

“I like that we are allowed a space to be vulnerable about our experiences, given space to heal”: Black Algebra I Educators’ Perceptions of a Liberatory Algebra I Professional Learning Community

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Abstract

This paper examines Black Algebra I educators’ perceptions of their experiences in a professional learning community, *Algebra I Academy*, designed specifically to equip Black Algebra I educators with liberatory pedagogical practices for their instruction with Black students taking Algebra I. Utilizing survey and focus group data from Black Algebra I educators who participated in the Algebra I Academy, findings from this study indicate that the Algebra I Academy had a positive effect on Black Algebra I educators by creating a sense of community with fellow Black Algebra I educators, providing a space for Black Algebra I educators to re-imagine who they are as Black math educators, and by offering a collaborative space for Black Algebra I educators to learn and apply new, more liberatory, Algebra I pedagogical practices. More universally, this study highlights the need and value-add of educator learning communities that are racially affinity-based, professional learning spaces that are responsive to the historical and contemporary socio-racial contexts of educators’ lives in and outside of schooling, and attentive to the social and emotional, as well as pedagogical, needs of educators.

Keywords: Black algebra I educators, Black liberatory pedagogy, racial affinity-based professional learning

Despite the documented positive impact that Black mathematics teachers have on Black students’ mathematics achievement (Dee, 2004), and on disrupting Black students’ negative perceptions of their ability to do math (Marshall et al., 2022), there has been limited direct effort to retain and support Black mathematics teachers in K-12 education. While discourse and efforts

to promote Black students' learning in core mathematics areas such as Algebra I typically center on issues of access to rigorous mathematics coursework and teachers' pedagogical strategies (Sparks, 2020), the specific role and promise of Black educators in the mathematical lives of Black students warrant greater attention and exploration.

It is well-documented that Black educators across K-12 education and subject areas endure myriad forms of bias and racism (e.g., microaggressions, under-resourced schools, etc.) in their everyday teaching lives (Krull & Robichea, 2020; Pizarro & Kohli, 2018). While this should readily betray the need and urgency for intentional spaces and strategies to support Black teachers in particular ways, there remains a lack of imagination and will in developing Black teachers in ways that would allow them to flourish and thrive as educators. One example of this lack of imagination and sociopolitical will is in the seeming unwillingness of schools and districts to create professional learning communities with the specific positioning and experiences of Black teachers in mind. For example, many districts and schools in the U.S. do not promote racial affinity-based teacher development despite their positive impact on Black teachers (Mosely, 2018), as well as Black workers in other industries (Bethea, 2020). Employee Resource Groups (ERG) are key retention tools for corporations, citing the sense of belongingness and connection these groups provide, particularly for historically underrepresented groups who have faced identity-based oppression (Miller, 2022). Affinity-based professional development in school systems holds the promise of yielding similar benefits, but, due to criticism from external groups, schools and districts might dismiss such professional development spaces as segregation (Pendharkar, 2022). As such, schools and districts miss the opportunity to identify and support the unique needs of marginalized groups of educators such as Black educators. This study aims to illuminate the potential impact(s) of racial affinity-based

professional development by taking advantage of the opportunity to learn about Black Algebra I teachers' perceptions of the impact of a unique and innovative teacher development program geared specifically towards Black Algebra I teachers, and anchored and responsive to the racial and sociopolitical contexts of their lives as Black educators and Black people. Additionally, as a team comprised of both practitioner-researchers and researcher-practitioners, all of whom committed to situating practice-based knowledge as critical to understanding and addressing urgent contemporary educational problems, our study expressly aims to disrupt the researcher-practitioner aperture that too often prevents the identification and implementation of relevant and practical solutions within education.

Literature Review

Nationwide, 6% of certified secondary mathematics teachers are Black (Digest of Education Statistics, n.d., 2020; Neil, 2016). Despite what we know to be the impact of Black math teachers on Black students' learning (Chazan et al., 2013), literature on these teachers', and specifically, Black Algebra I teachers', professional learning desires and needs is non-existent. As such, the authors of this study adopted an epistemological and empirical orientation grounded in listening to Black teachers themselves articulate what they value and why to contribute to this scholarship.

For Black mathematics teachers, teaching math in K-12 education, or 'teaching math while Black' (Frank et al., 2021), is a highly racialized experience. For example, recent research on the attrition of Black math teachers shows that anti-Black microaggressions (e.g., repeated questions about their mathematics training) are a significant factor explaining why these educators leave the mathematics teaching profession (Frank et al., 2021). Specifically, Black teachers shared stories of their mathematics expertise being devalued within the academic space.

For many K-12 Black mathematics teachers, these racial biases about their intellectual ability to learn and teach math started during their pre-service years and followed them into the profession. For example, in her study of advanced Black pre-service teachers, McGee (2014) found that these students experienced racial stereotypes about their mathematics abilities and non-affirming mathematics professors. In their study of Black mathematics and engineering college students, McGee and Martin (2011) found that these students endured constant assaults on their intelligence and presence within these programs. These findings paint a portrait of a mathematical journey for Black math educators - from pre-service teacher to classroom teacher - of resilience in the face of racially hostile learning and teaching environments. Resilience requires a deep level of mental and emotional stamina that can feel like oppression without the proper support.

