

**AN EXPLORATION OF THE FACTORS THAT MOTIVATE GIFTED
AND TALENTED BLACK MALES TO ENGAGE IN SCIENCE,
TECHNOLOGY, ENGINEERING AND MATHEMATICS
IN A GIFTED, RESIDENTIAL COMMUNITY**

A Doctoral Dissertation Research

Submitted to the
Faculty of Argosy University, Online
College of Education

In Partial Fulfillment of
the Requirements for the Degree of

Doctor of Education

by

Adrienne L. Coleman

May, 2014

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Department: College of Education

ABSTRACT

This study was an exploration of the factors that motivated gifted and talented Black males to engage in science, technology, engineering and mathematics (STEM). The specific problem addressed was the lack of motivation among Black males to become gifted and talented learners engaged in STEM. Thus, the purpose of this study was to examine the factors that motivate gifted and talented Black males to engage in STEM at the Illinois Mathematics and Science Academy (IMSA), a residential academy for gifted/talented students. Qualitative methodology was used to interview focus groups of 20 gifted and talented Black males who currently attended IMSA as well as interviews with 25 gifted and talented Black male IMSA alumni, 21 parents of IMSA Black male students/alumni, and 27 IMSA faculty/staff. Utilizing triangulation analysis, patterns and trends of factors emerged that motivate gifted and talented Black males from the perspectives of the students themselves, faculty, staff, alumni, parents, along with literature on motivation. The trends that developed as a result of this triangulated analysis were IMSA, obligation to Black community, success, learning, being good at STEM, STEM passion, competition, STEM exposure, and self-motivation. The factors that motivate gifted and talented Black males that were new and contributed to the literature on Black male STEM motivation were the ability to solve problems, to advance humanity, being challenged, and be actively involved in leadership. Future studies should specifically question why a Black male STEM gap exists and how to engage more Black males in STEM.

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DEDICATION

To my parents, Robert and Helen Coleman

and my brother Jason Coleman.

Thank you for believing in me and making sure
I had all the tools and experiences in life to ensure
my success and development.

I love you!

CHAPTER ONE: THE PROBLEM

Introduction

Evidence states that the vast majority of Black male students are academically underachieving, typically are not exposed to gifted classrooms, and have limited exposure to Science, Technology, Engineering, and Mathematics (STEM) experiences, “an interdisciplinary or trans-disciplinary approach to learning where rigorous academic concepts are coupled with real-world problem-based and performance-based lessons” (CA Department of Education, 2013, para.1; Dixon, Griddine & Tucker, 2010; Rowley & Bowman, 2009; B. L. Wright, 2009). The outcome is a STEM achievement gap in which the Black male is rarely involved in STEM education and STEM careers (C. G. Wright, 2011). This is possibly a result of societal challenges that have led to an array of negative consequences and misunderstanding of the Black male student (Nasir & Shah, 2011; Parson & Kritsonis, 2006). This study on gifted and talented Black males engaged in STEM is important to motivate Black males to engage in STEM education and pursue STEM careers.

The motivation of the gifted and talented Black male who contributes to STEM engagement has rarely been studied in a positive light (Dixon et al., 2010; McGee & Martin, 2011a). Thus, this study examines why certain Black males have the motivation to become gifted and talented learners, and how that motivation is defined and manifested in the Black male as well as why the Black male decides to pursue STEM.

Statement of the Problem

Academic underachievement in the Black male student is becoming an epidemic that needs specific and immediate attention (Gonzalez, Cauee, Friedman, & Mason,

1996; Schott Foundation, 2012). The problem of underachievement impacts Black males more than any other subculture of the population: “African American males are underperforming at alarming rates across the K-12 educational pipeline, as well as in their college attendance and completion rates” (Rowley & Bowman, 2009, p. 305). They earn lower grades, attain less education, and are typically tracked in lower level courses (Gonzalez et al., 1996; Mandara, 2006). This underachievement is a direct reflection of inadequate schools and ineffective teachers (Mandara, 2006). Also, because of perceived and experienced inequality in the United States, many Black males have a negative attitude towards education and “devalue the benefits of academic achievement” (Caldwell & Obasi, 2010, para.1).

The American educational system views Black males as challenging and typically does not provide them with exposure to gifted programs, which inhibits Black male student-centered learning and denies access to educational resources needed for Black male academic achievement (Dixon et al., 2010; Schott, 2012). Some administrators “hold the belief that Black male students will end up in prison, therefore Black male students who are interested in their education may not receive as much support within the school system compared to other students” (Dixon et al., 2010, p. 136). Thus, the attitude that Black males have towards education becomes warped and their motivation to become gifted and talented learners becomes diminished (Jones, 2009).

More specifically, related to STEM academic areas, Black males seem to be deficient and invisible (C. G. Wright, 2011). STEM achievement and the educational interest level of Black males are significantly lower than those of White and Asian students (Thompson & Lewis, 2005). In addition, the Black male is absent from STEM

majors and occupations (Riegle-Crumb, Moore, & Ramos-Wada, 2010). In order to gain a deeper understanding of gifted and talented Black male students who are engaged in STEM, in order to understand their motivation to achieve, and in order to design a framework that motivates engagement in STEM and enhances Black male talent and giftedness, the absence of Black involvement in STEM needs to be addressed. The specific problem that is addressed is the lack of motivation among Black males to become gifted and talented learners engaged in STEM.

Problem Background

Academic underachievement is rampant in the Black community, specifically with Black males having high drop-out rates, poor achievement, and low test scores (Whiting, 2006). This underachievement is verified in the following statistics: 41% of Black males graduate from high school, 69% of Black males have a fourth-grade reading level, and only 16% of Black males hold a bachelor's degree (Graham & Anderson, 2008; Quality Education for Minority Networks [QEMN], 2010; Schott, 2012). In addition, Black males typically have demonstrated inferior scores in standardized tests as evident in the 2008 SAT in which "the average black score on the combined mathematics and verbal portions of the SAT were 856. . . . The mean score for whites was 1065, more than 17 percent higher" ("The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years," 2008, p. 74). This is further evident in the 2008 ACT in which the average score for Black students was 16.8; whereas, the average White student score was 23.3 (Black Star Project, 2009). The problem of underachievement has been attributed to numerous factors, including, but not limited to, non-supportive family, inadequate educational resources, racism, low academic

expectations, and peer pressure (Mandara, 2006; Moore, Ford, & Milner, 2005b). This standardized test, racially based, achievement gap is problematic and suggests there are inequalities in the educational system that hinders the academic development of the gifted and talented Black male student.

