward higher ratings on career exposure ($M = 4.33$ vs $M = 3.98$, $p = .073$), this difference did not reach statistical significance.

Comparing Hybrid/Online and In-Person Events

Independent samples t-tests revealed significant differences between event types across several metrics collected. Overall, In-Person events received significantly higher ratings for inclusiveness ($p = .006$, $d = -0.62$) and team responsiveness ($p = .029$, $d = -0.46$), while Hybrid/Online events received significantly higher ratings for those likely to recommend someone to attend ($p = .022$, $d = 0.34$). No significant differences emerged for Career Value, $t(65.1) = 0.18$, $p = .857$, or Exposure to Black Scientists, $t(61.4) = -0.36$, $p = .718$.

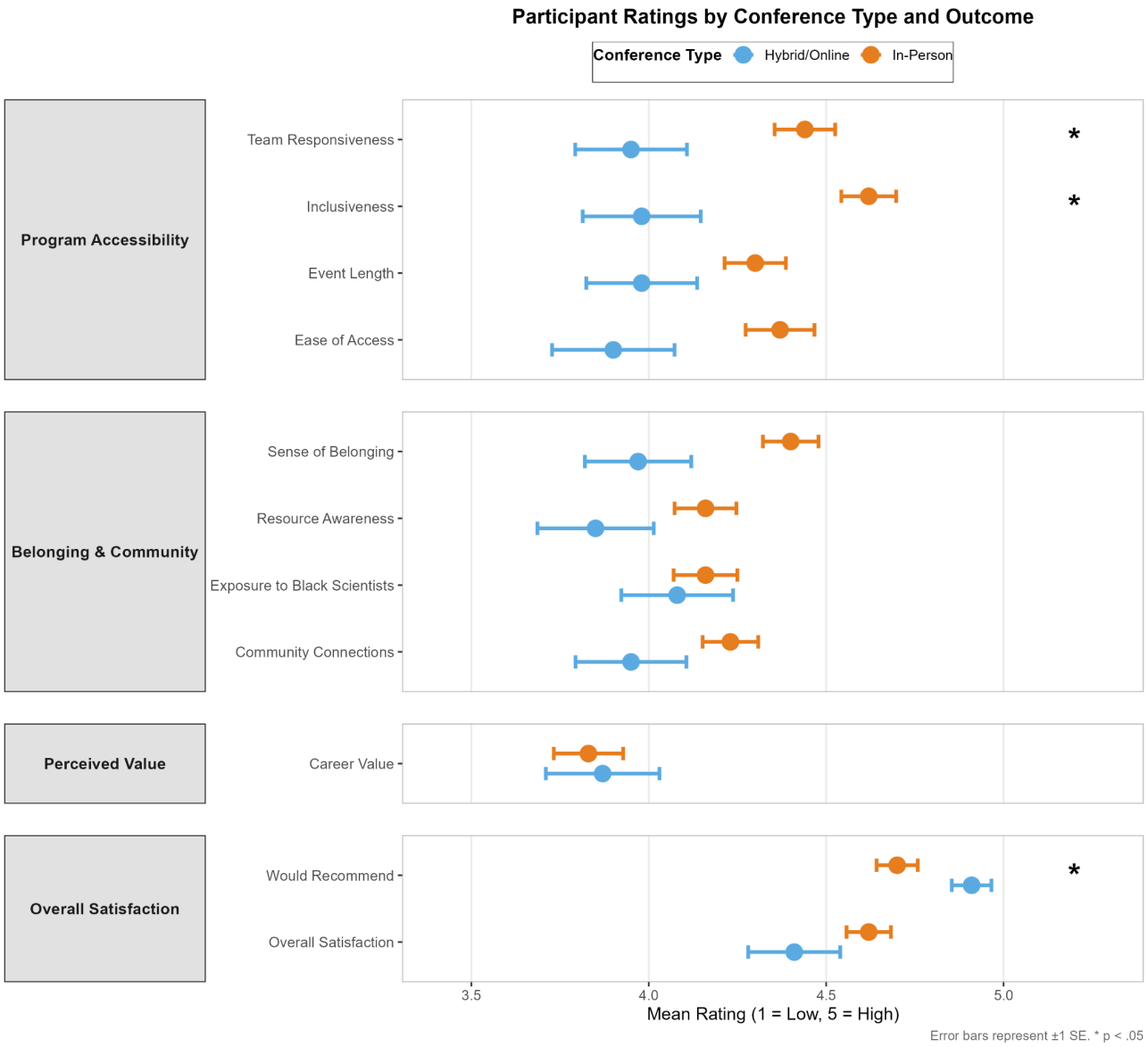

Figure 1. Participant ratings by conference type across all outcome rating domains. Points represent mean ratings; error bars show ±1 standard error (SE). Asterisks indicate statistically significant differences between event types ($p < .05$).

