The Racial Identity Conflict: Diverse Perspectives on the Minimization of the STEM Education Gap that Impacts Gifted and Talented Black Male Students!

by ADRIENNE COLEMAN

Introduction

Research suggests that a cognitive gap begins as early as nine months of age in Black males, widens by two years of age, and by fifth grade cognition lags by nearly two full years (ETS, 2011). This gap is a result of multiple facets: "Children are suffering from a toxic cocktail of poverty, illiteracy, racial discrimination and massive incarceration that sentences poor boys to dead-end hopeless lives" (ETS, 2011, p. 2). The outcome is the Black male being inadequately educated and academically behind other subcultures of the population. Lack of family support, poor school systems with inadequate resources, peer pressure, prejudice, and discrimination as well as individual factors such as self-concept, racial identity, lack of academic motivation, test-taking skills and learning styles are societal and personal factors that have led to the achievement gap in Black males (Moore, Ford & Milner, 2005).

Racial identity conflict has been a persistent source of academic underachievement in Black males (Reynolds, 2010; Stinson, 2006). Because Black males fear being accused of "acting White," they tend to deny or hide their talent and potential in order to not being seen or viewed as smart or valuing academic achievement (Emdin, 2011; Stinson, 2006, 2010). The Black male has gone as far as adopting "a cool pose," a defense mechanism and ritualized form of masculinity that allow them to cope with oppression, racism and oppression (Stinson, 2006; Whiting, 2006). This has led to the Black male adopting five personalities to deal with racial issues: the assimilator personality that does not associate with Black culture, the emissary that downplays their Black culture, the alternator personality that tries to balance Black culture and White societal norms, the regular personality who is accepted in Black culture but does not abide by all the norms; and the ambivalent personality who is caught in between wanting to be part of Black culture and the desire to academically achieve (Spradlin, Welsh, & Hinson, 2000). These roles limit the Black male in fully demonstrating his academic talent. The ambivalent role has led to the Black male adopting the "cool pose" mentality.

> There was a group of Black students being honored for outstanding academic achievement. . . . One Black male approached the van dressed in baggy pants, an overly large sweatshirt and

headband. . . . Upon entering the van he proceeded to pull off the outer layers of his outfit to expose a crisp dress shirt and creased Khaki pants . . . "I have an image to maintain." . . . After the event and before returning to school he went back to what his peers would accept him in, the original "urban" outfit (Whiting, 2006, p. 225).

Because Black males are likely to be accused of "acting White" or selling out when they achieve academically, the cool pose allows them show their "Black culture" outside of the classroom and "be intelligent" inside of the classroom. There was a student in a specialized urban public school biology classroom who was afraid of "acting White" so he made himself invisible; however, in the lunchroom he would "drop science," discussing, describing, predicting and analyzing situations (Emdin, 2011).

> In this space, I was droppin' science–a highly complex way of speaking in rhyme while discussing complex topics using metaphor and analogy . . . but in the actual science classroom, I was not able to hold on substantially to anything the teacher was sharing.

This is the experience of many Black males (Emdin, 2011). Having to balance multiple personalities and roles contributes to the academic achievement gap that impacts Black males.

This imbalance in regard to the multiple identities of Black males becomes more complex when giftedness is added, thus impacting social interaction and student development. An outcome of being Black, male, and gifted is that "African American gifted male students become caught in this middle position . . . not real enough and too smart to be part of the home community and not cultured enough or too foreign to be part of the mainstream" (Bonner, Jennings, Marbley, & Brown, 2008).

The literature further shows a significant deficiency related to academic achievement and STEM (science, technology, engineering and mathematics) education of Black males when compared to other subcultures. Several studies (Lattimore, 2005; Thompson & Lewis, 2005)

have articulated that Black students tend to struggle in mathematics and science. They have interest, but they struggle with the teaching methodology and real-world application. Examining the 2014 Illinois Standards Achievement Test of 8th graders and 2014 Prairie State Achievement Examination of 11th graders, it was found that only 38% of Black students in the eighth grade were meeting or exceeding mathematics standards, compared to 69% of White students (ISBE, 2016). By grade 12, this gap widened with only 23% of Black students meeting and/or exceeding mathematics standards, in relation to 65% of White students (ISBE, 2016). This may be attributed to the fact that only 10% of Black students complete the high school mathematics curriculum, which is a pipeline that includes algebra, geometry, trigonometry, and pre-calculus (McGee & Martin, 2011).

Also, there is a stereotypical perception of mathematicians/scientists as old White men (McGee & Martin, 2011). The University of Wisconsin at Madison reviewed its STEM majors finding that African American, Latino/a, South East Asian, and Native Americans (ALANA) were "less likely to actually major in STEM fields and more likely to drop out once they have declared a STEM major" (The Center on Education and Work [CEW], 2008, para. 2). The Black male is invisible in STEM fields with less than 5% of the STEM workforce representation; researchers say that a large scale study needs to occur to get insight about Black male interest in mathematics and science careers (Baptiste & Boyer, 2000; Thompson & Lewis, 2005; National Science Board, 2014). An indirect outcome is that the target population does not pursue an education in STEM and is thus unable to excel in careers that typically provide a higher standard of living. Caucasians and Asians view STEM careers as a world of opportunities; whereas, Blacks see it as challenging and inaccessible (The Center on Education and Work, 2008).

