

Voices of Black Women as Directors of Informal STEM Programs

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This autoethnographic study highlights the personal experiences of two African American women graduate students who direct summer STEM programs designed to engage and mentor students who are underrepresented in the STEM disciplines. They share reflections and personal accounts of how they position themselves in their directorship roles and provide insights into their struggles and successes. The programs take place in different cities with unique program structures, but are united in their goal of providing 5 weeks of culturally-relevant STEM learning experiences for Black and Latino/a middle school students. Both researchers self-reflected and shared narratives expressing how the intersections of their race, class, and gender have interacted in complex ways to shape their identities as Black working class women in positions of power empowering the next generation of Black and Latino/a students to pursue careers in STEM.

Keywords: African American graduate students, STEM, autoethnography

The future of our society depends on our children's ability to problem solve, work collaboratively, and be responsible and productive citizens in a rapidly progressing global society (Langdon, McKittrick, Beede, Khan, & Doms, 2011; Vilorio, 2014). In order for the United States to maintain its national security in the 21st century global market, all students, including underrepresented minorities in Science, Technology, Engineering, and Math (STEM), need to develop scientific literacy. Policymakers, educators, and those in industry are all recommending that STEM education become a national priority due to the need to train, attract, and retain STEM-literate professionals to serve in these fields (Chang, 2002; Farrell, 2002; Geisinger & Raman, 2013). There is an even greater need to retain students of marginalized ethnic groups and women in the STEM fields as a result of the diverse population in the United States and the growing economical need for more STEM career professionals to enter the workforce (Hill, Corbett, & St Rose, 2010; Langdon, McKittrick, Beede, Khan, & Doms, 2011; Litow, 2008). As a result, potential actions have been presented within the STEM disciplines to recruit and retain all populations of students (Chang, 2002; Geisinger & Raman, 2013; Wilson et al., 2012).

Research supports that informal STEM programs are an effective approach in exposing underrepresented students to the possibilities and careers within the STEM disciplines (Leslie, 1997). In education, participation in mentoring programs has been shown to sustain and increase motivation to pursue STEM careers for all students, including those who have historically been marginalized (Hernandez, Schultz, Estrada, Woodcock & Chance, 2013; Wilson et al., 2012). Research suggests that middle school is a critical time for students to develop an appreciation for science if there is any hope of them persisting in the STEM pipeline (Mesa, Pringle, & King, 2014). Many organizations and universities have risen to the challenge and developed programs to engage underrepresented populations in STEM during out-of-school time (Barton, 2007; Jones, 1997; Simpson & Parsons, 2008). These studies have addressed the program's structures, students' experiences, parents' roles and involvement, and even teachers' and mentors' experiences. What the literature has not unearthed is how directors of programs designed to engage Black and Latino/a middle school students in STEM disciplines position themselves in

their directorship roles and how they approach designing programs that meet the sociocultural needs of the participants. This study provides insight into the struggles and successes of two African American women who serve as directors of programs designed to provide STEM mentoring experiences to middle school Black and Latino/a students through community-based STEM programs. The paper is structured to first share their unique stories regarding how they began the journey into directorship roles and their struggles and successes. This study does not describe the programs' designs and activities because the purpose of this particular paper is to share the cultural experiences of both directors and how the intersections of their race, class, and gender have interacted in complex ways to shape their identities as Black working class women in positions of power as they empower and prepare the next generation of Black and Latino/a students to pursue STEM careers. Their narratives serve as a form of resistance to women of color historically being silenced, ignored, and isolated. Both researchers have undergone the self-reflection process and co-constructed overall themes from narratives, which are shared in the discussion. Specifically, we ask the following research question: How do Black women as directors of informal STEM programs position themselves to design and implement effective and culturally relevant programs for Black and Latino middle school students?