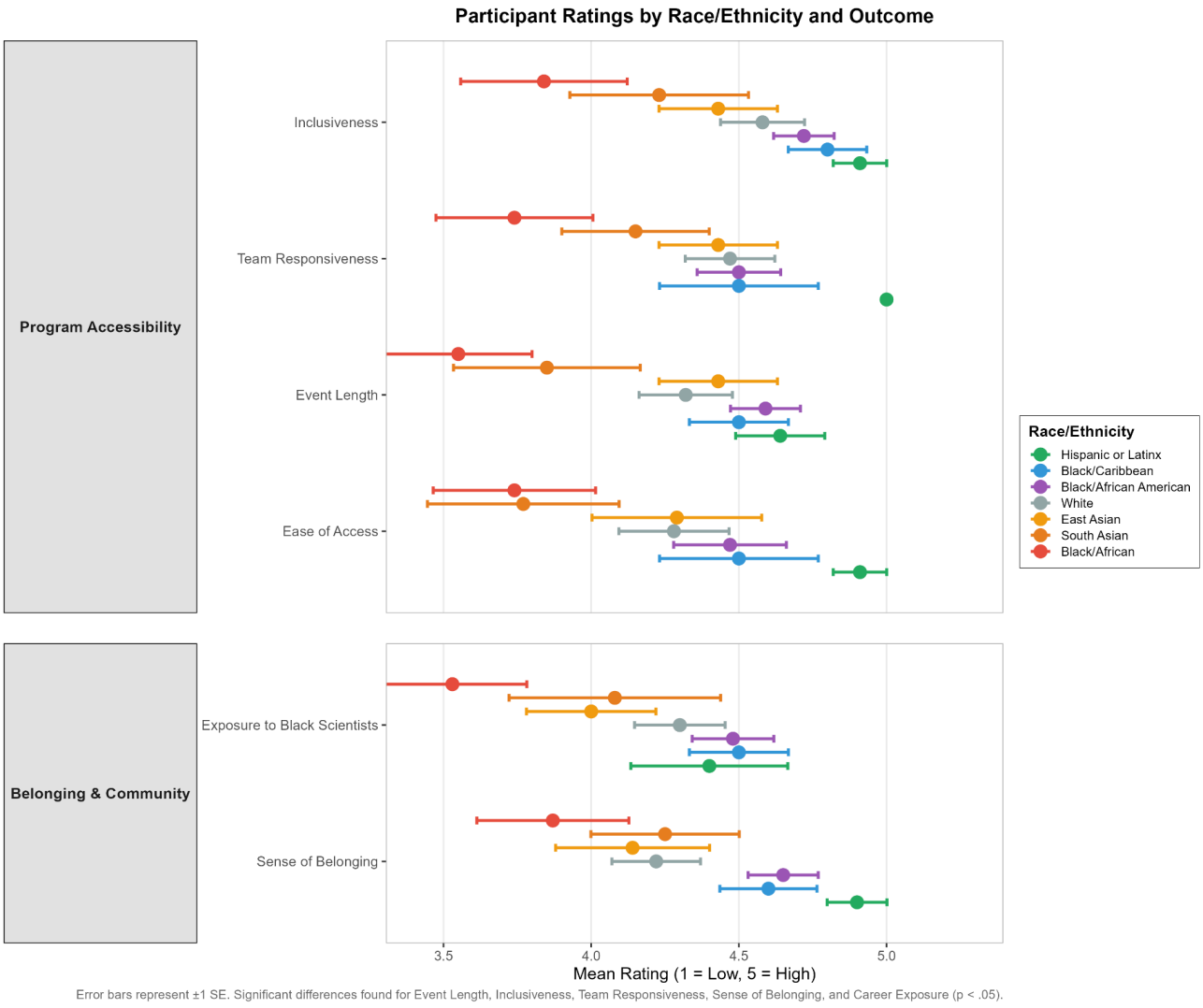

Figure 2. Significant race and ethnicity differences across five outcomes. Error bars represent ± SE. Significant differences found for Event Length, Inclusiveness, Team Responsiveness, Sense of Belonging and Career Exposure ($p<.05$)