Other factors that impact the underrepresentation of Black males in STEM include lack of exposure to STEM in K through 12 education, mathematics phobias, students' misperception of what science is, no real-life application of science, motivation to succeed, and peer pressure that devalues high achievement (QEMN, 2010). Thus, this racially based STEM education gap needs to be examined in order to engage more Black males in STEM education for gifted and talented learners. Although there is documented evidence that with access to enrichment opportunities and motivation, along with parental support, students will achieve academically, this information is incomplete in that most of the studies were not generalizable, did not consider STEM implications, and focused on either the elementary or collegiate levels. To address the Black male STEM education

gap, Black males, their parents and faculty/staff who work with Black males were asked their perspectives regarding why there is a STEM gap and how to minimize that gap.

Methodology

According to the literature, the role of parents, mentors, teachers and STEM exposure is pivotal in the academic and STEM development of Black males. Thus, this study considered the literature and further contributed to it by interviewing gifted and talented Black males who are engaged in STEM, their parents, and faculty/staff members who work with Black males in STEM. This study examined the reasons that a STEM gap exists among Black males and how to minimize that gap. The following research question was addressed: *The literature suggests that there is a gap in STEM majors/careers in which Black males do not major in or enter STEM fields as often as their White and Asian counterparts …why do you think this gap exists and how would you address this gap?* A qualitative approach utilized focus groups with Black male high school students and interviews with Black males engaged in STEM majors/careers, their parents and their teachers. Diverse perspectives emerged as to why there is a Black male STEM gap and how to address that gap. These perspectives came from 93 participants out of three distinct groups affiliated with the Illinois Mathematics and Science Academy, a residential high school for students gifted/talented in mathematics and science: 45 Black males, 21 parents of Black males, and 28 faculty/staff who worked with Black males.

Findings

Current Black Male IMSA Students

The gifted and talented Black male students were asked their perspectives as to why there was a STEM gap in which Black males did not major in or enter careers as often as their White and Asian counterparts and what makes them different, of which 15 students responded. The themes that emerged were (a) lack of STEM vision for Blacks, (b) lack of STEM parental support, and (c) negative stigma of/misperceptions about Black males. The lack of STEM vision was stated by six (40%) of the respondents:

> I guess there is this train that needs to be interrupted, but the reason is a little different. The way that I see it is there might not be as many Blacks in STEM for the same reason you don't see as many women in STEM, which is the fact that there aren't many and I know that sounds like circular reasoning but I know that growing up when STEM is just a field that you don't associate growing up African American. If you don't see African Americans in STEM, if African Americans don't feel

it is something they should go into; either that or we aren't given the same opportunities.

These students felt they did not see Blacks engaged in STEM, and thus their perspective of who entered STEM did not look like them. They also felt society, schools, and the Black community emphasized becoming an athlete or entertainer, not a scientist or mathematician as a means of acquiring success. With this lack of vision of Blacks engaged in STEM and overexposure of sports and the arts, Black males are not entering STEM.

Another theme that emerged, stated by six (40%) of the respondents, was lack of STEM parental support. This dearth of support by parents was a result of a lack of knowledge, deficient monetary resources for STEM enrichment, and not serving as a motivator:

> I'm half Asian and half African American and I see there is a huge gap. My Chinese cousins, like whenever I go visit them, they are like, "I can't hang out with you, I can't play video games, I'm studying, I have to study for the SAT." And then I go visit my Black cousins and they are like, "What are you doing, come hang out with us, come play video games," and I'm like, "Oh, well I have to practice my clarinet, I have to study for my math test," or something; so there is this huge difference. It's from the parents, it's the notion of this mindset that in both communities that is so different; like Asian parents, most of them are immigrants. They come over and right from the beginning they say you need to grow up and be a doctor or lawyer or something that makes a lot of money so that you can give back to us and you can provide for your own family. Whereas, I see with my cousins and African Americans in general, it's like that's how it's always been, what is the point in changing. So I think the big thing is that's how it is, that's how it's always been. What's the point in changing?

The final theme that emerged in which three (20%) of the respondents agreed was negative stigma or misperceptions about Black males. Because a stereotypical image of Black males is put forth in society from the media and seems to trickle down generation to generation, these participants felt Black males not being exposed to STEM contributed to the STEM gap, as stated in the following remarks by the gifted and talented Black males:

> It's mostly the parents that influence this; I feel like there is a trend with African American people who live in lower socio-economic communities where the most prevalent alternative is pimping or drugs or things of that nature. I feel like it becomes

difficult to instill things in our children when it's bad all around and I feel like it's difficult to expect things from a group of people who have grown up in this cycle of poverty. Their parents did not motivate them so they do not know to motivate their kids; it becomes almost a vicious cycle. Where I grow up in this community and this is all I know; this is all I know of the world, it becomes difficult for people of that nature to expand.