Black Feminist Thought

The conceptual framework for this inquiry pulls from Black Feminist Thought in order to inform the findings of this research, which seeks to address some of these challenges. Black Feminist Thought (BFT), introduced by Patricia Hill-Collins (1989, 1998, 2002), is “a critical social theory committed to justice for the collective population of Black women and other oppressed groups. The premise of BFT centers on the empowerment of Black women and the assertion of their voices as central to their experiences” (Patton, 2009, p. 516). In the work of Patton (2009), she devises Black Feminist Thought into six distinguishing factors developed by Hill-Collins (2002), including:

1. “Dialectical relationship” among African American women as a collective linking their intersecting oppressions with activism. Countering these oppressions broadly embraces social justice drawing on Black women’s consciousness and experiences, collectively and individually.
2. Challenges faced by Black women might be similar, however, how these challenges are experienced by Black women may be noticeably different.
3. “Dialectical relationship” connecting Black women’s experiences with the emergence of a group standpoint...This feature focuses on the autonomy of Black women to produce Black feminist thought and action.
4. Black women intellectuals come from all walks of life and offer unique contributions to the creation of BFT by bringing a distinctive perspective on Black womanhood that enables them to introspectively examine multiple oppressions better than those beyond the collective group.
5. Acknowledge that change is inevitable. Black women’s methods of resistance must change.
6. The struggles of Black women are unique, but not isolated from other social justice projects. This humanist approach succinctly identifies difference, yet is simultaneously committed to advancing oneness among all peoples (Patton, 2009, pp. 516-517).

The themes of Black Feminist Thought provide greater insight into the paradigm and how the concepts were formed. “The experiences and life history of Black women project a different

perspective. This is coupled with the fact that literature does not fully address the needs, concerns, and achievements of Black women, the stereotypical images and expectations of these women are still held by many” (Bova, 2000, p. 6). It is crucial that “self-valuation, self-definition, and knowledge validation replace the negative images of self in the minds of these women” (Howard-Hamilton, 2003, p. 22). Race, gender, and class are identities that interlock the components of African American women’s identity (Howard-Hamilton, 2003). Furthermore, the intersectionality of these identities is immersed in oppression and lessens their “status in an array of either/or dualities” (Collins, 2002, p. 472). Collins’ perspectives provide a rich context and meaning for African American women whose voice must be heard from within rather than heard from outside of their own perspectives and experiences.

Conceptual Framework

The conceptual framework for this research is developed through implementation of components of Black Feminist Thought. This conceptual framework entails one major theme which is “dialectical relationships” (Hill-Collins, 2002). In order to inform this theme, we have identified components in other bodies of research, specifically Critical Race Theory, that embody the same initiative. Therefore, four components to this “dialectical relationships” are used in this inquiry (Figure 1) which include: intersectionality (Delgado & Stefancic, 2012), counterstory (Solorzano & Yosso, 2002), counterspaces (Howard-Hamilton, 2003), and oppression meets activism (Hill-Collins, 2002). In this inquiry, intersectionality will be used to highlight the notion that lived experiences are frequently a result of race, gender, religious perspective, age, etc. It is not one aspect alone that makes our identity, but rather the unique ways in which our different identities intersect to shape who we are. Counterspaces provide shelter from the “daily torrent of microaggressions” and can be fostered through positive support systems, which include family, friends, community members, organizations, etc. (Howard-Hamilton, 2003, p. 23). These spaces typically operate as counterspaces because the people within the spaces share lived experiences as a result of the intersectionality that develops their position in society. Since the intersectionality of Black women's identities is immersed in oppression, it is important to link this oppression to activism. The Informal STEM programs develop opportunities for counterspaces and activism to exist.