Race/Ethnicity Analysis

Survey respondents across racial and ethnic categories provided high ratings (>4/5) for most outcomes. However, variation within Black groups proved as meaningful as variation across racial groups. One-way ANOVA tests revealed significant race/ethnicity differences across five outcomes (Figure 2, Supplemental Table 2): event length ($F(6,137) = 4.08$, $p < .001$), inclusivity ($F(6,137) = 3.16$, $p = .006$), responsiveness ($F(6,135) = 2.78$, $p = .014$), sense of belonging ($F(6,133) = 2.63$, $p = .019$), and career exposure ($F(6,133) = 2.87$, $p = .012$). Post-hoc comparisons (Tukey HSD) revealed Black/African respondents rated these outcomes significantly lower than most other groups (Supplemental Table 3). For example, on inclusivity, Hispanic/Latinx respondents rated highest ($M = 4.91$, $SD = 0.30$) while Black/African respondents rated lowest ($M = 3.84$, $SD = 1.57$), a 1.07-point difference. No significant race/ethnicity differences emerged

for resource gains, networking/connections, career value, satisfaction, or likelihood to recommend (all $p > .05$).

Respondents could select multiple race/ethnicity categories. We used an expanded approach wherein each selection was counted separately, allowing examination of experiences within each racial/ethnic community while recognizing multiracial identity complexity. Since 12.4% of respondents selected multiple categories (n = 23 of 185), we conducted sensitivity analyses comparing three coding approaches: (1) expanded (each selection counted), (2) single selection (retaining only one category per respondent), and (3) multiracial category (combining all multi-race respondents). Results were consistent across all three approaches for the five significant outcomes reported above. Accessibility showed significant differences only in the expanded approach and was therefore excluded from interpretation. Analysis included seven race/ethnicity groups with sufficient sample sizes: Black/African American, Black/African, Black/Caribbean, Hispanic or Latinx, White, South Asian, and East Asian. Indigenous participants were excluded from statistical analyses due to small sample size ($n < 5$).

Qualitative Results

Emerging Themes for Participant Experiences

When asked "How would you describe your experience interacting with [BlackInX] during [conference]?" 102 participants responded. Overall, 10 general themes are observed (Table 3). Of these, “positive sentiment” and “gained knowledge” occur in highest abundance across all event types. An additional 108 responses are collected for "Is there anything we could improve?” Most of these represent new topics, with only 4 out of 16 themes in common with the previous question (Table 4). Compared across all suggestions, in-person events show a higher number of brief, positive comments (7 participants). Whereas, hybrid/online events show “scheduling and timing” as commonly recommended to improve. Representative quotes are visible for each theme (Table 5). In addition to the thematic categories identified, there were a few cases of singular responses (n=1) that were not assigned to any theme. These related to shortening the length of the survey, having more venue space, tailoring the event to first-time attendees, and a concern about the unintended consequences of working within anti-Black racist systems.

Theme	Hybrid/Online	In-Person	Overall
positive sentiment	14	20	34
community/representation	9	9	18
barriers to attend	3	2	5
gained knowledge	10	11	21
tech issues and support	3	0	3
presenters and speakers	1	0	1
collaborative environment	0	8	8
event facilitation	0	4	4
concerns about unintended consequences	1	0	1

neutral sentiment	0	7	7
Total	**41**	**61**	**102**

Table 3. Inductive Themes Describing Overall Experience. Results shown for free-text responses to "How would you describe your experience interacting with [BlackInX] during [conference]?

	Individual Participant Responses		
Theme	Hybrid/Online	In-Person	Overall
positive sentiment	0	7	7
increased representation	2	2	4
tech issues and support	6	0	6
event facilitation	3	2	5
interactive environment	1	0	1
survey length	0	1	1
scheduling and timing	5	2	7
educational	0	2	2
global and pan-african inclusion	0	1	1
publicizing events	1	2	3
future events	3	3	6
career development opportunities	4	0	4
social opportunities	3	0	3
venue	0	1	1
tailoring to first time attendees	1	0	1
communication	2	0	2
Total	**31**	**23**	**54**

Table 4. Inductive Themes Representing Suggestions for Improvement. Results shown for free-text responses to "Is there anything we could improve?"