Although the Black male STEM gap was linked to a lack of STEM vision, parental support, and negative perceptions, this group of gifted and talented Black male participants were helping to bridge that gap. When asked what makes them different in terms of being a Black male engaged in STEM when so many were not, six (86%) of the seven respondents overwhelmingly stated their parents played a pivotal role. The reasons parents were such an integral part of their STEM development included the fact that their parents intentionally lived in safer, more diverse neighborhoods to gain access to opportunities and also exposed them to STEM early. Other students discussed how being the only Black student in the majority of their classes in their educational career has shaped them and made them different than other Black males not engaged in STEM:

> I can definitely add on to the classroom thing. In my entire educational career, I have been the only person of color in my classrooms. It kind of got to the point where I forgot my own racial identity. I did not really grow up with a strong African American or strong Chinese background or community around me. It's always been the White, typical neighborhood and I kind of just went with the flow. I never really looked into myself to find out who I am as a person, an individual from two different backgrounds until I came here. So it's really difficult especially if we are trying to break the cycle. What do you do when it's hard for people to identify themselves if you throw them in a room with people who are unfamiliar to them, when they are accustomed to a classroom of people that look like themselves?

To address this STEM gap, four (50%) of the eight respondents stated more Black males needed to be involved serving as mentors and role models. One student discussed passionately the need for involvement by Black male role models and that parents needed to play a role in motivating Black males to engage in STEM and minimize the gap:

> Going along with a point about Dr. White, the physicist, he said he was very interested in STEM and

through his studies he was extremely discouraged by his professors and his peers because he was an African American. Now today, it's not as bad, but it still exists. I think the number of African Americans that want to go into STEM is increasing, but what I think is making things difficult is discouragement. There are a lot of motivated students but there is a good portion that stop their interest in STEM because of what their peers and their teachers say, "You can't do it." "You are not smart enough." "You're never going to be able to do it," so I think that is another factor that contributes. The most influential way to motivate the students is through the parents; the parents have lived with them all their life; they gave birth to them and are genetically related to them, and they provide food/shelter, everything to them; they love them, and I feel the way to influence the child is through the parents. First it comes from the parents, then the teachers; I really think those are the only two ways to influence a child in their childhood and it is very difficult to influence them later; as they grow older it's harder and harder to influence them.

Other participants discussed beginning STEM education early in life and having a nation-wide STEM intervention focused on Black males to minimize the Black male STEM gap.
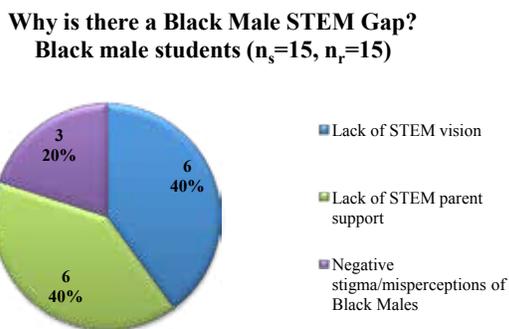
Why is there a Black Male STEM Gap?
Black male students (n_s=15, n_r=15)

Figure 1. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "Why is there a black male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

How to address the Black male STEM gap?
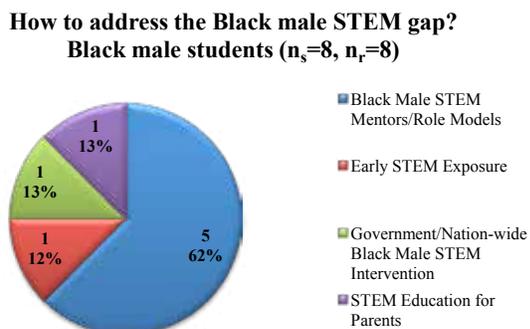**Black male students (n_s=8, n_r=8)**

Figure 2. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "How to address the Black Male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

Black Male IMSA Alumni

The gifted and talented Black male IMSA alumni were asked their perspectives as to why there was a STEM gap in which Black males do not major in or enter careers as often as their White and Asian counterparts and what makes them different and how to minimize the gap. The themes that emerged for why there was a STEM gap included (a) lack of STEM vision for Blacks, (b) lack of STEM exposure, (c) negative stigma of/misperceptions about Black males, and (d) lack of parental support. This question yielded some powerful findings with 13(52%) of alumni stating a lack of STEM exposure and 13 (52%) stating lack of STEM vision for Black males. For many of the alumni who discussed a lack of STEM exposure, they focused their remarks on a lack of quality education, especially in urban areas:

> I think that Black males are not encouraged enough to enter STEM fields or given enough tools to succeed in them. I also think that the educational systems in which Black males are enrolled are far inferior to the ones that Whites and Asians are typically enrolled. I would expose Black males at an early age to STEM majors and careers and provide them the necessary tools, knowledge, education to actually excel in such fields.

For those who stated a lack of STEM vision for Black males as the reason a STEM gap existed, they discussed discouragement from others, a vision of sports/entertainment being promoted, and STEM not being "cool" as contributing factors to this lack of STEM vision as indicated in their voices below:

> I think that's what a lot of them don't understand is the fact that as Black men we're very young and typically in stereotypes to be athletic or see that as the only way of getting out of whatever situation that we're in, so we focus on that opposed to math. Who wants to spend time doing integrals and doing algebra when they can go out and play basketball for three hours; but if you learn to love that as a child, when you're five or six year old and told that you're good at it; and rather than negative feelings about how this is hard and I can't do it, I think that makes the whole difference in the world.