The Black male students are not being challenged, which is having additional detrimental effects on their academic achievement and academic motivation. Many times, they are mistakenly placed in special education classes rather than in gifted and talented classes (Bonner, Jennings, Marbley & Brown, 2008; “The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years,” 2008). Even for Black males that are placed in gifted classrooms, they are achieving below their gifted counterparts as a result of negative peer pressure, racial isolation, and racial identity conflict (Moore et al., 2005a). Not only that, the gifted Black male student has to maintain several identities, including Black, male, and gifted, causing distress in their lives and ultimately impacting their academic achievement negatively (Moore et al., 2005b). Socioeconomic status also contributes to the gifted education gap. The gifted and talented students from urban communities are academically behind their more economically advantaged counterparts, with only 19 percent of lower-income students attending the nation’s most selective colleges, compared with 29 percent of higher-income students and 24 percent of lower-income students attending community colleges, while only 16 percent of higher income students do” (Wyner, Bridgeland, & DiIulio, 2006, p. 23). Although this gifted education gap exists, studies indicate that Black males are academically motivated, want to academically achieve and can become gifted and talented learners (Stinson, 2008).

Regarding the STEM achievement gap, it is highly evident in Black youth who tend to struggle in mathematics and standardized tests (Butty, 2001; “The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years,” 2008). Examining the 2008 Illinois Standards Achievement Test, it was found that only 61% of Black students in the eighth grade were meeting or exceeding mathematics standards, compared to 88.9% of White students (Black Star Project, 2010). By grade 12, this gap widened with only 20.6% of Black students meeting and/or exceeding mathematics standards, in relation to 64% of White students (Black Star Project, 2010). 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).

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. 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 15% 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). 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 achievement gap needs to be examined in order to engage more Black males in STEM education for gifted and talented learners.

A case study was done on a Black male who sought to have advanced mathematics courses added to his course of study in order to be prepared to pursue his dream of being a pilot, realizing "to be competitive and to enter a competitive college he would need the additional preparation offered by advanced mathematics courses" (Thompson & Lewis, 2005, p. 11). His goal of being a pilot connects motivation to academic achievement suggesting that motivation plays a factor in the pursuance of STEM. Other studies (Griffin, 2006; Kaplan & Maehr, 1999) also demonstrate positive motivators that have led to academic achievement in Black male students including personal drive, parental expectations, positive racially motivated stereotypes from teachers, being challenged academically, and positive environmental/social interactions. A study of four Black males who succeeded in mathematics and science was conducted to better understand why they were high achievers. The study concluded that the following factors led to their high mathematics achievement:

God, internal force of self-motivation, observing/known family members who benefited from formal education by achieving financial and societal success, encouraging family members and community, caring and committed teachers who established high academic expectations, associating with high-achieving peer-group members who had similar goals and interests. (Stinson, 2008, p. 988)

In an effort to provide an equitable, competitive, and quality education, there must be a

focus on minimizing the current racially based gifted and STEM achievement gaps by studying the factors that motivate gifted and talented Black males that engage in STEM.

Purpose of the Study

The proposed study examines the factors that motivate gifted and talented Black male students to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy (IMSA), a residential academy for gifted/talented students.

In order to continue bridging the gifted and talented Black male STEM engagement and career gaps, the racially based STEM achievement gap needs to be understood and studied further: “There must be a re-examination of the scientific community environment . . . more African American males, diversity and thought about the aging scientific community” (Baptiste & Boyer, 2000, p. 60). Black male gifted and talented students indicate that the following habits contribute to their success: strong sense of self, sustained motivation for achievement, a determination to succeed, aspiration to access higher education, and significant relationships (Parson & Kritsonis, 2006). Thus, the proposed study informs the design of a motivation-based academic achievement curriculum to encourage gifted and talented Black males to engage in STEM.

Research Question

The following research question guides this study: *What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?*

Limitations and Delimitations

Due to the geographic location of the researcher, there was more access to the target population in the Midwest. Participation from Black males in the South, West Coast, and East Coast is dependent upon utilizing professional connections to access the target population. Thus, there is an overrepresentation of participants from the Midwest, which will decrease the value of this study to schools from other geographic locations. Only Black males who have attended a STEM gifted, residential academy were studied. Since the researcher has professional connections to such academies, the research will not consider Black males who are gifted and talented in STEM in non-residential communities. The residential community may be a unique motivating factor for Black male STEM engagement but this study will be unable to yield that information.

There are delimitations that may inhibit generalizability, but not invalidate the proposed study. The researcher is choosing to utilize only Black males, which makes the study inapplicable to other students who may have similar experiences of underachievement and limited STEM engagement. Also, the proposed study only includes students that have achieved in STEM, eliminating additional Black males who are gifted and talented in other academic areas. Thus, this information is significant only in understanding the motivation of gifted and talented Black males from the Midwest engaged in STEM.

Definitions

This section contains terms to provide clarity and better understanding of their use in the study.

Academic motivation: Motivation is concerned with students' beliefs about their competence and the quality of task engagement, as well as the goals or reasons for learning and the duration, intensity and direction of academic behaviors... motivation is considered a prerequisite for or an enabler of academic success (Freeman, Alston, & Winborne, 2008, p. 228).

Achievement Motivation: "A learned motive . . . a drive whereby behavior should involve competition with a standard of excellence . . . and if successful produce a positive effect or if unsuccessful a negative effect" (Castenell, 1983, p. 503).

Black or African American: These terms refer to a person having origins in any of the Black racial groups of Africa. Because the U.S. Census groups the terms *Black* and *African American* and the literature has utilized both, the terms *Black* and *African American* are utilized interchangeably throughout this proposed study (U.S Census Bureau, 2013, para. 2).

Engineering: Engineering means "a body of knowledge about the design and creation of products and a process for solving problems utilizing concepts in science and mathematics and technological tools" (CA Department of Education, 2013, para. 3).

Extrinsic motivation: "Behaviors carried out to attain contingent outcomes" (Areepattamannil, Freeman, & Klinger, 2010, p. 234).

Gifted and talented: Those who demonstrate outstanding levels of aptitude (defined as an exceptional ability to reason and learn) or competence (documented performance or achievement in top 10% or rarer) in one or more domains; . . . the development of ability or talent is a lifelong process; . . . it can be evident in young children as exceptional performance on tests and/or other measures of ability or as a rapid

rate of learning, compared to other students of the same age, or in actual achievement in a domain . . . as individuals mature through childhood to adolescence, however, achievement and high levels of motivation in the domain become the primary characteristics of their giftedness (National Association for Gifted Children [NAGC], 2013, para. 4).