Table 5. Representative Quotes from Program Participants, Categorized by Theme	
Theme	**Representative Quote**

Positive Sentiment	"It was a great experience!" "Excellent!" "We need more of these events!"
Neutral Sentiment	"Good"
Gained Knowledge	"I learned so much!" "Informative and thought-provoking"
Community/Representation	"It was amazing to be surrounded by so many Black successful scientists" "Inspiring! Seeing all the Black men and women attendees/speakers really warmed my heart to the future of science in the Black community. The conversations and connections I was able to make throughout the week were more than what I expected." "While I learned of the struggles a lot of us have to deal with, it was reassuring to have community and see how everyone overcomes them or how we can support each other."
Collaborative Environment	"Very welcoming and collaborative environment" "Everyone was approachable and encouraged open dialogue in a safe space"
Global and Pan-African Inclusion	"Broader international context" "Being more intentionally welcoming to non African-Americans that identify as Black"
Increased Representation	"Invite all stages of scientists" "I understand why the focus on black community but of course there are other minority groups too"
Event Facilitation	"Amazing level of facilitating activities and networking among the audience members. Most interactive session I've been to." "More time for group discussions"
Publicity	"Increase awareness about the event" "Connecting with people who may not be on social media"
Scheduling/Timing	"The time zones for virtual events" "Timing overlapped with other talks so I unfortunately missed most of it" "More time for the events"

Tech Issues/Support	"Troubleshooting tech with the presenters prior to prevent issues" "The [conference] app was frustrating"
Future Events	"Professional development events" "Future educational programming including discussing the history of anti-Blackness globally or highlighting the accomplishments of marginalized folks"
Social Opportunities	"More socialization-friendly venues (less loud and packed)" "Virtual social hours to connect with members in different geographical areas"
Career Development	"Sharing about grant and job opportunities" "Special interest groups for people to collaborate to create interdisciplinary studies or projects"
No Feedback	"None" "Nothing I can think of"

Table 5. Representative quotes from program participants. Free-text responses are shown, categorized by theme.

Development of a Codebook for BlackInX Programming

To identify how multiple themes may contribute to a person's individual experience, manual coding examined smaller text segments from each response. This includes 298 coded text segments containing descriptive information. The final codebook contains 7 codes: Emotion, Identity, Education and Training, Participation, Programming, Values, and No Comment. Based on these groupings, data is further stratified into 49 subcodes (see Table 6). Overall, conference attendees use Participation subcodes at the highest frequency (Figure 3). This accounts for 24.6% of all coded segments. Compared to remaining data, Emotion and Programming are observed at moderately high frequencies (11.96% and 13.77%). To organize feedback into groups that inform future event design, the most frequent subcodes were identified for each open-ended survey question. To describe their overall experience, for example, participants commonly use words coded as: positive (17 occurrences), knowledge (16), joyful (10), engaging (8), and connecting (7). However, to provide suggestions for improvement, the most frequent subcodes are: logistic (12) and schedule (11). For these suggestions, other subcodes appear at rates similar to each other. This includes: career, connecting, communication, future events, knowledge, nationality, organizer, publicity, race_ethnicity, and well-handled (~4.5 occurrences per subcode).

Table 6. Final Codebook Developed and Utilized for Manual Coding

Code	Subcode	Definition

Emotion	***positive***	A brief comment expressing a positive emotion. Note: this subcode is used on its own, when others do not apply
	negative	Expressed a negative emotion in at least part of their response
	neutral	Expressed an emotion not overly positive or negative, with no additional details
	grateful	Expressed appreciation
	helpful	Described as helpful, encouraging, or supportive
	easy	At least part of the experience is described as easy
	difficult	At least part of the experience is described as difficult
	honest	Described conversations and interactions as open, honest or candid
Identity	***inspiring***	Mentioned inspiration; expressed increased motivation or confidence to pursue an activity
	representation	Mentioned visibility or participation of scientists underrepresented in their field
	nationality	Referred to a specific nation or country of origin
	location	Referred to a geographic region (e.g., a city or the west coast)
	race_ethnicity	Mentioned race or ethnicity
Education & Training	***degree***	Referenced a major, degree, or training program
	STEM	Mentioned a discipline or field in science, technology, engineering, or math
	research	Mentioned a research experience or research interests
	mentoring	Described a mentoring relationship or mentioned mentor, mentee
	career	Described career progression, a career stage, or access to career opportunities
	funding	Mentioned a grant, fellowship, or other type of financial support
Participation	***group***	Referenced a community, team, or being surrounded by people
	new	Described a new idea, feeling, or experience
	welcoming	Described an inviting or welcoming environment