This toxic racialized teaching context and its impact on Black mathematics teachers are concerning in their own right. However, when situated at the interplay of the high turnover rate of Black mathematics teachers (Frank et al., 2021), the impact that Black mathematics teachers can have on Black students' mathematics learning (Klopfenstein, 2005), and the academic challenges and limiting beliefs in their math identity that Black students continue to face in mathematics (Gonzalez et al., 2020; Martin, 2012), the need to provide specific and targeted support for Black mathematics educators becomes critical.

One area in which we can support Black mathematics teachers is in professional learning. However, teacher development and support in K-16 education has traditionally taken colorblind and apolitical approaches (Pour-Khorshid, 2018) despite the very racialized and political contexts of teaching and learning historically and today, particularly for Black educators (Givens, 2021). Not only has this colorblind and apolitical approach to teacher development and

support resulted in few racial affinity-based teacher development and professional learning spaces, but it has also resulted in professional learning spaces that do not support teachers in educating through the very material political forces that influence not just their teaching, but their lives.

Within teacher education and professional learning, Black educators across content areas lack affinity spaces (Blackwell, 2018). Some Black educators have noted that this lack of affinity spaces within K-12 education can make them feel isolated (Pour-Khorshid, 2018) and can be a contributing factor to the turnover rate of Black educators (Miller, 2019). Research shows that affinity-based and culturally relevant professional development might be especially important for Black teachers (Mosely, 2018).

Unsurprisingly, professional learning communities for Black mathematics educators specifically, and for Black Algebra I educators in particular, are virtually non-existent. As a vehicle for understanding and responding to the needs of Black teachers, a professional learning community geared towards the specific experiences and needs of Black Algebra I teachers holds promise to provide Black Algebra I teachers with the affinity and learning space they need that not only can strengthen their practice but also contribute to their desires to stay in the profession. This study is animated by the following question: what are Black Algebra I educators' perceptions of the value of the professional learning community designed uniquely for Black Algebra I teachers and anchored in Black liberatory educational approaches?

Conceptual Framework: Black Liberatory Algebra I Pedagogical Practices

The professional learning experience (Algebra I Academy) examined in this paper was born out of a grant-funded project aimed at supporting Black Algebra I students' learning via Black Algebra I educators' adoption and utility of more liberatory Algebra I teaching practices.

National educational statistics on Black students and Algebra I suggest that Black students need a more affirming Algebra I teaching and learning environment. For example, Black students are less likely to pass Algebra I than White and Asian students (Department of Education, Office of Civil Rights, 2016). Considering access to Algebra I, Black students make up 17% of all eighth grade students but only 11% of eighth grade Algebra 1 students (Department of Education, Office of Civil Rights, 2016).

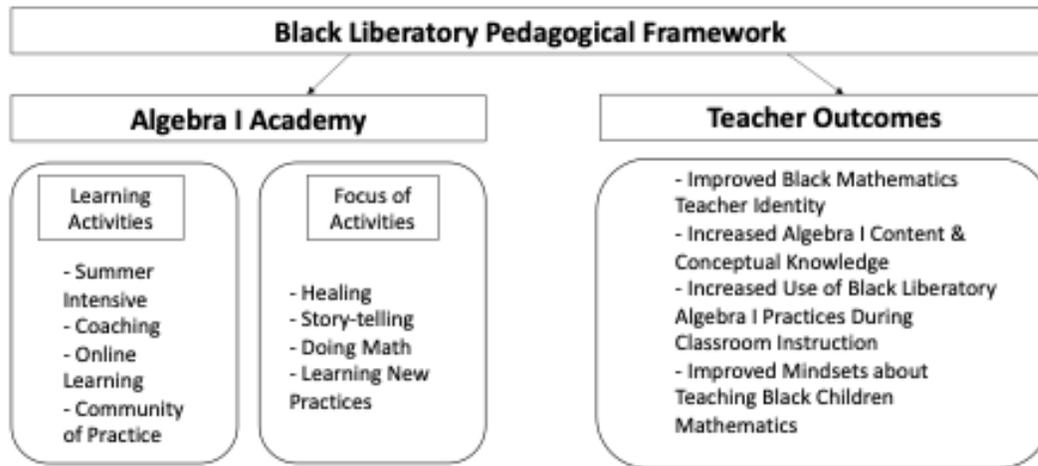
While the ultimate aim of that body of work is to understand the impact of the Algebra I Academy on Black students' Algebra I learning, the aim of this paper is to understand if and how the academy creates value for Black Algebra I educators. This is a worthy empirical endeavor on its own, given how little is known regarding the experiences and needs of Black Algebra I teachers and professional learning spaces that aim to meet those needs.

The Algebra I Academy is anchored in the Black Teacher Collaborative's (BTC) Black Liberatory Pedagogical (BLP) framework (Black Teacher Collaborative, n.d.). Underpinned by a systematic literature review of theoretical and empirical research on Black educators' pedagogical practices with Black students, the BLP framework outlines teacher mindsets, knowledge, instructional strategies, and classroom practices anchored in eight elements: positive racial identity; sociopolitical consciousness; love of learning and intellectual excellence; healing; collective responsibility; high expectations; cultural connectedness; and critical care and love (Black Teacher Collaborative, n.d.). Critically, Black Liberatory Pedagogy (BLP) rearranges power in K-12 education by centering Black educators' historical and contemporary ways of being and knowing, often referred to as The Black Teaching Tradition (Givens, 2021), as the foundation of pedagogical praxis with Black children (Black Teacher Collaborative, n.d.). As such, the logic underpinning the Algebra I Academy is that, if Black Algebra I educators learn to

teach Algebra I aligned to the Black Teaching Tradition, they will expand their view of themselves as Black Algebra I educators, and Black students will have a more liberatory learning experience in Algebra I. Applied within a professional learning experience for Black Algebra I educators, BLP Algebra I equips Black Algebra I educators with the pedagogical tools they need to make Algebra I a site of learning and liberation for themselves, their fellow Black Algebra I teachers, Black students and their communities.