Another theme that emerged regarding why there was a STEM gap that disproportionately impacted Black males was

a negative stigma of Black males, stated by six (24%) alumni. They suggested there were misperceptions of Black males in the media and society, as evident in the following comments:

> I think the gap exists in part, there is an historical explanation and that Blacks have been historically in a disadvantaged position in this country due to, of course, a history of slavery; and then after slavery, prejudice, and then continued prejudice, and so the societal expectation for Blacks has not been as competent as Whites, and some other minorities had greatly contributed to our success in. This historical disadvantage has manifested itself in economic structures and political structures and so in my opinion it's still harder for a Black male to have access to the structures such as education that will allow for them to be exposed to STEM.

The final theme that emerged was lack of parental support, reported by two (8%) participants. One of the gifted and talented Black male alumni indicated a lack of knowledge being passed down from generation to generation as a reason why parents could not be more supportive:

> I think the gap exists because our community is distracted with a lot of things. I was talking to my dad about this recently, and he was talking about how it seems like a family in the Black Community, they seem to start over every generation and they don't build on the knowledge and the wisdom of the previous generation and the previous generations never messaged it and passed it down the right way so that renew of what is it we can do, what is it that we can be; and we get distracted by what we see and we start playing into these stereotypes that people give us and it becomes a vicious cycle; specifically for science and technology.

When the gifted and talented Black male alumni were asked what made them different than Black males who were not engaged in STEM, 15 of the 25 participants responded and the following themes emerged: (a) parents, (b) early STEM exposure, (c) good at STEM, and (d) determination. The majority, 10 (67%) of the respondents stated their parents providing a stable home environment, access to diverse schools, having STEM degrees, and exposure to science fiction literature/television made them different. Other factors of difference were being naturally good at STEM and having an early exposure to STEM, as indicated each by two (20%) alumni. One alumnus (10%) discussed his determination as the reason that he was different than those not pursuing STEM:

> I think they're is just something about me that

no matter what I knew I wasn't going to give up, I wasn't going to be put down, so I kind of stayed true to myself, no matter what somebody said. Whether it was a teacher or adviser or peer that would say why are you aiming for that or that's lame or why are you spending the time reading or studying when you can go out and have some fun, or, you know, so on so forth. I remained true to myself and I knew that I wanted to do something important in life; and I knew if I stayed this particular course in life I would get there . . . so just like having determination and faith and knowing that I like really believing that, having that resolve to get back up and go for your goals.

In an effort to minimize this Black male STEM gap, 14 (88%) of the 16 respondents emphasized the importance of Black males involved as mentors/role models and four (25%) of the 16 respondents supported exposing Black males to STEM inside/outside the classroom. Of the gifted and talented Black males who stated there needed to be more mentors and role models, four of them were currently running STEM enrichment programs for youth, including a youth aviation program, two tutoring programs, and an urban youth education and Squash enrichment program.

Why is there a Black Male STEM Gap?
Black male alumni (n_s=25, n_r=34)

- Lack of STEM vision
- Lack of STEM exposure
- Lack of STEM parent support
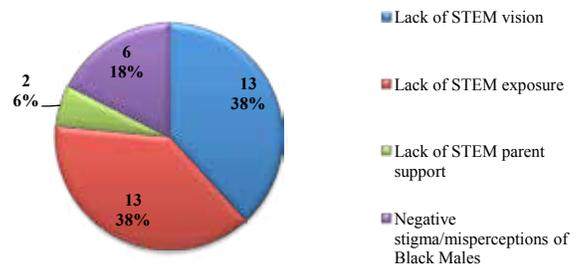- Negative stigma/misperceptions of Black Males

Figure 3. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "Why is there a black male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

How to address the Black male STEM gap?
Black male alumni (n_s=16, n_r=17)

- Black Male STEM Mentors/Role Models
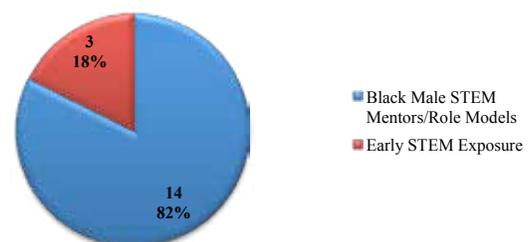- Early STEM Exposure

Figure 4. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "How to address the Black Male STEM gap?" Sample sizes for number of subjects

responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

IMSA Faculty/Staff

The IMSA faculty/staff were asked their perspectives about why there was a STEM gap in which Black males do not major in or enter careers as often as their White and Asian counterparts and how to minimize the gap. The themes that emerged for why there was a STEM gap included (a) lack of STEM vision for Blacks, (b) lack of STEM exposure, and (c) lack of parental support. This question yielded some powerful findings with 15 (58%) faculty/staff stating a lack of STEM vision and 14 (54%) stating lack of STEM exposure as reasons for the Black Male STEM gap. Regarding the lack of STEM vision, the IMSA faculty/staff discussed their perceptions that Black males do not see images of themselves as doctors and scientists in society and that STEM is not focused on in the Black community as expressed below:

> I think the cultural narrative told to Asian, Whites, and Blacks are three different narratives. Asian children are told that you have to work really hard to get better. They will have a growth mindset. White kids will have a fixed mindset which makes them very competitive and wanting to be better than everyone else. Black kids would feel less capable so there may be a burden of "I am not as good, I can't do as well," or "it is harder" because of the barriers, real and perceived. How you identify yourself is a powerful narrative than what someone else thinks of you? I think this is one of the drawbacks for Black males entering into STEM is their own sense of maybe this is not where they belong, others views of them not belonging, or not seeing Black individuals in STEM. There is not an invitation extended to Black males by other Black males' scientist that say, "Come into this field because there are fascinating opportunities or enormous opportunities for contribution." I think that there is a gap...You might be the one to make the contribution that is the next Jonah Saugh or the next one to walk on the moon.