Intrinsic motivation: “Behaviors performed out of interest and enjoyment” (Areepattamannil, Freeman, & Klinger, 2010, p. 234).

Mathematics: Mathematics is “the study of patterns and relationships among quantities, numbers, and shapes” (CA Department of Education, 2013, para. 3).

Motivation: “The level of effort an individual is willing to expend towards the achievement of a certain goal” (Pew, 2007, p. 14).

Science, Technology, Engineering and Mathematics (STEM): A sequence of courses, activities involving science, technology, engineering, and mathematics,” an interdisciplinary or trans-disciplinary approach to learning where rigorous academic concepts are coupled with real-world problem-based and performance-based lessons” (CA Department of Education, 2013, para. 1).

Science : Science is “the study of the natural world including the laws of nature associated with the physics, chemistry, and biology and the treatment or application of facts, principles, concepts, or conventions associated with these disciplines” (CA Department of Education, 2013, para. 3).

Technology: Technology “comprises the entire system of people and organizations, knowledge, processes and devices that go into creating and operating

technological artifacts as well as the artifacts themselves” (CA Department of Education, 2013, para. 3).

Significance of the Study

This study serves as a foundation to minimize the achievement gap by developing a framework that motivates gifted and talented Black males to be engaged in STEM. This study also contributes to positive literature on gifted and talented Black males and may help to inform STEM curriculum (Dixon et al., 2010; McGee, & Martin, 2011a).

The genuine Black male voice tends to be absent from research; “it is important that we listen to what they are telling us about who they are, what they think, and what they hope to achieve” (Rowley & Bowman, 2008, p. 323). Thus, this study serves as the authentic voice of the gifted and talented Black males regarding their motivation to engage in STEM. With an understanding of gifted and talented Black males’ motivation, the standardized test averages of Black males may increase, high school drop-out rates may decrease, matriculation to higher education may improve, and STEM engagement may be enhanced.

This study is also beneficial to the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology (NCSSSMST, 2012-2013) and their plight to diversify their schools (para. 1). More specifically, an affiliate school, Illinois Mathematics and Science Academy, will utilize this information to inform motivation enhancement activities and a motivational curriculum to be utilized during the PROMISE (providing opportunities of mathematics and science enrichment) pre-enrichment programs designed to “serve underrepresented and economically disadvantaged students who have talent and interest in mathematics and science” (Illinois

Mathematics and Science Academy [IMSA], n.d., para.1). “Research into the motivation of gifted minority students is so scant that there remain many untapped avenues of investigation as we attempt to develop a more complete understanding of the interaction between giftedness, race and ethnicity” (Rodgers, 2008, p. 118). Because IMSA believes that “diverse perspectives bring deeper understanding and create/develop a culturally rich and inclusive environment that affirms and celebrates differences,” this proposed study may lead to enhanced motivation in gifted and talented Black males to engage in STEM, which may assist IMSA as well as other NCSSSMST affiliate schools in their goal of diversity (IMSA, n.d., para. 2).

CHAPTER TWO: LITERATURE REVIEW

The literature has a significant deficiency related to the academic achievement of Black males when compared to other subcultures. Several studies (Kaplan & Maehr, 1999; Lee & Bowen, 2009; Robinson & Biran, 2006) confirmed that Blacks have lower grades, are less successful on standardized tests, drop out more often, and graduate at lower rates than their Caucasian counterparts. Very few studies of positive educational experiences or academic achievement have been published; most of the studies have focused on the lack of academic achievement and related issues. “There has been little attention paid to how to raise expectations and performance” (Parson & Kritsonis, 2006, p. 3). In addition, research is lacking as it relates to Black males who are gifted and talented learners. The literature suggests there is an academic achievement gap, although smaller, that exists between Black gifted and talented learners and other subcultures (Dixon, Griddine & Tucker, 2010).

The literature has also shown that Black males are earning less than other subcultures. An indirect influence is that the target population is not pursuing an education in science, technology, engineering, and mathematics (STEM), 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). Within the literature, programs are not listed or not available that has proven to be successful in educating or developing gifted and talented Black males, especially in STEM.

A reoccurring theme in the literature as to Black students has been the need of “motivation” within those who have both achieved and struggled

academically. Although there is documented evidence that access to enrichment opportunities and motivation, along with parental support, students will achieve academically; however, 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 gifted and talented Black male STEM achievement, the concept of motivation will be examined along with programs that focus on motivation to enhance achievement. Thus, this literature review will take an in-depth and an historical exploration into the academic lives and achievements of gifted Black males engaged in STEM, research why there are STEM gaps related to Black males, and describe the motivation that leads Black males to academically achieve within gifted/talented programs engaged in STEM.

Perspectives of the Black Male

The story of the Black male seems to have both good and bad attributes; in a sense the literature depicts or conjectures why there are multiple contradictions and complexities of attempting to understand him. In one regard, the Black male is a professional, intelligent, nurturing human being who is a positive, valued member of society; on the other hand, the Black male is a violent, lazy, dysfunctional being who does not value much in society (Blake & Darling, 1994; Shea, 1995; Strayhorn, 2010; Wilson, 2002). Upon thorough examination of the literature, there seems to be highly documented evidence of the negativity that exists within this population, with few accounts of the Black male in a positive light. This section explores the literature that discusses societal perspectives of Black males from these opposing spectrums.

Positive Portrayals of Black Males

One researcher asked, “What is a Black man?” to which this response by Bake and Darling (1994) describes him as “a husband and father, son and brother, lover and boyfriend, uncle and grandfather, construction worker and sharecropper, minister and ghetto hustler, doctor and mineworker, and auto mechanic and presidential candidate” (402). From this perspective, the Black man is family-oriented, has a solid work ethic, and has a vision and goals. He is a valued member of society who holds an important role in the lives of others. Not only that, he is educated and professional.

The 1995 Million Man March prompted the attendance of thousands of Black male college students who wanted to let their leadership be known, who wanted to demonstrate unity, and who wanted their voices be heard. These Black men believed it was their responsibility to ensure that the next generation had the resources they needed to be successful; thus, this march signified hope, determination, and success (Shea, 1995).

Looking beyond professional journals and research-based articles, the online forum described or promoted a positive Black male who defies stereotypes. The Black Man Can (2013) describes the Black male as a unique and voluntary contributor to society. There are hundreds of current personalized accounts focusing on positive actions and behaviors that include being the first Black poet Laureate in Kentucky, being a Black male teen Jeopardy winner, becoming a Black councilman at age 22, starting IamBloom.com to help Black male youth on probation to further their education and find jobs, a lawyer giving up his home to a homeless family, and an athlete giving seventy-nine \$10,000 scholarships away (The Black Man Can, 2013). These accounts show

Black males from many facets of society providing meaningful services and resources to those in need and assurance to those working hard at being successful.