The Algebra I Academy is designed to achieve four teacher outcomes (Figure 1). While it is out of the scope of this paper to examine the direct impact of the Algebra I Academy on those outcomes, it is helpful to understand the aims of this academy in order to contextualize participants' perceptions of value. All aspects of the Algebra I Academy were designed to center the aforementioned elements (see Appendix A) that would respond to the immediate needs of Black Algebra I educators and humanize and provide a more liberating experience for them.

With these elements, and drawing on learnings at the intersection of adult learning theory (e.g., adult learning should be experiential and build off of prior knowledge; Aguilar, 2013; Aguilar, 2016;) and the Black teaching and learning tradition (e.g., Black educators engaging in liberatory pedagogical and curricular activities to ignite Black students' learning; Givens, 2021), the Algebra I Academy is anchored in core learning activities (Figure 1) and focus areas of those activities (Figure 1) that the BTC believes provide Black Algebra I educators with a liberating, innovative, and rigorous learning experience (see Appendix B).

Figure 1*Black Liberatory Pedagogical Framework***Methods**

The central question guiding this study is: what impact did the Algebra I Academy have on Black Algebra I educators? To address this question, we implemented a mixed methods approach that capitalized on available information to inform the organization of the 1) progress of the intervention and 2) necessary adjustments to ensure that future activities are effective. Mixed methods is inherently a pragmatic and solutions-focused paradigm that depends upon the interplay between text and numeric data (Creswell & Clark, 2017; Teddlie & Tashakkori, 2020).

Data Collection and Procedures

In October 2022, data were collected from Algebra I Academy participants (e.g., teachers, math instructional coaches and district Algebra I leads) during a half-day in-person workshop facilitated by BTC Algebra I Academy coaching and program staff. At the time of the workshop, participating educators had experienced four months of engagement with the Algebra I Academy's professional development activities (e.g., coaching and observations, online learning, and whole-group learning). In order to assess the efficacy of the Algebra I Academy

and participant experiences in the academy up to that point, a retrospective pre-post feedback survey was administered to all attendees during the workshop to collect data on Algebra I Academy participants' self-assessments of their skills, mindsets and knowledge related to Black liberatory Algebra I pedagogical practices. Following their completion of the survey, math teachers were invited to participate in a focus group about their experiences implementing Black Liberatory Algebra I practices in their classrooms.

Participants and Context

The population of interest for this study consists of Algebra I educators from a large district outside of a large metropolitan area in Georgia. The participants of this study experienced the Algebra I Academy and were available to participate in the survey and/or focus group. Black Algebra I teachers, math instructional coaches and district math leads worked in districts where the majority of teachers, students and district office staff are Black. All educators volunteered for the Algebra I Academy.

Surveys and Structured Interviews

Participants completed a five-item Demographic Survey in which they were asked to report their age, gender, race, ethnicity, and highest level of higher education. They also completed an eight-item Workshop Perception Survey in which they were asked questions regarding participants' satisfaction with the workshop's format, execution, and usefulness across eight areas - relevance, needs, utility, organization, materials, time, leadership, and clarity & guidance (see Appendix E). Finally, participants completed an 18-item Pedagogical Growth (PG) survey in which they were asked a variety of questions regarding their level of confidence and comfort in utilizing BLP frameworks successfully in their classroom instruction (see Appendix E). These items were presented on a 5-point Likert scale (from strongly disagree to strongly

agree). Survey items were averaged to compute sub-constructs of pedagogical growth (i.e., positive racial identity; critical care and love; sociopolitical consciousness; high expectations; and cultural connectedness). To facilitate dialogue among participants in the focus group, nine interview questions were used to gauge participants' perceptions of the usefulness of the intervention, how they were going about implementing Black Liberatory Algebra I teaching practices in their classroom, and the ways the intervention impacted their professional identity as Black math teachers.

Sampling Technique

For both the qualitative and quantitative aspects of this study, a purposive sampling technique (Creswell & Clark, 2017) was applied to garner responses specifically from educators who had experienced the professional development activities (quantitative) and from educators who were directly in charge of instructional decisions being made in Algebra I classrooms (qualitative). Twenty-four educators completed the demographic and PG surveys. Five Black teachers participated in the focus group.

Research Design

The current study employed a parallel mixed methodology (Parallel MM) design to address 1) the effectiveness of an intervention focused on Black educators' professional growth using BLP to frame math instruction and 2) Black teachers' experiences implementing what they learned from BTC's intervention into their pedagogical practices (Tashakkori, Johnson & Teddlie, 2020). Parallel MM describes research designs in which the data collection for two or more components of the study occurs concurrently or with a small-time delay in between. Parallel MM is best used when each program component (e.g., coaching, community of practice)

addresses a related aspect of the overarching research question(s) and is best executed when the findings from each are integrated to suit this purpose (Tashakkori et al., 2020).