The IMSA faculty/staff who discussed a lack of STEM exposure as the reason for the STEM gap articulated that Black males are not exposed to STEM and typically come from under-resourced schools, which leads to a lack of educational preparation in STEM, as indicated in their remarks below:

> I hate to say this. If Black males had the same opportunities as White and Asian males, there would not be that gap. I think that gap really results from

lack of opportunity and the school systems where many of our Black students come from. I think we need to throw some resources into communities that do not have what other communities have. I think it's great that we are trying to reach out and get into those communities and find those talented kids. Also, we bring them to a place where they have more of a chance to get what they need. I think it's a shame, but I think that there are societal problems contributing to that. I don't know how to change that. It's a shame because there a lot of kids who really want to do well. It takes an incredible spirit to fight the challenges that bring down Black men.

A few of the IMSA faculty/staff discussed that Black males sometimes choose to enroll in a less rigorous curriculum, which ultimately limits their preparation for STEM majors and careers:

> Black males go to tough colleges. At IMSA, Black students who were at the top of their class arrive at IMSA and notice they are in the middle. They have to compete with White students who have received rigorous curriculum in preparation for IMSA and Asian or Indians who are brilliant mathematicians. . . . In college, they get discouraged because the programs are extensive causing them to drop out. . . . Black male students don't have to attend Cal Tech to be successful in STEM fields. The Nobel Prize winners are not from top 10 schools and probably wouldn't have stayed in chemistry or physics at those schools. We need to inspire and inform these Black males by telling them that they are exceptional in math. They probably will not score as high on SAT as their White or Asian counterparts, but they still have immense talents and gifts they could put into a STEM career. We should guide Black students into college where they have opportunities as STEM majors.

There were five (19%) IMSA faculty/staff who expressed a lack of parental support as an indicator of the Black male STEM gap, as discussed in the responses below:

> I grew up wanting to be a teacher. My father was a college teacher, my mother was a teacher, and most of the adults I observed were teachers. My environment shaped who I was and what sort of careers was possible for me. I didn't think about a lot of things. If the African American male students don't come from environments where parents or other adults are engaged in STEM careers, it limits the expectations that they have for themselves.
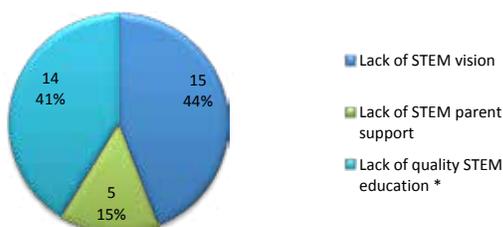
To address the STEM gap and motivate Black male students to engage in STEM, the IMSA faculty/staff suggested the importance of STEM exposure and more Black male mentors. Ten (63%) of the 16 respondents said that Black males being exposed to STEM through involvement in clubs and research would help to minimize the STEM gap:

It's a difficult question in terms of getting it done. Making programs like SIR [Student Inquiry and Research] available to areas with a large Black male population. Allowing them the opportunity to experience this will help shift them into STEM fields. The absences of opportunities or experiences that kids tend to stay away from those STEM areas. Doing original research, SIR [Student Inquiry and Research] experience, or shift in the curricula to provide unique learning experiences that goes beyond memorization or facts about science. This will impact the number of Black males going into STEM fields. Adjusting and modifying the learning experiences of Black males in areas that are predominately Black. We can give them the opportunity to be involved in original research and the process of doing science will have a big impact on shifting them into STEM fields.

Nine (56%) of the 16 respondents indicated having more Black male mentors and role models would also help minimize the STEM gap, as stated in comments by four of the IMSA faculty/staff below:

How are we going to get Black role models in STEM fields, if the kids are not interested in STEM to begin with? I think that's another thing that is lacking that would help motivate kids, role models such as doctors, physics, engineers, architects. People that African American kids could see, Black engineers or scientists working to be a role model. They don't necessarily have to sit and talk with them; they just need to see that they do exist and that there are a lot of them. There is that opportunity. It is another field that is open for them; I think a lot more Black males would start to move into those fields, seeing that it's not close to them because of race.

Why is there a Black Male STEM Gap? IMSA faculty/staff (n$_s$=27, n$_r$=34)

Lack of STEM vision
Lack of STEM parent support
Lack of quality STEM education *

14 41% 15 44% 5 15%

* includes "Unaware of future

Figure 5. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "Why is there a black male STEM gap?" Sample sizes for number of subjects responding to the question are represented as **n$_s$**, while the actual number of reponses given is represented as **n$_r$**. Since subjects can respond more than once to the question, the values for **n$_s$** and **n$_r$** are often not equal.