Despite these stories of positive contributions to society and helping others improve, there are some that are skeptical of the Black male. An incident happened at Vanderbilt University in which a group of well dressed, newly hired Black male faculty were mistaken for the new football recruits by two White females. Being an athlete is not negative; however, a stereotypical image of a Black male was put forth. The Black men faculty responded, “Not all African-Americans are football players, drug dealers or entertainers . . . not many are professors either” (Wilson, 2002). Basically, the literature indicates that some Black males are positive, contribute in positive ways to society, and are educated; however, these specific depictions are not prevalent in professional literature.

Negative Portrayals of the Black Male

Although some literature has indicated that the Black male is an affirming and valued citizen, there is a bulk of literature that is in direct opposition. Black males have been perceived as the five D’s: dumb, deprived, dangerous, deviant, and disturbed, with narratives describing them as unintelligent, lazy, criminally inclined, and always in danger (Nasir & Shah, 2011; Parson & Kritsonis, 2006). Additional literature states that one in three Black men in their 20s are in prison; 44% of the prison population is made up of Black males, even though they represent only 6% of the population; and of the Black males born in 2010, 29% are expected to end up in prison (Harvey, 2004; Parson & Kritsonis, 2006; QEMN, 2010). This may be a result of violence and drugs that seem to

be rampant in the Black community (Blake & Darling, 1994; Harvey, 2004; QEMN, 2010).

In the United States, it is virtually impossible for one to escape hearing about the “plight” of the African American male, a plight which includes unemployment, underemployment, education deficits, and higher rates of drug/alcohol abuse. Delinquency, crime, and imprisonment coincides with media’s portrayal of being punks, trouble makers, dope addicts, gang-bangers, lazy, and hostile. Added to these plights are higher rates of health problems such as heart disease, hypertension, and diabetes (Stinson, 2006, p. 482). The research further discusses the Black male as dysfunctional, referring to him as an at-risk and endangered being (Bryant, 2000; Smith, 1997; Strayhorn, 2010).

Racism, socioeconomic disadvantages, and oppression seem to be at the root of issues that put Black males in this situation (Wyatt, 2009). Looking at this from a historical context, this perpetual state of racism that began with the African slave trade has led to these detrimental effects. During the slave trade, the Black male lost his African language, religion, and ultimately himself (Harvey, 2004). This system of racism continues to impact the Black male today with a negative impact on family structure, parenting, education, self-esteem, and income. Thirty-six percent Black children live in poverty, 35% live in households with insufficient food, 35% live in households of unemployment, 13% have a mother with less than a high school education, and more than 75% of children born between 1985 and 2000 grew up in disadvantaged neighborhoods (Bryant, 2000; ETS, 2011). A study conducted with 151 Black and Latino undergraduate students found that racism-related stress and institutional racism led to amotivation and academic underachievement (Reynolds, Sneva, & Beehler, 2010). These are examples of

cultural-ecological theory which “asserts that the American racially stratified system contributes to the academic underachievement of specific racial minorities in U.S schools” (Stinson, 2006, p. 490). The Black male continues to be a victim of almost 250 years of racism and 100 years of segregation, leading to a group that is deemed to be the most feared, least understood, and least likely to be educated (Smith, 1997).

Despite this, there is a belief that because the United States of America has its first Black male president, racism is no longer an issue (Donner & Brown, 2011). However, even those Black males who have overcome societal ills still experience racism. There was an incident with a Harvard University faculty member in which he was accused of breaking into his own home because he was a Black male in an affluent neighborhood. “Despite his prominent status and professional affiliation with Harvard the professor did not escape the prism of racism” (Donner & Brown, 2011, p. 1). Basically, the literature suggests that racism has caused society to have a negative perspective of the Black male, has led the Black male to the prison system, and has contributed to the economical deficiency of the Black male.

The Black Males’ Education

These contradictory perspectives of the Black male with both positive and negative attributes are also evident in their educational endeavors. Only minute facets of the literature state that Black males do care about their education; whereas, an overwhelming amount of literature suggests education ceases to matter to them as early as fourth grade (Harper & Davis, 2012; Schroeder, 1998). This section on Black males and education reviews two studies of Black males that valued education as well as various studies that suggest that Black males devalue the educational process.

A study analyzed the essays written by 300 Black male undergraduates applying for a graduation preparation program. Two themes that came across in the study were an awareness of educational inequalities and a belief in education as an equalizer (Harper & Davis, 2012). This is evident in the authentic voices of Black males:

I think that education is the great equalizer. I feel like if you can get more Black males educated and if you can get more minority people educated in general, then you uplift the whole society because education puts people on an equal playing field.

I'm trying to affect the next generation it has to be through education first and foremost [sic]. That is the best way to address many of these problems that are institutionalized, permanent and pervasive . . . it seems like the most logical way.

Education is the primary tool for emancipation and liberation for African Americans in the true fight for equality in this country.

The phrase that comes to mind is Black Liberation Pedagogy. . . . When you talk about the concept of liberation, what you are talking about is people having the agency and consciousness not to have freedom given to them, but they actually have the capability of liberating themselves. . . . When you are educated it opens up your consciousness to a lot of different and new possibilities and allows for Black people to liberate ourselves.

As an African American person who has been underprivileged, underrepresented, and who has witnessed the failures of an inadequate school system, I want to be one of the many examples that demonstrate that we as a people can overcome socioeconomic barriers and still choose education as a pathway. (Harper & Davis, 2012, pp. 113-115)

Another study refuted that Black students do not want to achieve; finding that “African American students maintain a high academic self-concept and expectations of future success” (Cokley, 2003), concluding, there are some Black males that view education as important and as an approach to future success.

Although there are documented occurrences that demonstrate that Black males value academics, the educational facts and figures about their level of attainment suggests otherwise. The Black male has been considered more at-risk academically in comparison

to their nonminority counterparts, and viewed as performing substandard in terms of grades, matriculation, and goal attainment (Greene, Mari, & McClenney, 2008). Black male students score lower than White students in reading, vocabulary, and mathematics (Robinson & Biran, 2006). This was evident in the 2008 Scholastic Achievement Test (SAT) exam in which White students scored 17% higher than Black students and in the 2008 Illinois Standards Achievement Test (ISAT) scores in which White students scored at least 20 points higher in reading and mathematics than Black students (Black Star Project, 2009; (“The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years,” 2008). The research further reveals that only 41% of Black males graduate from high school and those who graduate are not college ready (Graham & Anderson, 2008; Lesesne, 2012). As a result, only 32% of Blacks compared to 66% of Whites between the ages of 18 and 24 are enrolled in a degree-granting institution according to the U.S. Census (Greene et al., 2008). Given these educational statistics, it is evident that Black males are academically behind other subcultures of the population, suggesting the Black male and the educational system have not made the education of the Black male a priority (Kaplan & Maehr, 1999).