Quantitative Analysis

This study used a paired samples T-test to determine the extent to which engagement with a Black Liberatory professional development workshop impacted educators' beliefs about their pedagogical growth across five subdomains: racial identity, critical care and love, high expectations, sociopolitical consciousness, and Black Liberatory Praxis (see Appendix A). The paired samples t-test is an appropriate analysis whenever two sample means are related and the researcher is interested in observing whether any differences between these two means are due to chance (Agresti & Finlay, 2009). Cohen's d analysis was included to help gauge whether similar improvements could be expected further along in the execution of the professional development for this group (Cohen, 1998). Due to the timing of data collection at an early stage in the professional development calendar, this current study focused on the following sub-elements of the Black Liberatory Framework only: Positive Racial Identity; Critical Care and Love; Sociopolitical Consciousness; High Expectations; and Cultural Connectedness (see Appendix A).

Qualitative Analysis

Narrative data collected from Black teachers were analyzed using thematic analysis (Corbin & Strauss, 2014). When applied to focus group data, thematic analysis allowed us to identify patterns of agreement between participants as they exchanged their experiences with implementation with each other. Within the broader framework of the Parallel MM research design, thematic analysis allowed us to provide depth to aid a rich understanding of the insights gleaned from the quantitative analysis (Braun & Clarke, 2006).

Results and Findings

Participants of this study experienced the Algebra I Academy as a valuable professional learning community. The vast majority of participants felt that by building stronger personal and professional relationships with fellow Black Algebra I educators, by reflecting on their identities as Black math educators, and by learning new instructional practices, the professional learning experience was ultimately relevant and meaningful.

Workshop Perceptions

On average, most participants agreed that the workshop's content was relevant (96%), met their needs as educators (96%), could positively impact their teaching (92%), was well organized (96%), included learning materials that enhanced their understanding (100%), was efficiently run (91%), featured knowledgeable/helpful leaders (100%) and had clear goals and objectives (96%; see Appendix D). When asked to rate the overall quality of the workshop, the average response on a five-point Likert scale (1, Poor to 5, Excellent) was 4.57 (see Appendix D). This suggests that the workshop performed optimally in terms of meeting participants' needs.

BLP Pedagogical Growth

As shown in Table 1, across all subdomains of BLP pedagogical growth, there was a significant increase between the pretest and the posttest, suggesting that the intervention was effective in bolstering participants' ability to integrate BLP into their lesson plans and curriculum.

Table 1*Paired t-test Results Across BLP Sub-Constructs*

Domain	Sub-Constructs	Items	<i>n</i>	Pre-survey		Post-Survey		Difference	Cohen's <i>d</i>	95% CI for Cohen's <i>d</i>		
				M	SD	M	SD			Lower	Upper	
Pedagogical Growth	Racial Identity	4	22	2.63	0.83	22	4.04	0.55	1.41**	0.82	1.066	2.367
	Critical Care & Love	3	22	3.59	0.85	22	4.41	0.67	0.82**	0.73	0.573	1.645
	High Expectations	4	23	3.9	0.68	23	4.41	0.48	0.51**	0.39	0.745	1.869
	Sociopolitical Consciousness	4	22	2.46	0.93	22	3.57	0.79	1.11**	0.72	0.919	2.135
	Cultural Connectedness	3	23	2.38	0.95	23	3.87	0.73	1.49**	0.99	0.897	2.102

Note: M, SD and **are used to represent mean, standard deviation, and $P < .01$, respectively. For Cohen's *d*, effect size thresholds include the following: small = 0.2, medium = 0.5, and large = 0.8.

For racial identity, average scores increased from 2.63 to 4.04 ($t=8.27, p<.001$) and the effect size was large ($d = 0.82$). For Critical Care & Love, average scores increased from 3.59 to 4.41 ($t=5.24, p<.001$) and the effect size was medium ($d = 0.73$). For High Expectations, average scores increased from 3.90 to 4.41 ($t=6.31, p<.001$) and the effect size was small ($d = 0.39$). For Sociopolitical Consciousness, average scores increased from 2.46 to 3.57 ($t=7.36, p<.001$) and the effect size was medium ($d = 0.72$). For Cultural Connectedness, average scores increased from 2.38 to 3.87 ($t=7.23, p<.001$) and the effect size was large ($d = 0.99$).

Participants showed the largest pre to post change in their ability to use cultural connectedness as a praxis technique in their instructional practices and build upon the Black Liberatory pedagogical traditions in Mathematics. However, Table 1 also indicates that there is still room for continued growth in relation to high expectations. Participants may need further

support in designing lesson plans based on the belief that Black children can meet rigorous and challenging standards.

Building A Sense of Community

A prominent theme that emerged from the data is the sense of community participants feel within the Algebra I Academy. From the survey results (see Appendix D), most participants strongly agreed that the opportunity to connect and collaborate with fellow Black Algebra teachers was a value-added feature of the Algebra I Academy. This nuances the results associated with cultural connectedness from the paired samples t-test and suggests that the benefits of the intervention extended beyond connection to the material being taught to encompass interpersonal connection between Black Algebra I teachers.

This theme sheds light not just on the sense of community participants feel they are building amongst each other and why this might be valuable to them, but also on the extent to which building such a community was important to their self-perceptions as Black math teachers. For example, one participant stated: “I enjoy exploring and collaborating with intelligent Black teachers on how we can be change agents to support and liberate our Black students from racial sociological beliefs.” This community was also positioned as a site to reflect and find support in healing from the racial traumas they experience as Black people and Black educators. For example, one participant stated: “I like that we are allowed a space to be vulnerable about our experiences, given space to heal.” Collaboration and collective learning were also described as important functions of the community the teachers developed. For example, one educator stated: “The collaborative conversations between teachers and math instructional coaches’ were much-needed aspects.” Additionally, another teacher shared that they value “really connecting with

fellow Black Algebra I teachers and building and brainstorming ideas that support and protect ourselves and our students.”