	belonging	Mentioned or described belonging and inclusion; may mention 'all, everyone'
	engaging	Described feeling engaged or a desire to stay engaged further
	connecting	Mentioned connecting to others at the event, including interacting, listening, or discussing
	interesting	Described the event as interesting
	joyful	Mentioned enjoying their experience or described their own enjoyment (i.e., it was great, it was fun)
	value	Described as valuable or worth attending; expressed the need for this event (i.e., this is necessary)
	perspective	Described a change in opinion, awareness, or interest
	knowledge	Described as insightful or described an experience learning something
	relationship	Mentioned a type of relationship (i.e., friendship)
Programming	***organizer***	Mentioned the event organizer(s) or facilitator(s)
	logistic	Commented on software app or tool, room format, instructions
	schedule	Commented on date or timing of the event
	publicity	Commented on how the event was advertised
	communication	Mentioned a specific type of written or verbal communication
	access	Described their own ability to access or participate
	well-handled	Described a strength in the program, organizers, or a specific approach
	future event	Suggested a specific topic or event for the future
Values	***legacy***	Described sharing pieces of history or stories being celebrated and passed between generations
	success	Related to success, leadership, or accomplishment
	progress	Mentioned advancing progress in STEM or the future of STEM
	persistence	Mentioned resilience or described persisting in STEM
	well-being	Discussed healing, cognitive load, or mental health
No Comment	***unclear***	Comment appears off-topic or did not answer the question

	no suggestion	Participant expressed that there is no need for improvement
	did not attend	Participant mentioned missing or not attending the event
	none NA	Participant only responded with 'none', 'n/a', or 'not applicable'
	blank	No response was provided

Table 6. Complete codebook for BlackInX participant responses. Data structure shows 7 codes and their component subcodes, with all code definitions.