A Historical and Legal Perspective of Education and the Black Male

This section reviews the historical and legal implications that have influenced this educational disparity. *Plessy v. Ferguson* is the first legal case that had an impact on the Black Male and his education. In this ruling, the courts stated that segregation was legal and constitutional, leading to the creation of separate schools (*Plessy v. Ferguson*, 1896). In 1954, *Brown v. Board of Education* overturned this ruling, making the argument that segregated public schools are not equal and cannot be made equal, and the segregation of

White and colored children in public schools has a detrimental effect upon colored children (1954). It was concluded that for public education to be effective, “separate, but equal” could not exist (*Brown v. Board of Education*, 1954). As a result of this ruling, affirmative action, “a policy of taking positive steps to remedy past discrimination,” was instituted by educational organizations (*Regents of the University of California v. Bakke*, 1978).

Over time, practices of affirmative action were questioned and deemed unfair. In the cases of *Regents of the University of California v. Bakke* (1976) and *Grutter v. Bollinger* (1997), this notion of affirmative action was challenged. In both cases, highly qualified White students were denied admission into an educational program while less qualified minority students were admitted. This was an effort to level the educational playing field for students who came from disadvantaged backgrounds. The Supreme Courts held that race could be considered in educational admissions decisions, but stated, “We expect in 25 years from now, the use of racial preferences will no longer be necessary” (Bok, 2003).

Affirmative action programs have been in place since *Brown v. Board of Education* and although it has been over 50 years since this ruling, an educational achievement gap continues to persist between Black and White students (Rothstein, 2004). Even though this gap exists, affirmative action policies continue to be challenged. The current case of *Fisher v. University of Texas* (2009) challenged affirmative action policies that denied admission to a White student (among the top 10% of the state) who was not in the pool of students automatically enrolled. Instead the student was placed in a pool of students in which race was a factor of admissions, with the university

contending that without such practices, enrollment of minority students will decline and may prevent diversity in STEM fields (Lesesne, 2013). The state court held that the use of race was legal and the constitutionality of affirmative action was upheld. The case is currently awaiting trial in the United States Supreme Court.

From a historical perspective, the education of Black males has been unequal and inadequate for over a 100 years. As a result of “educational inequities and court-sanctioned discrimination that has institutionalized differential access to education, Black students in America have endured myriad hardships that have often challenged and impeded their academic achievement” (McGee & Martin, 2011b, p. 7). Although case law has positively evolved in relation to the educational endeavors of the Black population from “separate, but equal” to “attempting to level the playing field,” there is still an educational attainment gap that disproportionately impacts Black students.

The Black Male Academic Achievement Gap

As there is a significant amount of literature regarding the educational deficiencies of the Black male, this section delves deeper into those academic underachievements and societal factors associated with the academic achievement gap. 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 et al., 2005b). In terms of family, the absence of the father, from many Black households has a significant influence on underachievement in Black males (ETS, 2011; Kenny, Gallagher, Alvarez-Salvat, & Silsby, 2002; Kenny, Walsh-Blair, Blustein, Bempechat & Seltzer, 2010; Rowley & Bowman, 2009; Polite & Davis, 2002). Also, many Black parents do not offer guidance to their students, assist with homework, or demonstrate concern with their educational process, leading to persistent underachievement. When the Black male's academic endeavors are supported by the family and the student has a positive relationship with his parents, academic underachievement is not as persistent. "Parent involvement has been shown to be positively related to children's educational performance and may mediate the effects of poverty, parents' educational attainment and race on achievement" (Dixon, Griddine & Tucker, 2010; Kenny et al., 2002; Lee & Bowen, 2006; Maton, Hrabowski & Greif, 1998).

Another factor that has contributed to the academic achievement gap that negatively impacts Black males is underresourced and ineffective schools (Rothstein, 2004; ("The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years," 2008; Schott, 2010; Uwah, 2008). The schools tend to be in dilapidated buildings, staffed with unqualified teachers, utilize a poor curriculum, led by non-strategic administrators, suffer from overcrowded classrooms, and have inadequate funding ("The Racial Scoring Gap on The SAT College Admission Test is

Now Wider Than it Has Been in 20 Years,” 2008; Schott, 2010; Rothstein, 2004; Uwah, 2008). Public schools in many urban areas with majority Black populations are not adequately funded, poorly staffed, and underprepared to provide the same quality of education that is offered in predominately White suburban school districts (“The Racial Scoring Gap on The SAT College Admission Test is Now Wider Than it Has Been in 20 Years,” 2008). These conditions affiliated with ineffective schools have led to failure and academic underachievement in Black males (Schott, 2010). To combat these issues of failing schools and underachievement, students must be prepared; there needs to be a rigorous content, programs to address student and school needs, safer facilities, and more accountability in minimizing the achievement gap (Rothstein, 2004; Schott, 2010).

Racial identity conflict has also 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,

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

The Black Male Gifted and Talented Education Gap

This imbalance in regard to the multiple identities of Black males becomes more complex, thus impacting social interaction and student development when giftedness is added. 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). As a result, many Black males choose not to participate in programs designed for gifted and talented learners (Grantham, 2004). Black males view such programs as being overwhelmingly comprised of White students and thus do not want to be accused of “acting White” (Graham & Anderson, 2008; Grantham, 2004; Moore et al., 2005b; Whiting, 2006). A Black male student that was considered gifted and talented says nearly all the students in his honors classes were White, and he felt uncomfortable talking with his Black friends about his educational endeavors (Schmidt, 2008). This is a classic example of the Raceless Persona Theory, the conflict Black students face when they achieve academic success (Stinson, 2006).

Although there are Black males engaged in gifted and talented education programs, they are less likely to be identified as gifted and talented by teachers and administrators (Baker, 2004; Grantham, 2004). The educational system in New York City conducted a review of their gifted programs and found that the majority of them were not in Black populated areas, suggesting that Black students are either not gifted or there is an issue with the gifted selection process (Baker, 2013). This “underrepresentation of Black males in gifted education is one of the most unresolved issues in education” (Grantham, 2004, p. 7). Nationally, Black students are underrepresented in gifted programs by nearly 70%; four out of five Black graduates do not take advanced placement tests for which they are qualified (Grantham, 2004; Schott Foundation, 2010). Basically, Black males are not entering gifted and talented programs for the following reasons: a lack of teacher referral, poor test performance, negative peer

pressure, and racial and academic identity conflicts (Grantham, 2004; Moore et al., 2005a).