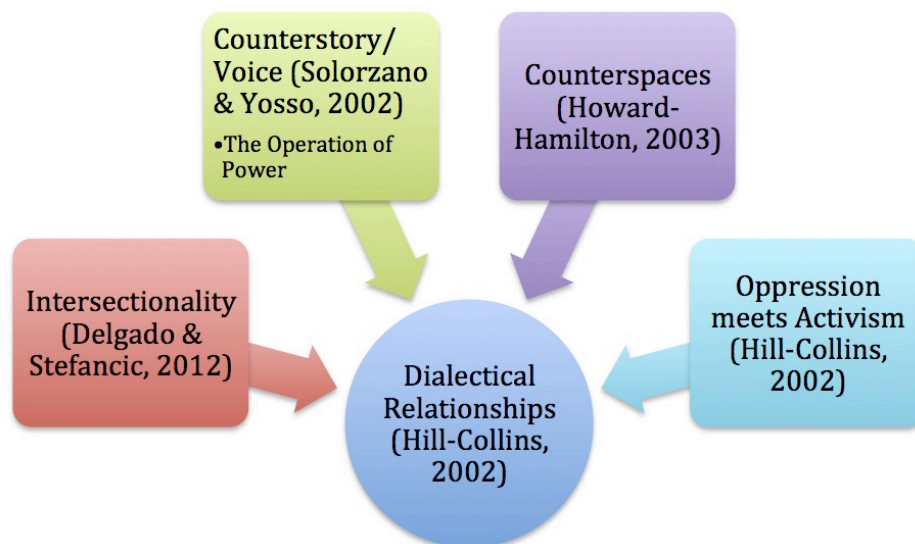


Figure 1. Conceptual Framework

Methodology

Resources for this body of research include autoethnography and counternarratives. These resources intersect different boundaries of culture and identity. This is necessary because we are Black women as program directors to a diverse population of students. Understanding these resources makes it easier to understand why and how they are integrated for the framework, and methods of this research. The research question for this inquiry is as follows:

- How do Black women as directors of informal STEM programs position themselves to design and implement effective and culturally relevant programs for Black and Latino/a middle school students?

An overview of autoethnography and counternarratives follows and this section concludes with the methods for this inquiry.

Autoethnography

Autoethnography is a reflexive and reflective process of autobiographical genres of writing and research that exhibits multiple layers of consciousness that connect the cultural and personal (Ellis & Bochner, 2000). The process begins with an outward, ethnographic lens that focuses on social and cultural aspects of one's personal experience, and the process proceeds with an inward, autoethnographic lens that exposes a "vulnerable self that is moved by and may move through, refract, and resist cultural interpretations" (Ellis & Bochner, 2000, p. 739). Autoethnographic accounts take a variety of forms, which include short stories, novels, poetry, journals, fragmented and layered writing, social science prose, etc. (Ellis & Bochner, 2000). Autoethnography challenges our "assumptions of normalcy, instructs us about forms of socialization, explores our participation in school socialization, and in turn, teaches one about the self. Second, it may teach one to write to practice and share emotions with audiences and to improve the craft for its own sake" (Hernandez, 2013, p. 106). Third, autoethnography teaches one to instill in and model through the exploration of self-critical attitudes, which offer self-disclosure in the facilitation and learning, and to investigate inequity and oppression in educational settings (Denzin, 2003). Adams-Wiggan (2010) and Hernandez (2013) implement counterstory and autoethnography to research the experiences of Black professional women and Latina/o educators. Collective autoethnography enables collaboration among researchers to analyze and interpret one another's work, simultaneously developing a space for members of the group to respond to that work (Hernandez, 2013). Individual narratives are developed by participants based upon critical moments that entail responses from all contributors' members of the group (Lapadat, 2009).

Counternarrative

Counterstory-telling includes the reproduction and production of individual narratives that counter the evident and accepted knowledge of master- or meta-narratives, frequently referenced as majoritarian stories (Terry, 2011). In counterstory-telling a dialectical relationship exists between African American narratives (a implicit African American philosophy, liberation as education) and dominant narratives (indications of White supremacist ideology) (Terry, 2011). Although, not all narratives intend to challenge or counter majoritarian narrative (Terry, 2011). Solorzano and Yosso (2001) assert, "a story becomes a counter-story when it begins to incorporate the...elements of critical race theory" (p. 39). Terry (2011) claims a narrative constitutes a counterstory when it fulfills three key criteria:

1. contains a kernel or representation of the dominant narrative such that it communicates a clear understanding of that dominant narrative and its implications to the communicant;

2. provides the communicant (in the form of a competing narrative that is grounded in a “freedom reality”) reasonable and sufficient grounds for contradicting the dominant narrative; and
3. allows the communicant to access the larger freedom reality toward which the competing narrative pushes (Terry, 2011, p. 30)

The fictitious work of Derrick Bell’s (1992) “Space Traders” story, for example, grappled with the idea of Blacks in America being traded to aliens by political leaders. The story provided a truth to the political value of Black people in America (Bell, 1992). Counternarratives can develop empathic communities among those at society’s margin by humanizing educational theory and practice; unveiling opportunities; challenging conventional ideologies from society’s center; using narratives to provide a space to challenge existing ideological systems (Delgado, 1989).

Methods

This inquiry began as a discussion of our experiences as program developers within these Informal STEM programs. During our discussion, we established central themes. Following the discussion, we agreed to reflect on each theme and compose an autoethnographic account of our experience in our programs.