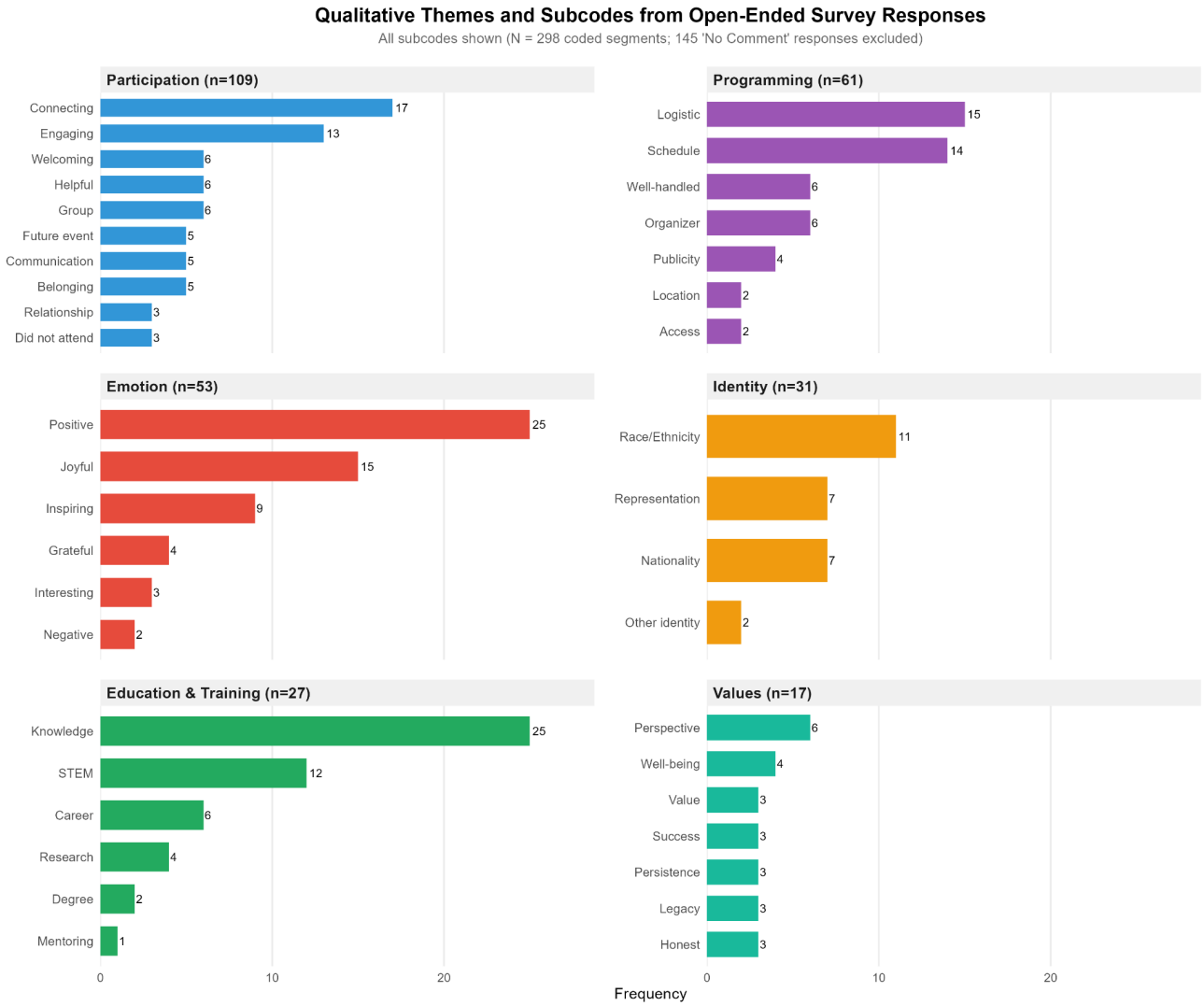

Figure 3. Frequencies of codes across the full qualitative dataset. All subcodes are shown (n=296), with the exclusion of "No Comment" responses (n=145).

Discussion

While BlackInX events are organized and led by Black scientists, our findings suggest that community-driven programming creates inclusive conference experiences that benefit attendees across racial and ethnic backgrounds. We developed survey tools for evaluating BlackInX programming events that were implemented across five events in different formats. There were no differences in perceived belonging and community for hybrid/online vs. in-person sessions, which indicates program experience can be consistent across modality for these measures. Statistically significant differences did exist between different conference formats for program accessibility and overall satisfaction measures. This is the first research study providing systematic evaluation of conference experience and belonging at Black In Neuro and Black In Micro/BMA events, with potential for future growth and expansion to other conferences.

Previous studies have used qualitative and quantitative mixed methods to examine the subjective experiences and observed program outcomes for trainees, professionals, and students in STEM disciplines (Bhatnagar et al., 2014; Braun & Clarke, 2019; Wendt et al., 2019) . Additional prior studies have identified peer and informal mentoring, knowledge sharing, collaboration opportunities, sense of belonging and community as key predictors in retention and professional development for historically marginalized scientists (Moreira et al., 2019; Segarra et al., 2019). Identity-centered and community-driven programming has emerged as a critical intervention for addressing persistent diversity challenges in STEM fields. Program evaluations such as the Research in Academic Pediatrics Initiative on Diversity (RAPID) demonstrate that culturally affirming mentorship and professional development can substantially improve career outcomes for historically marginalized scholars, including higher publication rates, increased grant success, and greater confidence in academic spaces (Flores et al., 2021). This study extends these findings to scientific conference settings and specifically the role of community-driven programming led by BlackInX scientists.

Impact on STEM Community Members

Consistent with membership demographics for BIN and BMA, graduate students comprised the largest career stage and women comprised the largest gender demographic among survey respondents (Black In Neuro, 2023, 2024; Donovan-Banfield, 2025). The majority of survey responses were obtained from one in-person event hosted by BMA at ASV. This is likely a result of survey distribution logistics. The method of participants accessing the survey varied between events. For example, QR codes were presented at the in-person events at ASV and SfN, whereas other surveys were emailed via anonymous post-event links. Accessing surveys online, either on social media or via email, may have been more accessible for respondents to complete the survey (Fan & Yan 2010). Despite the predominance of graduate students, the career stage did not significantly differentiate participants' experiences. Both students and professionals reported comparable satisfaction, belonging, and inclusivity ratings, suggesting BlackInX programming successfully addresses professional development needs across career trajectories.