For the educators participating in this professional learning experience, building and being in community with other Black Algebra I educators in their district was an important site for them developing readiness to transform what they had learned of BLP and Black Liberatory Algebra I into curricular and instructional changes in their classrooms. For participants, they valued the space not just for the sake of coming together but for the opportunity to be in community for the purpose of reflecting on who they are as Black educators and how to show up for students.

Building Teachers’ Black (Math) Identity

Reflecting on the value of the Algebra I Academy for them, educators find that this professional learning community is providing them with the space to cultivate a more expansive idea of their racial and professional identity as Black math teachers. As in the case of cultural connectedness’ relevance exceeding the scope of their classroom practices, the teachers’ dialogue around their initial ideological growth as Black and math teachers suggests that the professional development helped them deepen and expand their own racial math identity, not merely plan for their students.

From this theme, we can better understand how this opportunity was used by teachers to further their personal and professional growth. One participant talked about the connections to Blackness that the academy allowed them to make. They stated: “The information is always valuable, and I always feel I am walking away with more connection to my Black culture and how we are integrating it into mathematics.” In reflecting on how the Algebra I Academy helped teachers understand themselves as Black math teachers, one participant stated:

Whereas before I may have embraced my Blackness and everything like that, and at some point, in time it [my Blackness] may have been shut down, it [the Algebra I Academy] makes me now be okay to be more expressive about it, to be more vocal about it, to say things, to do things.

For teachers, this professional learning experience pushed them to think about the role that (their) Blackness plays in their lives beyond/within the classroom and its usefulness as a site of professional and personal liberation and positivity.

Building and Applying Liberatory Pedagogical Practices in their Algebra I Instruction

As previously mentioned, Black Algebra I teachers' building their knowledge and application of more liberatory pedagogical practices is a primary aim of this professional learning community. Much like the themes above, this theme nuances one of the sub-constructs of pedagogical growth - namely, high expectations. What is interesting is that high expectations had the lowest practical value ($d = 0.39$), suggesting that the intervention may not produce meaningful changes among educators that resemble those in our sample - namely those that start off with high expectations for Black students' learning, which is typically the case for Black educators (Givens, 2021).

Concerning the extension of high expectations into the perceived benefits of professional development, teachers expressed appreciation for the feedback they received from their peers and the opportunity to strengthen their mathematical practice. This theme sheds light on how this dynamic facilitated their adoption of new liberatory Algebra I instructional practices. One educator shared: "I enjoyed the strengthening teacher practice session. I enjoyed the honest discussion about our practices and the work that is ahead of us." While another educator noted

the value of “seeing how to incorporate Black Mathematics in the classroom and the use of manipulatives.”

Participants also felt that the Algebra I Academy is helping them shape Black students’ mathematics identities. For example, one educator stated: “I think that it is imperative for black students to see themselves in mathematics. I like that and were provided strategies to improve mathematics through a lens in which our students can relate.” Overall, teachers felt that the program is helping them develop work for their Black students by allowing them to gather more intentionally and openly. One teacher shared that:

We can have in an open forum and be effective and strategic about doing something about it [Black students’ learning in Algebra I]. Whereas having that conversation there [in school] when someone walks in, that we have to stop, now we can focus on really doing something about the things that we complained and try to think about.

This teacher’s sentiment illuminates Black teachers’ value, need for, and propensity to create fugitive spaces (Walker, 2013) wherein they might strategize about the best ways to think about supporting Black students in this space. For this teacher, the Algebra I Academy is not just a space to learn new instructional strategies. Rather, it is the space to assess the potential of these strategies in community and in “safety.”

Discussion

By centering Black Algebra I educators’ voices, this study sought to understand the perceived value of a professional learning community designed specifically for Black Algebra I educators and anchored in Black liberatory educational approaches. Overall, the Black Algebra I educators that participated in the Algebra I Academy garnered value from this professional

learning community. Building community with fellow Black Algebra I educators; having the healing space to expand their view of themselves as Black math educators; and, collectively learning innovative, liberatory instructional practices to pilot in their classrooms all amounted to a deeply resonate professional learning experience. To Black Algebra I educators, the Algebra I Academy has provided them with the space to re-imagine who they are as Black math educators, reflect on and have their unique needs as Black math educators met, and lean, unapologetically, into their desire to play a lead role in supporting Black students' Algebra I learning.

Teaching math while Black (Frank et al., 2021), and successfully to Black students, involves working through past and current traumas to the mind, heart and psyche, collective re-imagining, and collective learning. Through sharing stories of their own math histories (storytelling and healing), discussing how and why centering Blackness in mathematics is crucial for them and for Black students (storytelling, healing, and doing math together), and learning new knowledge and strategies to make Algebra I more liberating for Black students (doing math together, strengthening teacher practice), the Algebra I Academy added value to Black Algebra I educators as a space to heal, re-imagine and learn. Critically, this study shows that, even within a predominately Black school district, Black Algebra I educators are not insulated from the broader racial and sociocultural contexts of teaching while black. As such, to the extent that the Black Algebra I educators in the Algebra I Academy experience teaching math as a racialized experience, the Algebra I Academy helped them begin to unpack it and bring a more liberatory perspective to reflecting on this experience generally, and how it informs their practice, particularly with Black students in Algebra. To this end, the affinity space – e.g., a space just for Black Algebra I educators – that grounded the Algebra I Academy was viewed as something they knew they needed but, due to a complex interplay of factors (e.g., time, money, racial

context, etc.), an affinity space within professional development that they did not have. Findings from this study confirm what (Mosely, 2018) and other scholars have found, that affinity-based professional development for Black educators is not only beneficial for their praxis; such spaces within a professional development context help sustain them mentally, emotionally, and psychically as Black educators.