This study implements a content analysis as a method of open coding. The researchers developed and sampled their own work and experiences to create their autoethnography and counternarratives. The data collection process was completed through personal and program reflections, allowing the researchers to recall our experiences and personal accounts. The resulting ethnographies have been categorized by the thematic categories developed in the conceptual framework, which is rooted in Black Feminist Thought. The analysis of this research is facilitated with examples in the data analysis and findings.

Findings

Reflections from Director Ariya of the Engineering Mentoring Program (EMP)

When I was first introduced to the Engineering Mentoring Program (EMP), I was completing the second year of my PhD program in the College of Education. The program had just received grant funding in order to host a pilot program, which included a Robotics Summer Academy. Mentally, at the time I was in a space where things were looking up for me, the chance to work for this program was an outstanding opportunity. The previous two years were some of the lowest moments of my life as I endured the day-to-day life of a low-income, young Black woman of size, in a STEM discipline in pursuit of an advanced degree while trying to maintain my Christian faith. I had become an outsider within every environment that I knew, and in turn was faced with feelings of incompetency, self-doubt and feelings of rejection. I reached a point where I was forced to conform in every space in my life, which meant I was consistently wearing a mask, and in some cases multiple masks in order to please others and be accepted, when all I wanted and needed to be was me.

In an attempt to seek allies to support me during this complex experience, I found that my definition of support and mentorship was very different from what I was being provided and that my understanding of support translated in this new environment (research one institution) was viewed as a negative outcome of my experience at a Historically Black College and University (HBCU). Things began to get better when I began taking courses that discussed topics that critically analyzed race, gender, classism and social justice in education. I began to see myself in

my coursework and I began to understand what was happening in the world around me. It was a reassuring experience because for the first time in years I realized that I was not crazy or simply playing the victim, but instead that I was having real and valid experiences. These experiences were occurring because I was an outsider within so many spaces in my life that my perspective was silenced because it was not a dominant perspective. As I learned about the operation of privilege and oppression I began to understand the world so much better. Things in life began to look up and I wanted to return to what I knew I loved, helping people and doing outreach to support my community. EMP was the beginning of the process of reclaiming my joy.

Before directing the EMP, I was working with a program that provides local Black and Latino/a PhD students with support and networking opportunities within academia to share our research and interests. A professor in the College of Engineering received a grant that aligned with my research interests of providing STEM mentoring opportunities for Black and Latino/a students to enter STEM disciplines. I was the first to join the EMP team and was asked to take the lead on program assessment and to begin my journey by reviewing literature on service learning programs. The proposal for the EMP described a program that served underrepresented and underserved populations including middle school children from low-income families and undergraduate engineering students with similar demographics in a robotics context. Additionally, this program would provide opportunities to build life and technical skills within the context of a culturally relevant curriculum. It was a dream come true for me. I would have the opportunity to develop something great that I was passionate about, while simultaneously contributing to my own professional development goals.

During the EMP Robotics Summer Academy undergraduate engineering and mathematics students were hired to serve as mentors to middle school students (mentees). The EMP mentors were truly an asset to the program. The mentors had expertise and experiences as young adults, college students, and engineering or mathematics majors that the mentees did not have. The mentees on the other hand had young and creative ideas and were open to the trial and error process. This made for an excellent team and the mentors and mentees were both empowered from the experience of working together. One of the most impactful experiences in the program was when African and Bomba dance instructors and drummers facilitated an activity to connect culture, family, language and STEM education. It was an excellent experience and the mentors and mentees enjoyed it. However, one particular student stands out who struggled with her identity as Latina and refused to share information about her family. When the Bomba dance instructor introduced herself as a Latina from Puerto Rico, the student immediately identified herself as being Latina from Puerto Rico, started speaking in Spanish and gave praises to all of Latino/a descent. Three of the other participants in the EMP were Latinos from Puerto Rico as well, and the instructor asked them to come up front. In that moment, the mentees were so proud of their culture and shared stories about their families. From that day forward, they were open and proud of their identity as Latino/a students and opened up to their peers and mentors in the program.