How to address the Black male STEM gap? IMSA faculty/staff (n$_s$=16, n$_r$=19)

Black Male STEM Mentors/Role Models
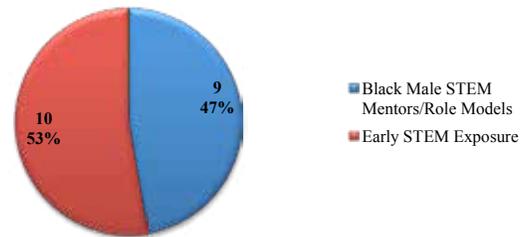Early STEM Exposure

9 47% 10 53%

Figure 6. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "How to address the Black Male STEM gap?" Sample sizes for number of subjects responding to the question are represented as **n$_s$**, while the actual number of reponses given is represented as **n$_r$**. Since subjects can respond more than once to the question, the values for **n$_s$** and **n$_r$** are often not equal.

IMSA Parents

The IMSA parents were asked their perspectives as to why there was a STEM gap in which Black males did not major in or enter careers as often as their White and Asian counterparts and how to minimize the gap. The themes that emerged for why there was a STEM gap included (a) lack of STEM vision for Blacks, (b) lack of STEM exposure, and (c) lack of parental support. This question yielded some powerful findings with 14 (67%) parents stating a lack of STEM vision and 11 (52%) stating lack of STEM exposure as reasons for the Black Male STEM gap. Regarding the lack of STEM vision, the IMSA parents discussed their perceptions that Black males do not see images of themselves as doctors and scientists in society and that STEM was not focused on in the Black community, as expressed below:

Even those children that are Black males who are exposed in the better schools are often stereotyped. "You'd make a great football player," "You'd make a great basketball player,"...that's kind of a White code if you will...stereotyping many of these children who may be great potentially in STEM subjects, but instead are often categorized...be like Michael Jordan or somebody in the football league and so on, rather than the sciences, mathematics; and they're not envisioned as that, nor are they communicated to in that way; and I think follows the child: "You are not really suited for a STEM area." Now they're not going to say this: "You are Black."

These parents perceived society as having either an image of an athlete or entertainer for Black males; whereas, others in society have negatively stigmatized Black males. One parent even discussed the juvenile system and how it has been designed to incarcerate Black males, as well as how STEM is a way out, as reported below:

Why is STEM so important in keeping our kids, especially our young Black kids from being incarcerated, because this incarceration rate in this country and what they are doing now—when I was in school, certain things you go to the disciplinarian board and you might get a suspension, but for what these kids are doing, they're making what we used to do for them criminal acts and they're being incarcerated for it and getting records and felonies for it and something has to be done about that. But I believe in our capitalistic society because of greed we have created a new slavery and that's the penitentiary and so therefore greedy, wealthy people do not care about the education of Black and Brown and especially poor Black and Brown because prison, incarceration is a business, is a multi-billion dollar business, and they need someone as slaves, and we are the slaves, so we have to find ways to keep our kids out of slavery, our young men out of slavery and STEM is a way of doing that.

Another parent discussed the importance of STEM's application to the lives of Black males and the applicability to African culture, as stated below:

And again just when you're engaging in life, doing things that interests you and makes you want to question, "How does this work?" you have to make it a value, . . . to know things, an environment, it's cool to know things, and it's cool to know how the universe works. One thing I personally study is like how in Africa, how a lot of the games they play, like the Mandala game, it's an African board game that teaches high math, but it's a playing game, games like chess; so things like that, but a lot of African societies are built in fractals. We have a culture where math and science are sort of a part of how we live that's not recognized. If you can teach, in this country—we've had the legacy of slavery—but if you could teach our children, our African children that they have culture that did celebrate math and science and solved problems in engineering, I think they would have more of a feeling that we could do it too. It's not just something for White Boys, you know. I would throw in some African culture, even like French braids are a fractal pattern, and that's

something people can relate to; they've grown up with people that have had cornrows, but to know that's a mathematical principle that we're doing when we make the cornrows, I think it gives them an appreciation that this is something that is part of their heritage too and it's cool and it's a part of life; and its natural to want to know about your environment and want to contribute to building things, making things, knowing how things work through science and technology.

Lack of STEM exposure, especially early exposure, was suggested as another reason for the Black male STEM gap. Parents perceived that White and Asian students had access to quality education; whereas, Black male students were not exposed to STEM as much and for those that received exposure, it was substandard, as evident in their statements below:

I definitely can agree that there is a gap. Why does it exist? Well I think that it's obvious that it exists because our schools tend to be, even though we are not segregated, we really are financially segregated, so you end up in the same social economic class in areas where for whatever reason STEM isn't pushing these schools they don't have the funding for it. Maybe they don't have the teachers that are capable of communicating to the kids. They don't have passion in administrators that understand how important these fields are. I always say the most important learning is from birth to about 6 or 7. So if you're not getting it, then boy are you behind the eight ball. It is hard to turn them around; it can happen and the children are brilliant enough for it to happen, but my goodness are they behind the eight ball if it's not happening that early. . . . If knowing is nurturing them from that young age in these fields, then it's hard for them to have a passion for it later in life because they're already behind. You know once you get behind in math or science, boy you're in trouble because it all builds. By the time they are in the eighth grade, man, you're lost already. Before you get to major selection in college, boy you are out of there, you might not even get through the SAT.