While evidence from Parallel MM design employed in this study illuminated the value-add of the Algebra I Academy, there are important limitations and gaps in our current understanding of its value for Black Algebra I educators. Perhaps the most important limitation is that, from the data, it remains unclear which aspects of the Algebra I academy are more valued or impactful than others, and to what extent. For example, the current data do not yet shed light on the extent of individual, additive or comparative value of the summer institute, coaching, and community of practice (see Appendix B) on fostering a sense of community amongst teachers. Data suggest that Black Algebra I educators experience a sense of community while engaging in doing math together, but whether this has more, less, or the same impact on building a sense of community as the coaching circles (e.g., group coaching) remains unclear. Similarly, while Algebra I Academy participants' Black math teacher identity is more directly targeted at the Summer Intensive and Communities of Practice than in other aspects of the academy, the cultivation of Black math teachers' racial identity is a throughline throughout the academy. That is, there are aspects of the academy, such as Coaching and the Online Learning Modules, that might also directly impact their racial mathematics identity or reinforce it. Our data do not allow us to engage in crucial analyses yet. More research is needed in this area to both understand the value and efficacy of the Algebra I Academy and to inform the design of the Algebra I Academy for scale.

Implications

Findings from this study have important implications for Black teacher education specifically, teacher education more broadly, as well as policy. Our findings suggest that Black pre-service teachers who plan to teach math, Black Algebra I educators, and Black mathematics educators more broadly need and desire racial affinity-based professional development opportunities. As much of the current K-12 teacher development ideology and approaches take a colorblind orientation to professional development, our findings suggest the need to center more racially affinity-based and Black-affirming professional learning for Black Algebra I educators. Such professional learning experience could be an important tool in retaining and supporting Black Algebra I, and Black mathematics educators.

Critically, our findings illuminate the relevance and urgent need to think more expansively about the aims and desired outcomes of professional development for Black Algebra I teachers. While professional learning that improves teachers' pedagogical practices is important for Black Algebra I educators as it is for all educators, as a singular aim, pedagogical focus alone is insufficient to meet the professional development needs of Black Algebra I educators. Our study highlights how critical healing and re-imagining are as explicit outcomes for Black Algebra I teachers within a professional learning community. The historical and contemporary ontological (i.e., ways of being) and epistemological (i.e., ways of knowing) context of being Black math educators, and in particular, Black Algebra I educators, is specific and complex. As such, our findings suggest that professional development for Black math educators envision and pursue broader outcomes than traditional professional development.

Our findings have important implications for policy around race and teacher education. Currently, much of the attention and resources in education are directed toward building the

pipeline of teachers of color rather than *retaining* those teachers, with few resources targeted, specifically, for Black teachers. As an example of policy shortcomings in addressing this challenge, the FY 2024 United States Department of Education budget request includes \$3 billion for the Education Innovation and Research Program, \$798 million of which is allocated for “competitive programs that support a diverse and well-prepared pipeline of educators and strengthen teacher retention” (United States DOE FY 2024 Budget). The budget also requests \$132.1 million be allocated to support alternative pathways into teaching, such as teacher residencies and Grow Your Own programs. However, within this budget, the Supporting Effective Educator Development (SEED) program would utilize \$93 billion to provide competitive grants to support evidence-based professional development that prepares, develops, and retains a diverse teacher workforce (U.S. Department of Education, n.d., p. 15).

BTC’s Algebra 1 Academy provides content-specific pedagogical support, as well as social-emotional learning for Black teachers, both critical supports after the COVID-19 pandemic that saw an increase in teachers’ feelings of anxiety and stress (Sparks, 2022) and their uncertainty about remaining in the profession (Zammaro et al., 2021). Nationwide, policymakers have also relaxed certification rules, hiring uncertified teachers or allowing teachers certified in another content area to teach those subjects that have been traditionally hard to staff, like math and science (Richman & Crain, 2022). The placement site for BTC’s Algebra 1 Academy experienced these policy shifts, illuminated the need to support Black Algebra I educators’ emotional well-being while also building their content knowledge and pedagogical skills even more necessary. As such, findings from the Algebra I Academy are promising in their ability to inform financial and program-related policy decisions aimed at retaining teachers of color, specifically Black teachers.

Finally, findings from this study highlight the urgent need for teacher education to eschew its traditionally colorblind orientation and contend with the broader racial and sociopolitical context (e.g., racial microaggressions) of the teaching field, and of Black teachers' lives, that impact Black Algebra I educators' experiences. Our study findings show that Black Algebra I educators have been yearning for a professional learning space in which their lived experiences were considered in every aspect of the design and implementation of the learning space. In order for professional learning to resonate with Black Algebra I educators, schools, districts, and other teacher development organizations need to create learning spaces that do not obscure Black Algebra I educators' lived experiences.