Some Black male students have been identified for, or made the decision to engage in, gifted education. A study was conducted on Black males' motivation to be gifted and talented learners and found that positive interactions with teachers and the academic environment led to their motivation. One Black male discussed his motivation to be a gifted and talented learner, stating he had positive peer influence by someone he had known since elementary school, he believed he could be successful, he had teacher support and encouragement, and he thought taking higher level classes was important to his success (Grantham, 2004). This student valued giftedness, overcame stereotypes, as well as managed his multiple identities as being Black, male, and gifted (Graham & Anderson, 2008; Grantham, 2004).

The major concern for Black males who do engage in gifted and talented education is that they are not doing as well academically as others (Moore et al., 2005a; Whiting, 2006). This is partially due to gifted and talented education programs focusing on the recruitment of Black males rather than their retention (Moore et al., 2005a). To ensure that Black males' engagement in gifted and talented programs persists, retention programs that encourage self-confidence, promote leadership, articulate long-term goals, and expect community service need to be implemented (Moore et al., 2005a). In addition, the intersection between race and giftedness must be nurtured to ensure that educators of gifted and talented Black males are culturally competent and utilize culturally relevant teaching and learning strategies that lead to the successful gifted and talented Black male (Moore et al., 2005b; Rodgers, 2008).

The Black Male STEM Education Gap

Not only has the Black male experienced academic achievement and gifted education gaps, he also has experienced a science, technology, engineering, and mathematics (STEM) education gap. This STEM gap is evident in high school classrooms, STEM majors, and STEM careers. According to national and international mathematics assessments, 50% of American Black high school students are scoring 39 points lower than White American students (Butty, 2001; Spencer, 2012; Stinson, 2006). Black students are academically four years behind their White counterparts and score below approximately 75% of White America in mathematics (Robinson & Biran, 2006). Also, Black students are less likely to take advanced courses in mathematics because 45% of them begin high school in a class lower than algebra; if you do not begin high school taking Algebra and Geometry, it is most likely you will not be able to enroll in advanced classes (Noble & Morton, 2012; Riegle-Crumb, 2006; Riegle-Crumb & Humphries, 2012; Sheppard, 2006). As a matter of fact, fewer than 10% of Black students complete the high school mathematics sequence, which includes algebra, geometry, trigonometry, and pre-calculus (McGee & Martin, 2011a). Researchers say achievement in mathematics and science in fifth through eighth grades determines high school course decisions and enrollment in advanced mathematics and science courses. These course selections further influence access to postsecondary and occupational STEM opportunities (Singh, Granville, & Diak, 2002). Other factors that have inhibited the Black student from advancing in STEM include lack of STEM exposure in K-12, lack of a STEM mentor, unqualified teachers, mathematics phobia, failure of students to see

the application of science to their lives, and watching too much television (Dumais, 2008; QEMN, 2010; Toldson & Brown, 2009).

However, there are some students who have been successful in STEM during high school despite adversities, attributing their success to parental involvement, teacher support, motivation to succeed in mathematics, and personal character traits such as ability to focus, desire to succeed, determination, curiosity/inquisitiveness, and belief in self (Berry, Thunder, & McClain, 2011; Sheppard, 2006). This is confirmed in two studies conducted on successful Black middle school students who identified several themes that led to their success in mathematics, including early educational experiences (prior to kindergarten), recognition of ability, belief in ability, support system, motivation to learn, positive identity and alternative identity (K. Jackson & Wilson, 2012; Jett, 2011). Another study looked at 16 successful mathematics high school students that chose to stay at an underperforming school because they trusted the school and believed this would prepare them for the real world (Sheppard, 2006). The students made the following comments:

The fact that I am considered a successful mathematics student has a lot to do with my math teacher, Mr. Greece, because math was my worst subject. There were times when I would want to give up, maybe it's just not for me, but he told me don't give up, it's not hard, you can do it. . . .

I have to give credit to my mathematics teacher because I believe that I am a success because of their teaching. . . .

My success also comes from me wanting to prove people wrong because when I get home I get called stupid. . . .

One of the keys to my success is that I am curious. Curiosity killed the cat, but in my case, curiosity made the cat genius. . . .

My parents have a big influence on me. My mom likes to brag to her friends and family about how well I'm doing. That inspires me to try harder. (Sheppard, 2006, p. 4)

These studies indicate that some Black students can become successful in STEM with an appropriate network of support and confidence in academic ability.

Although there is evidence of Black students who have been successful in STEM, many have an inadequate STEM foundation and are not prepared for and choose not to major in STEM during college (Williamson, 2010). The Quality Education for Minorities Network conducted an audit of approximately 11,000 Black male students who had obtained bachelor degrees in STEM from Historical Black Colleges and Universities (HBCU) in 2007, finding that only 410 Black male students received a degree in engineering, 125 received a degree in physical sciences, 3 received a degree in geoscience, and 736 received a degree in mathematics and computer science (QEMN, 2010). Even at HBCU's there are fewer students that major in STEM. However, those that do major in STEM say their families and the faculty are a pivotal motivating force (Williamson, 2010). One HBCU has a STEM Scholars Program that is strategic in ensuring that Black students are retained and graduate by incorporating a supportive family environment through living learning communities, hiring caring teachers, communicating high expectations, instituting academic rigor, and developing the students' professionalism (Kendricks & Arment, 2011). Other HBCUs have joined the Learning Communities for Science, Technology, Engineering, and Mathematics (LCSAA), developed to increase the representation of African Americans in STEM fields (Freeman, Akston, & Winborne, 2008).