An additional six (29%) parents discussed a lack of parental support in STEM as the reason for a Black male STEM gap. They believed that Black male parents did not have the knowledge or monetary resources to lead their students down a STEM path, as indicated in their comments below:

Well, I think it starts at home, recognizing your child's capabilities and then doing the work required to give opportunities. . . . It really takes work, a lot of time vested by myself and his mom early on and enrichment programs. You have to talk to the schools and administrators. I think enrichment programs are critical to engaging the African American student; are critical for a couple of reasons: outreach makes it easier to get to parents; they may not even be thinking about rigorous programs. The school system and early child development is critical, 5, 6, 7, 8 years old. Think about Serena and Venus Williams; they didn't wake up at 19 years old and decided they want to be tennis players, their parents had them working at a very young age towards that goal and guided them to get on the ball, no pun intended. . . . It needs to be part of the community. Nothing comes without hard work; they need a support system that is put in place at an early age, the parents have to do something, the child has to do something, the teachers have to do something.

To address the STEM gap and motivate Black male students to engage in STEM, the IMSA parents suggested the importance of STEM exposure and having Black male mentors/role models, as well as the need for a government intervention. Thirteen (62%) parents discussed Black males being exposed to STEM early, utilizing unique teaching and learning approaches as a means to minimize the STEM gap as suggested below:

Again, I think it starts very early on; like right now, for instance, where I work we are trying to get more African Americans dentists so we are starting early on in elementary school encouraging kids to seek out careers in dentistry . . . I think it starts when they are young, like 2 or 3, exposing them as much as possible to careers in that profession. I think also too, specifically with early education in math and English from the teaching perspective, one, you don't see that many African American male elementary school teachers kind of spending the time with African American boys; and, two, traditionally in a teaching setting it is a visual, auditory experience; you sit down, you listen to the teacher, you write your notes. Traditionally boys, especially African American boys, need that connect experience so any type of laboratory programs or something where they can move and actually engage in the materials is best; and if they're not able to do that early on, they disengage from the educational process. Just being an African American male and trying to do anything positive is such a slippery slope because of the images you see, the lack of exposure to mathematicians and scientists and folks of color that show you can do both, you can do athletics, you can do academics.

Having role models/mentors as part of that STEM exposure was suggested by 10 (48%) parents, as expressed below:

There aren't many mathematicians reaching out to the schools, talking about what wonderful jobs they have, and all of the different wonderful opportunities with math and science. . . . They don't know that there's financial and emotional satisfaction in these fields, because they don't know anyone who's in them to that extent. . . . If there is a way to identify males within the African American population that actually likes math and I think it starts with Do you like math? Do you like science? There's a good chance that they're good at it and at that point, expose those kids to all the different opportunities that exist. . . . I think that there is . . . the opportunity to contribute to society for individuals who are in the maths and sciences, . . . essentially people are coming up with different techniques in order to improve our quality of life and our way of living. . . . Do you have enough people who look like and can represent the Black male so that it feels attainable. . . . So what we need is African American men that can identify with young boys at an early age and say, hey, look at this great opportunity and how wonderful can this be and math can actually be turned into some career that's exciting and rewarding . . . I think it starts there.

One parent discussed minimizing the Black male STEM gap beyond the individual and institutional levels; instead he believed the government should intervene, as stated below:

How do you stop that cycle, the vicious cycle? The child that was born on welfare is going to have a child and stay on welfare and it repeats itself so how do you break the cycle? ... You break the cycle by the government getting involved; we're going to go into this neighborhood and we're going to put the infrastructure in place where we raise these children up to break this cycle. And my theory is even if you're on welfare, and there's nothing wrong with being on welfare if you need it, but you then have to meet some other criteria. You have to make sure your child is at school, you have to participate; so you're not just

receiving the check to eat every day and live every day, you are working for that. You have to make sure your child gets to school every day, you have to participate, you have to make sure that child's homework is done; and whether or not you can help them because you can't have a parent who's uneducated having trouble reading, but you find that help and you make sure you get them to that help, and it's in the neighborhood; so that's how the government helps and breaks the cycle. At one point in the 60's there was a plan that they put out and it did—the government reached a hand, but the hand was only for the White. There's a great deal of prejudice on Blacks and Latinos not just by Whites, but by other minorities so everyone's at each other's throat.

Why is there a Black Male STEM Gap?
IMSA parents of black males (n_s=21, n_r=31)

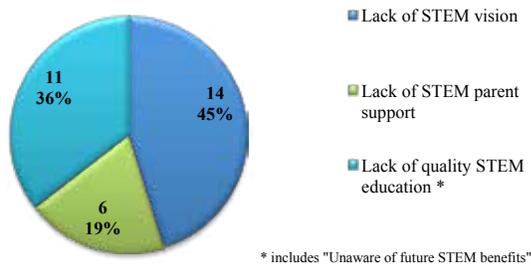* includes "Unaware of future STEM benefits"

Figure 7. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "Why is there a black male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

How to address the Black male STEM gap?
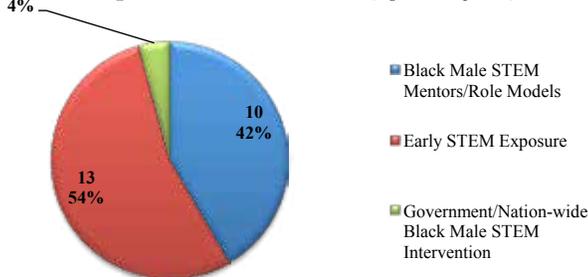**IMSA parents of Black males (n_s=21, n_r=24)**

Figure 8. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "How to address the Black Male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

Conclusions

The study participants were asked why there was a Black male STEM gap in which Black males did not enter STEM majors/careers, as suggested by the literature. The trends that emerged consistent with the literature were that the Black

male STEM gap was a result of a lack of a STEM vision and a lack of STEM parental support. A new concept contributing to the literature is that a negative stigma/misperception of Black males inhibits them from being engaged in STEM education, leading to the Black male STEM gap.