Conclusion

Though teaching math while Black (Frank et al., 2021) comes with its challenges, from the voices of Black Algebra I educators in the Algebra I Academy, professional learning can be a site of liberation for them, and Black mathematics educators more broadly. Ultimately, this study challenges teacher development and support professionals to center racial affirmation, liberation, and innovation in the professional development spaces they create for Black mathematics educators.

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Appendix A

Description of Black Liberatory Pedagogical Elements

Black Liberatory Pedagogical Elements	Description
Critical Care & Love	Creates classroom cultures in which Black students feel loved and known
Strong Racial Identity	Creates classroom cultures in which Black cultural customs & patterns appropriate/aligned to students are highlighted and embraced
High Expectations	Creates classroom cultures where students and teachers collectively engage in social, emotional, and academic support systems, routines and strategies for students striving to meet high expectations
Sociopolitical Consciousness	Creates classroom cultures in which Black students are comfortable with and skillful at engaging in sociopolitical discourse with their peers and confidently and skillfully challenge the status quo using content area knowledge and skills
Healing	Creates classroom cultures in which a “many hands make the work light” approach is taken to building a classroom culture, and there is structured time for lament, disappointment, and grief
Collective Responsibility	Creates classroom cultures in which intentional actions bring attention (without diminishing personhood) to the importance of full participation and community problem-solving is promoted to emphasize the classroom space as a learning space in which problems are solved collectively
Love of Learning & Intellectual Excellence	Creates classroom cultures in which resilience in learning and excellence as a way of Being is cultivated, and black students’ confidence in the “How” and the “Why” is developed

Culturally Compatible and Community Connected Praxis	Creates classroom cultures that model community obligation to cultivate students' community obligation and demonstrate the success of each learner to the success of the community
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Appendix B

Description of Learning Activities and Focus Areas

Learning Activity	Description	Focus Area(s)
Summer Intensive	Over the course of three days, Black Algebra I educators will participate in an offsite retreat where you will be introduced to BTC's Black Liberatory Pedagogical approach and principles of Black Liberatory Algebra I.	<ul style="list-style-type: none"> ● Healing ● Storytelling ● Doing Math ● Strengthening Teacher Practice
Coaching and Observations	Over the course of the school year, Black Algebra I educators will engage in individual and group coaching with BTC Algebra I math instructional coaches with	<ul style="list-style-type: none"> ● Strengthening Teacher Practice
Community of Practice	On a quarterly basis, Black Algebra I educators will participate in a fun, relational, engaging, and restorative co-learning space aimed at socially and emotionally supporting teachers as Black Algebra I Teachers	<ul style="list-style-type: none"> ● Healing ● Storytelling ● Doing Math ● Strengthening Teacher Practice
Self-Directed Online Learning Modules	Via interactive online modules twice per month, Black Algebra I educators will increase their knowledge of the African and African-American historical and contemporary connections to Algebra, increase their conceptual knowledge of Algebra, and increase their ability to apply this knowledge and skills in their teaching practices with students.	<ul style="list-style-type: none"> ● Strengthening Teacher Practice

Appendix C

Sample Community of Practice Annotated Agenda

Time	Mins	Workshop Segment
10:00- 10:05	5 mins	Welcome <ul style="list-style-type: none"> ● A word from Dr. Amos Wilson ● Community Agreements ● Review Agenda & Goals
10:05- 10:15	10mins	Healing Moment <ul style="list-style-type: none"> ● Radical Imagination - Scripted visual meditation
10:15- 10:45	30 mins	Understanding Black Math Identities- African Americans in STEM <ul style="list-style-type: none"> ● Seven groups of 2-3 participants will read about a person and take notes on a note catcher and use questions to guide their discussion
10:45- 11:45	60 mins	Building Community- The Remix Challenge <ul style="list-style-type: none"> ● The same group members will create a representation of their learning about African-Americans in STEM using multimodal resources ● Debrief Prompt- How can you use these ideas and resources in your instruction? ● Gallery Walk for all to explore ● Share / Debrief
11:45- 12:30	45 mins	LUNCH
12:30- 2:15	105 mins	Doing Math- The Housing Math Problem <ul style="list-style-type: none"> ● Launch Activity- low-income/ affordable housing- ● Act 1- Notice Think Wonder with Math lens - Housing in Georgia ● Act 2- Notice, Think Wonder, and Extend with Math lens- Forest Cove - news clip ● Act 3- Solve an action-driven math problem ● Share/ Debrief
2:15- 3:30	75	Strengthening Teacher Practices- Integrating Social-Political

	mins	Consciousness in Lessons <ul style="list-style-type: none">● Background of Lesson Plan● Model integration in lesson, practice the Math in real time● Participants practice in small groups● Share/ Debrief
3:30- 4:00	30 mins	Closing <ul style="list-style-type: none">● Wrap up and Exit Ticket Survey