For Black students at non-HBCUs majoring in STEM, there seems to be an array of challenges they confront during their pursuit of STEM. There was a study conducted of 23 Black mathematics and engineering college students who were victims of a

stereotype threat, “a type of confirmation bias in which the threat of being viewed through the lens of a negative stereotype leads to a suppression of academic performance” (McGee & Martin, 2011b, p. 2). The Black students were told statements, such as “You would never fit in,” “Make sure you get an Asian roommate,” “Yes, there is engineering, but you should pick a major that you are more likely to graduate in,” and “Really, wow, I didn’t think you would be able to answer a question like that, and no one helped you” (McGee & Martin, 2011b, p. 2). A case study conducted on a Black male with a Ph.D. in mathematics discussed how he utilized such stereotypical perspectives to his advantage:

Rob relishes telling the tale of how he manipulated the White students in the mathematics competitions by exploiting their perception that his being Black made him mathematically inferior: he transformed his competitors’ preconceived notions of Blacks and mathematics into a leg up for himself. . . . Rob performed “acting Black and dumb” by scratching his head, staring buckeyed and pretending to look at his White teammates for answers . . . he did not lose one single game. (McGee & Martin, 2011a, p. 54)

These studies demonstrate how students can overcome racism, classism, and other challenges to academically achieve and become successful in STEM.

Despite some Black students overcoming social injustices that inhibit their STEM engagement, there are few Black males that actually enter STEM fields. Less than 15% of the STEM workforce is multicultural and the Black male is noticeably absent (Baptiste & Boyer, 2000). The National Academy of Science has voiced their need for a larger STEM workforce to “maintain the economic supremacy of the United States and have articulated the need for individuals from all backgrounds” (Riegle-Crumb et al., 2010, p. 459). In response, the United States Innovation Committee on Science, Engineering and Public policy has charged the educational system with creating a more diverse pool

of people interested in STEM (CEW, 2008). Diversifying the field may indirectly impact the socioeconomic status of the Black population with opportunities to earn more money, have more consistent employment, and obtain leadership positions (Oakes, 1990; Vigdor, 2013).

History of Black Males Engaged in STEM

Even though there is a current cry to diversify STEM fields, there are numerous Black males who have contributed to and have been innovators in STEM fields. It would be a disservice to Black males who have engaged in STEM if a historical account of their attributes is not provided. Below is a historical timeline of gifted and talented Black male scientists, engineers, and mathematicians along with their contributions to STEM:

- Early 1700s *Thomas Fuller*, an American slave and a mathematical genius who could mentally multiply two 9-digit numbers.
- Late 1700s *Benjamin Bannekar*, a scientist and mathematician whose almanac has been praised for its accuracy; he constructed the first clock in this country.
- 1872 *Elijah McCoy*, an engineer who held over 48 patents in the field of automatic lubrication. He was a pioneer in the art of steadily supplying oil to machinery in intermittent drops from a cup, doing away with shutting down the machine to lubricate it.
- 1876 *Edward Alexander Bouchet*, a physicist who was the first African American to earn a doctorate from Yale University.
- 1893 *Dr. Daniel Hale Williams*, a scientist who performed the first successful open heart surgery.

- 1896 *Lewis Baxter Moore*, a mathematician and the first African American to earn a Ph.D. in mathematics from University of Pennsylvania.
- Early 1900s *George Washington Carver*, a scientist who advocated innovative agricultural methods and developed hundreds of applications for certain agricultural products, such as the peanut.
Charles Henry Turner, a scientist and the first researcher to prove that insects can hear.
- 1920s *Dudley Weldon Woodard*, a mathematician and the second in the nation to receive a Ph.D. in mathematics who was named one of the most gifted mathematicians in the nation.
- 1920'–1950s *Elbert Francis Cox*, a mathematician who received his Ph.D. from Cornell University and was head of Howard University's Mathematics Department for 32 years.
- 1930s *Percy L. Julian*, a scientist who brought comfort to sufferers of arthritis. He synthesized cortisone from soya beans at a fraction of the previous cost.
William Waldron Schieffelin Claytor, a mathematician who won the Harrison Scholarship, the most prestigious award offered at the University of Pennsylvania. His dissertation provided a significant advance in the theory of Peanno continua—a branch of point-set topology.
Ernest E. Just, a leading authority of marine biology who pointed

out the significance of cytoplasm in the cell. His research supported evidence of the importance of ectoplasm of the egg in the fertilization process.

- 1940s *Charles R. Drew*, a scientist who developed techniques for preserving blood and organized the first Red Cross blood banks in the United States and England. His organized bank saved millions during World War II.

Vivien Thomas, a scientist who had a partnership with a White surgeon, Dr. Alfred Blalock, and was a high school educated hospital janitor who developed a groundbreaking procedure in pediatric heart surgery that is used to correct blue baby syndrome.

J. Ernest Wilkins, a mathematician with a Ph.D. from the University of Chicago who became a professor of applied mathematics and physics at Howard University.

David Blackwell, a scientist with a Ph.D. from University of Illinois was the first African American elected to the National Academy of Science.

- 1960s *James West*, a scientist who developed the foil electret microphone, which became the industry standard.

Robert Coleman, a computer scientist who was the first African American programmer with People's Gas.

- 1970s–present *Clarence (Skip) Ellis*, a computer scientist who was the first

African American to hold a Ph.D. in computer science and helped to develop the icon-based GUI, the basis for Apple's Macintosh and Microsoft Windows' operating systems.

- 1980s *Mark Dean*, a computer scientist who helped to develop a one-giga-hertz computer processor chip and was instrumental in creation of the personal Computer (PC).

Philip Emeagwali, an engineer who won the Institute of Electronics and Electrical Engineers' Gordon Bell Prize. His calculations are currently being used to forecast the weather and predict future global warming.
- 1980s–present *Freeman Hrbowski*, a mathematician and scientist who is currently the President of University of Maryland, Baltimore, received a Ph.D. from University of Illinois in Higher Education Administration/Statistics and was selected as one of the 50 most important Blacks in research science by the National Science Foundation

Ben Carson, a scientist who was the first to perform a separation of craniopagus (Siamese) twins joined at the back of the head and currently is a professor of neurosurgery at the John Hopkins School of Medicine (Baptiste & Boyer, 2000; CSF, 2013; Cullotta, 2013; Imbornoni, 2013; U of Penn, 2013; Williams, 2008).

These Black male scientists and mathematicians have made valuable contributions to STEM fields despite adversities. Their accomplishments in STEM refute the perception

that the Black males' pursuance of STEM is atypical. This information may motivate some Black males to engage in STEM by demonstrating to them that Black males have been successful in STEM.

The Black Males' Motivation to Achieve Academically

A recurring theme in the literature on Black males that has positively influenced the academic achievement, gifted education, and STEM education achievement gaps is the concept of motivation. Studies have indicated that there is a relationship between motivation and academic success and that gifted and talented students tend to be more motivated than low-achieving students (Areepattamannil, Freeman, & Klinger, 2010; Hamilton, 1994; J. Jackson-Allen & Christenberry, 1994; Long, Monoi, Harper, Knoblauch, & Murphy, 2007; Silva, Dorso, Azhar, & Renk, 2007-2008; Singh et al., 2002). "Academic motivation can create confidence in one's ability, along with an increased value of education and desire to learn" (Young, Johnson, Hawthorne, & Pugh, 2011, p. 1). Specifically in Black males, intrinsic motivation leads to increased self-esteem, enhanced self-worth, and confidence in their academic abilities (B. L. Wright, 2009). This next section further explores motivation as it relates to the Black Males' educational endeavors.