All Perspectives: Why a Black Male STEM Gap Exists? (n_s=88, n_r=114)

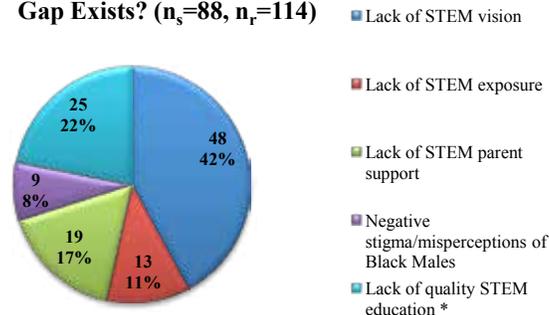* includes "Unaware of future STEM benefits"

Figure 9. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "Why is there a black male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

In terms of how to motivate Black males to engage in STEM, the trends that emerged consistent with the literature are early STEM exposure and Black male mentors/role models. The major contribution to the literature is that there needs to be a governmental intervention in which Black males understand the economics of entering a STEM career and parents are educated on how to provide STEM support along with early STEM exposure and Black male mentorship components.

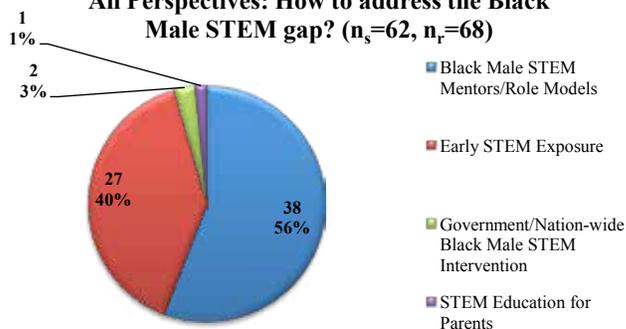**All Perspectives: How to address the Black Male STEM gap? (n_s=62, n_r=68)**

Figure 10. Pie charts displaying the relative frequencies of response catgories for different student and adult groups to the question, "How to address the Black Male STEM gap?" Sample sizes for number of subjects responding to the question are represented as n_s, while the actual number of reponses given is represented as n_r. Since subjects can respond more than once to the question, the values for n_s and n_r are often not equal.

Implications for Educators

Based on the findings of this study that examined the reasons that a STEM gap exists among Black males and how to minimize it, a 5-step model was developed for educators on addressing the Black male STEM gap leading to STEM careers:

1. Early STEM Exposure

The earlier Black males are exposed to STEM learning experiences and are supported throughout their primary academic years, the more they will develop the necessary skills and eventually nurture their passion for STEM. In doing so, they will instill a future vision for themselves that involves STEM by raising the awareness of it.

2. The Illinois Mathematics and Science Academy as a Model

There are components about IMSA's approach to teaching and learning that are essential to STEM motivation for Black male students. For one, the participants should not only be culturally but also intellectually diverse, allowing the students to learn from each other due to a variety of perspectives while in a collaborative group. The curriculum should immerse the students in STEM, introducing them to all areas of STEM. In addition, the teaching and learning should be exploratory in nature in order to mold the students into inquiry-based thinkers. The activities should include realistic problem-solving elements that promote participant collaboration and support. The students should work with Black male mentors engaged in STEM that help and encourage them to solve problems and advance humanity, further enhancing the STEM vision.

3. Historical and Current News/Issues Discussion

In addition to using the STEM immersion technique during these learning experiences, the curriculum should also include historical and current Black news and issues. This helps Black male students to understand societal perspectives and nurtures their obligation to their community and the world.   Also, this racial identity conflict Black males have need to be discussed and addressed in order to improve understanding that it is okay to demonstrate intelligence. The state of awareness of themselves and those around them will grow which could encourage them to develop as students. Recognizing this could increase their ability to understand themselves: who they are as a student, how they think and learn, and then discovering what is important to them. This process not only builds self-confidence but promotes resilience.

4. Personalized Assessment and Evaluation

Black male students should be regularly assessed to understand their strengths and weaknesses; then personalized evaluations should be created to emphasize their strengths and address their weaknesses. This demonstrates to them the importance of collaboration by showing how a diversity of strengths and weaknesses can assist in solving problems. In terms of competition, showing success in certain areas will ultimately help build self-confidence and enhance the students' awareness of areas that need improvement. This

enhances their determination to do better among the Black male students. Furthermore, it establishes a support system for the student with the teacher who will intimately know what each specific student needs to progress.

5. Leadership Opportunities

The STEM areas in which the Black male students have demonstrated strength need to be complemented with an activity he can lead that has a problem-solving component to it. Then the student should be provided with leadership opportunities, outside of STEM, and encouraged to be versatile. This will inspire them to develop leadership skills needed to be successful STEM leaders in a global world.

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