Black respondents, who comprised the majority of participants, reported substantial gains in belonging, community connection, and professional development. Importantly, attendees from other racial and ethnic groups, including White, South and East Asian, and Hispanic/Latinx scientists, also rated their experiences positively, suggesting that culturally-specific programming has value beyond its primary community. However, it is necessary to note that the Black experience is not a monolith as evidenced by variation within subcategories of the Black ethnic groups. Specifically, Black/African participants reported lower scores of program accessibility, belonging, and community as compared to Black/Caribbean and Black/African-American attendees. The subsequent free response questions were helpful in discovering novel

thoughts and suggestions. For example, open-ended responses provided additional insight on ways to increase participation from Black/African attendees. Black scientists in the United States (U.S.) include African Americans, African immigrants, Caribbean immigrants, Afro-Latinx individuals, and multiracial Black scientists, each navigating distinct cultural contexts and experiences with racism (Malcom & Malcom, 2011). The findings suggest that if BlackInX programming centers African American cultural references or U.S.-specific contexts without attending to diaspora diversity, Black participants from varying ethnic groups may feel less included. This highlights the need for tailored or differentiated programming such as diaspora-specific tracks, varied scheduling to accommodate international time zones, and multiple cultural framing approaches.

Producing a Codebook for Black-Identity Community Driven Programming

Qualitative methods allowed us to create a novel codebook for BlackInX programming. The qualitative themes that arose most frequently were related to Participation, Programming, and Emotion. Importantly, the Participation category had the highest number of responses (36% of all text analyzed). Therefore, when given the opportunity to say anything about their experience, attendees most often used words related to interacting and connecting with other people at the event. They also frequently comment on how engaged they felt during the event and how interactive it was. As the second-most common, themes for Programming and Emotion were observed at equal rates. Within Programming, feedback was evenly split between attendees describing the structure of the event and what they liked or disliked about it. As a programming tool, this highlights our survey as promising for collecting suggestions to improve future events. The third most common theme was Emotion with positive sentiment being the highest subcategory. In fact, most of the Emotion-coded themes in participant responses reflected satisfactory emotions (positive, joyful, inspiring, grateful, interesting). Only two responses were coded as negative emotions. As a note, other emotion codes were included in the initial codebook (i.e. lacking, needed) but these were not found within the collected responses, and thus were not used at a later stage. Finally, a high number of attendees indicated that they gained knowledge at the event, in agreement with quantitative results. Overall, these findings show that identity-centered programming delivered by BIN/BMA were perceived as beneficial and to be implemented effectively.

Perceived Benefits Across Online and In-Person Events

Regardless of hybrid/online or in-person modality, on a likert scale with 5 being the highest, the average outcome ratings for belonging and community by survey respondents was 4 and qualitative feedback was overwhelmingly positive. These findings align with research on professional development programs for historically marginalized STEM graduate students, which demonstrate that combining skill-building with community activities significantly improves belonging, confidence, and professional networks (Hokanson et al., 2019; Moreira et al., 2019). Moreover, strength-based mentoring approaches that center cultural identity and community reciprocity have proven effective for Indigenous early career academics (Povey et al., 2022), suggesting parallels to the identity-centered approach implemented by BIN and BMA.

In-person events showed significantly higher ratings for inclusiveness and team responsiveness. These advantages are consistent with research on face-to-face mentoring and immediate community engagement (Grant, 2019). It is easier for people to connect with others when in the same physical space and for the organizers to be more readily responsive to the singular event being hosted. These findings further gain meaning against broader evidence that mainstream scientific conferences remain unwelcoming for Black scientists through exclusionary practices and hostile climates (Ong et al., 2011). The ability of these Black

scientist-led community-driven sessions to increase feelings of inclusivity in predominantly non-marginalized spaces is a substantial benefit to the broader community. This serves as motivation for BIN and BMA to continue hosting these events at larger in-person scientific conferences like SfN and ASV. Conversely the hybrid/online week-long conferences, Black In Neuro Week and Black In Micro Week, received higher likelihood-to-recommend ratings despite logistical challenges of managing a multitude of different event types, speakers, and platforms throughout the week. This suggests the multi-event format's breadth, flexibility, and sustained community building offered unique value that participants recognized and would share with colleagues.