A key component of developing mentoring programs for Black and Latino/a students is providing opportunities for creativity that supports their psychosocial and cultural development. Since I am a part of an African dance group in the local community, I wanted to implement this component into the program and add Bomba for the Latino/a students. My contributions were treated as frivolous and the project team was not interested. However, I continued to push for the event, understanding the kind of impact that it would have for the mentees. Not only did the mentees and mentors state it as their most memorable experience, but the project team enjoyed it

as well. The Principal Investigator thanked me in private for my resilience and reassured me of the good work. However, I received no public recognition for my ideas or the struggles that I endured. I had to understand that although I played a major role in the development of this program, at the end of the day, it was not my own. Receiving grant funding puts constraints and guidelines on what the program is able to offer. I was troubled most by my perspectives and ideas not being held to the same level of respect as my Black male counterparts. No matter how much I learned and contributed through the development process of the EMP, I still had to prove myself each and every day.

Serving as the director requires many sacrifices and selfless acts. Prior to starting the EMP, we hosted an induction ceremony for the mentees. One parent approached me because her work schedule conflicted with the timeframe for the program and she would be unable to transport her children to and from the program. This mother was interested in having her children participate and receive these STEM experiences. Immediately, I volunteered to pick them up each day to ensure that they made it to the program. She looked relieved and was uncertain of how to respond. I believe she was in shock because I did not hesitate to offer my assistance. For the entire program I picked up and dropped off three children each day from two different households. I did not mind doing it and truly defined it as a rewarding experience. Although I offered a helping hand asking nothing in return, I was financially unstable and struggled to pay my rent and bills and keep gas in the car because the pay was so low. I could barely make ends meet and had to take out a student loan and beg my parents for extra money just to get by. I did not have health insurance and can also recall agreeing to apply for a graduate student grant just to reimburse the PI since he was coming out of pocket in order to pay for supplies for the program. Not to mention at the end of the program I spent over \$100 out of my personal funds to make small gifts to present to the mentors, mentees, and staff members for the program. I was willing to help in any way that I could especially if it meant positive outcomes for the students involved in EMP. I believed that if I gave, then I would receive and so I just could not understand how I poured so much into the program and yet struggled so much with little to no recognition for my efforts.

Reflections from Director Nicole of STAR Summer Program

First day back to school, August 22nd, 2011. I was a high school science teacher with two distinct groups of students: those in the highly esteemed International Baccalaureate (IB) Program and those considered mainstream in the major program courses. Not only was this day spent learning about my students, but hearing the stories about their summer adventures. As I listened to their stories, I noticed that the major program students spent the past two and a half months watching television, hanging out with friends, and maybe attending a family reunion in a neighboring town. However, my IB students traveled and visited different countries, enrolled in educational summer camps that strengthened their learning, and were not just academically ready, but ahead. I also observed that most of the children in my major program classes were minorities from low-income households while my IB classes consisted of majority White and Asian students from middle to high-income households. Perplexed and frustrated with the reality of these disparities, I knew it was time to act! I rallied together a few of my colleagues who taught in local schools that shared similar laments of the African American and Latino/a children in their classes being idle during the summer months. This is how the concept of the STAR Summer Program was conceived and has evolved tremendously over the past four years to meet the specific needs of children in our community and the demands society has placed on them to

compete in the global market. The mission of the STAR Program is to provide the most underserved children with the resources, skills, knowledge, and training to be well-rounded, productive, responsible, and engaged citizens. We accomplish this through a comprehensive program that prepares underrepresented populations in kindergarten through the twelfth grade to pursue careers in STEM and to be college ready upon completing high school through continued participation in the program and sustained mentoring.

As a Black woman of color, graduate student at the local university, and executive director of this program, I always found myself shifting between my roles and figuring out how I could build bridges to make connections between the university with plenteous resources and the east side of town with people just trying to get by. I positioned myself as a member of the east side community because I lived where the families lived, attended church in the same neighborhood, and taught at the local high school for three years. However, it took time, hard work, and dedication to build meaningful relationships with members of the community because although I lived there, I had a master's degree and social and cultural capital that they lacked. I realized that they were not looking for a savior, just a partner and someone who cared enough to listen to their concerns and provide access to basic resources and services that our lighter brothers and sisters were given without asking. They also wanted to ensure that I was in for the long run and not just offering a program one year and gone the next year.