Appendix D

Workshop Perception Feedback

Domain	Construct	Item	n	Mean	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
Workshop Perceptions	Relevance	The content of this workshop is relevant to my professional goals and interests as a participant in Algebra 1 Academy.	24	4.54	0%	0%	4%	38%	58%
	Needs	The workshop met my needs as an educator in Algebra 1 Academy.	24	4.58	0%	0%	4%	33%	63%
	Utility	I can use this content to positively impact my teaching/coaching.	24	4.67	0%	0%	8%	17%	75%
	Organization	The workshop was well organized.	24	4.79	0%	0%	4%	13%	83%
	Materials	The handouts and visual aids enhanced my understanding.	24	4.71	0%	0%	0%	29%	71%
	Time	Time was used efficiently and effectively.	24	4.42	0%	8%	0%	33%	58%
	Leadership	The workshop leaders/instructors were knowledgeable and helpful.	24	4.75	0%	0%	0%	25%	75%
	Clarity & Guidance	The workshop goals and objectives were clear.	24	4.71	0%	0%	4%	21%	75%
				n	Mean	1 (Poor)	2 (Below Average)	3 (Average)	4 (Above Average)
	Overall Rating	Please give an overall rating for the quality of this workshop	23	4.57	0%	0%	4%	35%	61%

Appendix E

Pedagogical Growth Survey



ALGEBRA 1 | COMMUNITY OF PRACTICE 1 FEEDBACK FORM

Your unique identifier:	
<small>Note: Your unique identifier will be used for tracking purposes only. Your responses will be kept confidential and will only be reported in the aggregate.</small>	

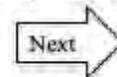
Thank you for your participation in BTC's Communities of Practice 1 Feedback Form. We would like to learn more about your experiences as a participant in the workshop. Your responses will be used to improve the program for future participants. This survey should take you no more than 10 minutes to complete.

To start, please share your overall impression with our professional development.

1. WHAT ASPECT OF THE BLACK LIBERATORY ALGEBRA I PROGRAM DO YOU LIKE MOST? WHY? [Summer Intensive, Coaching/observations, Community Space or Online Learning Modules]
2. WHAT ASPECT OF THE BLACK LIBERATORY ALGEBRA I PROGRAM DO YOU LIKE LEAST? WHY? [Summer Intensive, Coaching/observations, Community Space or Online Learning Modules]

Now, please indicate the extent to which you agree or disagree with the following statements by circling your response:

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
3. The content of this workshop is relevant to my professional goals and interests as a participant in Algebra 1 Academy.	1	2	3	4	5
4. The workshop met my needs as an educator in Algebra 1 Academy.	1	2	3	4	5
5. I can use this content to positively impact my math teaching/coaching.	1	2	3	4	5
	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)



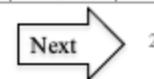
Continued,

6. The workshop was well organized .	1	2	3	4	5
7. The handouts and visual aids enhanced my understanding.	1	2	3	4	5
8. Time was used efficiently and effectively .	1	2	3	4	5
9. The workshop leaders/instructors were knowledgeable and helpful .	1	2	3	4	5
10. The workshop goals and objectives were clear .	1	2	3	4	5

<i>As a result of this Workshop, I...</i>	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
11. Have a larger professional network.	1	2	3	4	5
12. Feel like I fit in with this community.	1	2	3	4	5
13. Expect to be part of this community even after this workshop ends.	1	2	3	4	5

We are interested in finding out how you felt BEFORE attending this workshop and how you feel NOW. In responding to the following statements, please take a few moments to reflect on how you felt before this summer compared to how you feel now. For each item, please circle your response for each statement both in the left column (BEFORE) AND in the right column (NOW):

<i>As a result of this Workshop, I understand how to...</i>	BEFORE					NOW				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14. Offer a Black Liberatory education alongside the required curriculum.	1	2	3	4	5	1	2	3	4	5
15. Customize instruction to strengthen students' Mathematic Brilliance .	1	2	3	4	5	1	2	3	4	5
16. Strengthen students' identities as Black math learners .	1	2	3	4	5	1	2	3	4	5
17. Identify and respond to Black students' academic and social needs .	1	2	3	4	5	1	2	3	4	5
18. Communicate high expectations .	1	2	3	4	5	1	2	3	4	5
19. Teach a curriculum that meets and exceeds grade level expectations.	1	2	3	4	5	1	2	3	4	5
20. Manage internalized racism and deficit-thinking among Black students.	1	2	3	4	5	1	2	3	4	5
21. Create a classroom environment that aligns with the sociopolitical aims of the Black community.	1	2	3	4	5	1	2	3	4	5



Continued,

22. Design lesson plans and/or activities that focus on the sociopolitical conditions of Black people.	1	2	3	4	5	1	2	3	4	5
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<i>I am confident in my ability to...</i>	BEFORE					NOW				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
23. Use Black Liberatory Pedagogy in my instructional/coaching practices.	1	2	3	4	5	1	2	3	4	5
24. Build upon the Black liberatory pedagogical tradition in my classroom/schools I support.	1	2	3	4	5	1	2	3	4	5
25. Teach students/teachers about the Black presence in Mathematics.	1	2	3	4	5	1	2	3	4	5



26. WHAT ASPECT(S) OF THE WORKSHOP DID YOU FIND MOST VALUABLE?

27. BRIEFLY DESCRIBE 1-2 THINGS THAT YOU WOULD IMPROVE ABOUT THE WORKSHOP:

28. WHAT DO YOU INTEND TO IMPLEMENT OR USE IN YOUR CLASSROOM/SCHOOLS AS A DIRECT RESULT OF PARTICIPATING IN THIS WORKSHOP?

29. PLEASE GIVE AN OVERALL RATING FOR THE QUALITY OF THIS WORKSHOP:

- 1 - Poor
- 2 - Below Average
- 3 - Average
- 4 - Above Average
- 5 - Excellent

Thank You!