When assessing common themes from the free-text responses, participant experiences for in-person and hybrid/online events produced similar results. Qualitative findings indicated that, regardless of conference modality, participants frequently mentioned gains in knowledge, community or identity representation, and positive sentiment when describing BlackInX events. This information is beneficial in helping event organizers know what attendees valued the most and which areas to continue to expand for future events. When asked about suggestions for improvement, respondents still indicated many positive sentiments for in-person events, even while mentioning suggestions to improve technical issues for hybrid/online events. Both event types had a similar number of responses for feedback regarding event facilitation, scheduling and timing, as well as suggestions for future events. This information is necessary for event organizers to continue optimizing events and strengthen attendee experiences.

Both online/hybrid and in-person modalities appear essential for comprehensive depth of connection, accessibility, and breadth of exposure. Research on mentoring effectiveness shows that sense of belonging and networking opportunities are key predictors of STEM persistence for historically marginalized people (Marshall et al., 2022). BlackInX events, including Black In Micro Week, Black In Neuro Week, and related community-driven sessions at larger scientific conferences simultaneously create culturally-affirming spaces for Black scientists while also providing inclusive PD opportunities for all conference attendees.

Limitations and Future Directions

Our study evaluated how different event modalities (Hybrid/Online vs. In-Person) impact belonging, inclusion, and professional development outcomes, contributing to the growing evidence base for targeted, community-driven interventions in advancing equity within scientific fields. Several limitations should be noted. First, event format (virtual vs in-person) was confounded with event type (week-long vs single-day programming). All hybrid/online events were distributed across a week (Black In Neuro Week or Black In Micro Week), while in-person events occurred as single-day gatherings at large scientific meetings. Future research should examine whether observed differences are attributable to format, programming structure, or both. Second, survey responses were collected post-event only, preventing direct measurement of change from baseline to post-intervention. While post-only designs capture participant perceptions and satisfaction, they cannot isolate the specific impact of BlackInX programming from general conference experiences or pre-existing dispositions. Future evaluations could employ comparison groups by collecting parallel data from Black scientists attending mainstream conference sessions without BlackInX programming to establish baseline belonging and inclusion levels and assess true magnitude of impact. Third, the "ease of access" ratings for hybrid/online events represent only those who successfully accessed and registered for programming. Participants who experienced barriers to internet connectivity, platform navigation, or registration never enrolled and thus were not captured in our evaluation. This selection effect likely inflates accessibility ratings, as the most excluded individuals are absent from the sample.

Future assessments should incorporate alternative feedback mechanisms to capture non-participation barriers. Fourth, sample sizes for Black In Neuro Week 2023 (n = 20) were smaller than other events, limiting statistical power for program-specific analyses by demographic subgroups. Race/ethnicity analyses within hybrid/online events were therefore primarily driven by Black In Micro Week 2023 (n = 42), which had adequate sample sizes for group comparisons. Future evaluations with larger samples across both BIN and BIM programs would strengthen conclusions about race/ethnicity differences within hybrid/online programming. Finally, in the statistical analysis of race and ethnicity we utilized analysis of variance to multi-select race/ethnicity questions, which may not fully capture experiences of multiracial and multi-ethnic Black scientists. Sensitivity analyses confirmed results remained consistent when controlling for multi-ethnic participant subsets, supporting the robustness of findings. This methodological choice reflected the multicultural nature of BlackInX communities and avoided forcing participants into narrow identity categories. However, future assessments might consider other statistical methods for multi-select demographic options or optional open-text identity descriptions to capture nuances that checkboxes cannot, given research showing that intersectional identities create distinct experiences in STEM (Ong et al., 2011). Lastly, future directions should examine the effects of incorporating additional BlackInX events, identity-centered spaces, or community-driven programming into different STEM disciplines. The present study presents a pilot method for program evaluation of community-driven programming at hybrid/online and in-person scientific conferences. Future work may benefit from examining the replicability of these methods due to changes in scientific funding, policy, and public attitudes over time.

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