As director of the STAR Summer Program, I served as a counselor, mother, and friend – offered advice when solicited, networks when needed, or just a listening ear. My role was much deeper than the day-to-day interactions and planning activities for students, I was a part of the community and rejoiced with the families when they rejoiced and wept when they wept. It was of utmost importance that all parents bought into the program and they contributed whatever they could afford. I built relationships with the families and learned their strengths so that they felt a sense of belonging and inclusion in the community-based program. What I appreciated the most was that parents were not embarrassed to ask for help and entrusted me with very personal information. This was important to me because many of the children that we serve struggle in school for reasons beyond the child's control and parents do not feel comfortable speaking with the school/teachers about such personal matters. I depended on my parents/guardians to remain actively involved and sought opportunities for them to share their personal experiences and showcase their strengths. For example, one grandmother was one of the first students to integrate our local high school. She sat the students down and shared her story about what it was like growing up in our city during the segregation/desegregation era. Parents whose schedules did not allow for them to physically come in found other ways to contribute. One mother used her “food stamps” to purchase snacks for the children as her means of contributing to the program. Local churches, businesses, non-profit organizations and community members sponsored children to attend or co-sponsored aspects of our program to ensure that it would be a success. Our story is that it truly takes a village and when I opened the door for families and the community to be an integral part of the program, they embraced the opportunity with pride and dignity.

Because the STAR Summer Program was a grassroots movement, we did not have an account or any money at the beginning the program. Teachers brought in some of their lessons and activities and we used what we had. I wrote sponsorship letters and presented at various meetings (Black sororities/fraternities, local churches, and other non-profit organizations). I also wrote small grants, created crowdfunding accounts, and begged friends and family to support. Everywhere I went, I talked about the program and solicited supporters. This experience allowed me to put aside my pride and work unselfishly and advocate on behalf of the community to build

relationships with the College of Engineering and College of Education for the STEM components of the program. Some days, I was so discouraged because having the basic funding and resources to implement STEM activities became a chore. Even though the work was so draining, the rewards far outweighed my sacrifices. One parent sent a message after this year's program saying "Thank you so much for the STAR Program!!! Lisa really enjoyed herself this summer! As a parent, I observed Lisa's continued growth spiritually, academically, socially, and emotionally! Kudos to you and staff for a job well done! Forever grateful" (personal communication, August 2015). Simple words like these make directing the program worth all of the sweat, tears, and disappointments! My story is that there was a negotiation process of power and certain barriers to break through in order to provide a holistic STEM program for Black and Latino/a students that embraced their lived experiences and cultures.

Discussion

These autoethnographic accounts of two Black women serving as program directors in informal STEM programs provide a new lens to understand how their identities have intersected in complex ways to position them to successfully run informal STEM programs for Black and Latino/a students. They defined their directorship roles based on their previous experiences as Black women in STEM disciplines and produced a greater consciousness of the expectations and perspectives of Informal STEM Programs for Black/Latino/a students. They were committed to uplifting and supporting families even when they were not provided with the support and resources. Being a program director is a vital component of Black PhD women's academic experiences and professional development. This is supported by the first feature of Black Feminist Thought because Black women program directors are able to offer observations and share advice from their own lived experiences. There is a strong family connection and linkage to "mothering" as a Black woman director of mentoring programs for minority students. It is important for the STEM program to be "contextual in nature" and a "counterspace" for mentees and mentors to deal with daily challenges that they face. Trust issues are most intense in Black women program directors' discussion about Black male directors. Many times, there is a feeling of isolation as Black women in the directorship role because very few people may share those same passions. Within the STEM program, it is important to have familial and community support for a successful program.

Implications

These reflections document the personal accounts of two Black women directors of STEM programs for students who are underrepresented in STEM careers. Current efforts from both researchers and practitioners seek to broaden the participation in STEM learning by diversifying the students included as well as the educators and designers facilitating these programs. Their efforts seek to provide a safe space where children's prior knowledge, experiences, and social and historical contexts are valued and included in the lessons/activities. These informal institutions embrace the participants' cultural practice and develop programs that meet the needs of the community and interests of the students. It is essential to engage the community and build networks that foster sustained support and participation. Informal science institutions can partner with the local community to collaboratively set goals and structure a program that provides meaningful science experiences appropriate for their specific contexts. This autoethnographic study showed how two directors positioned themselves to provide effective STEM programs for Black and Latino students and how they fostered a supportive and

low-stakes environment for students to develop as STEM learners and project themselves into that image. Students' prior experiences, lived experiences, cultures, knowledge, and families are resources that must be harnessed for meaningful learning to take place.

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