The literature indicates that Black males' motivation to achieve academically stems from various internal and external factors that include a positive school environment, belief in self and social support (Byrd & Chavous, 2011; Caldwell & Obasi, 2010; Castenell, 1983; Long et al., 2007; Young et al., 2011). A study on 18 Black male eighth graders stated their motivation to achieve is enhanced when expectations are clearly defined and when there is personal autonomy in the selection of topics in class (Hudely,

1997). Another study of 687 Black college students from the Midwest and the South found that Black students do not lack academic motivation and that the educational environment plays a pivotal role in the level of motivation (Cokley, 2003). These studies suggest that motivation is a key factor in academic achievement and that a positive, supportive environment helps foster that motivation. This is an indicator of the self-determination theory as it applies to student motivation—the impact of internal, inherent interest, and external factors—doing something to achieve a desired outcome (Cokley, 2003; Griffin, 2006; Pew, 2007).

The self-determination theory is also applicable to motivation as it relates to the academic achievement of Black males who have been defined as gifted and talented. Two multi-case studies of gifted and talented Black male college students discussed intrinsic and extrinsic motivational factors that contributed to their academic success, including positive individual, career, social, and societal outcomes. One study of five gifted Black males communicated that having an influential mother, being recognized for their giftedness, support from teachers/mentors, integrated peer-group experience, and ignoring racism helped to shape a belief in self and internal motivation (Herbert, 2002). Another study with nine Black honors students developed a multidimensional framework to explain their academic motivation and includes:

- Self-motivation: personal drive, family influences (parents instill in them early on the desire to be academically successful and do their best and explore what life has to offer).
- Racial background: awareness of stereotypes about academic abilities of African Americans and a desire to challenge those misperceptions.

- Academic struggles: facilitate motivation and desire to succeed. (Griffin, 2006)

These studies further confirm that intrinsic and extrinsic motivation play an important role in academic achievement and are consistent with the components of the self-determination theory, competence, the desire to master, autonomy, the desire to be in control, and relatedness, the desire to belong (Pintrich, 2003).

This notion of motivation may also relate to the Black males' pursuit of STEM. The Mathematics and Science Partnership-Motivation Assessment Program states, "The role of motivation in STEM learning and performance is paramount . . . to stimulating and sustaining positive attitudes and interest in STEM" (Freeman et al., 2008). Students who have been involved in this program have reported a positive level of motivation in their core STEM courses, and their extrinsic motivation to achieve has been high (Freeman et al., 2008). Another study says intrinsic motivation plays a more significant role in STEM achievement (Areepattamannil et al., 2010). This study of approximately 14,000 high school students from 431 schools in Canada states that the number of STEM-related books at home, having interest in/enjoyment of STEM, internalizing motivational beliefs of positive self-efficacy and self-concept, and engaging in hands-on learning promote academic achievement in STEM. These studies examining students engaged in STEM may be applicable to demonstrating that motivation plays a critical role in the STEM engagement and achievement of gifted and talented Black males.

Minimizing the Black Male Academic Achievement and STEM Education Gaps

This literature review has yielded several education-related gaps that disproportionately impact Black males' academic achievement, gifted education and STEM education.

Researchers who endeavor to improve the African American male's success in education should commit at least a fraction of their intellectual efforts to studying those within the race who have earned good grades, avoided trouble and school suspension, assumed leadership positions, responded productively to racial stereotypes, resolved masculine identity conflicts, amassed social capital they previously lacked and negotiated same-race peer support for their school achievement. (B. L. Wright, 2011, p. 8)

These researchers should focus on the influence of families, schools, communities, social/economic policies and school preparedness in relation to Black males to address these educational gaps in Black males (Rothstein, 2004). This final section of the literature review examines ideas, practices, and organizations that have been deemed effective in minimizing Black male education gaps.

Parental involvement in Black students' academic lives is pertinent to their success (Gonzales, 1996; Greenman, Bodovski, & Reed, 2011; Mandara, 2006; Maton, Hrabowski, & Greif, 1998; Yan & Lin, 2005). Specifically to the Black male, parents who focus on self-development and racial pride seem to develop boys who are emotionally healthier and who perform academically higher (Mandara, 2006). For the Black males who achieve mathematically, not only are their parents involved, but they also have a high frequency of contacting the school about their students' performance and strict family rules (Yan & Lin, 2005). In general "academically successful African American males are raised in families characterized by extremely high levels of determined parental academic engagement, strictness, nurturance, and community

connectedness (church, influential teachers, academically motivated peers, and extracurricular activities)” (Maton et al., 1998, p. 10). Thus, the academic achievement gap can be minimized if parents are more involved in their students’ educational endeavors and provided a structured home environment.

The research also suggests that Black males need mentors, educators, and administrators that will support and nurture their academic endeavors (Dixon, Griddine, & Tucker, 2010; Garibaldi, 1992; Lattimore, 2005; Schott, 2012). These professional educators need to understand and meet the cultural, academic, social, and psychological needs of the Black male student so he has confidence in the educational system (Spradlin, Welsh, & Hinson, 2000). They need to use diverse strategies to support the educational endeavors of the Black male including implementing a rigorous curriculum, offering supplemental programs/services, providing cultural sensitivity trainers to teachers, and encouraging the community to offer outside-of-school educational opportunities (Olszewski-Kubilius & Clarenbach, 2012). For instance, the Polytechnic Institute of New York University has implemented a cooperative learning program that pairs teachers from economically disadvantaged schools in Brooklyn with doctoral students to design dynamic hands-on STEM curriculums (PINYU. 2013). This strategy is consistent with the findings of a study of two Black male high school juniors on their perspectives of the characteristics and instructional practices a teacher should possess to develop a successful Black male mathematics student. The Black male mathematics student needs teachers who are competent, patient, and relatable, and who have high expectations of their students’ academic success, value their knowledge, promote critical thinking, integrate active learning, and encourage providing support evidence for reasoning (Lattimore,

2005). With supportive teachers/mentors, experiential teaching strategies, cultural understanding of the Black male, the academic achievement gap of Black male students may be reduced.

Other literature discusses the need for more Black male teachers to play an instrumental role in improving the educational and social conditions of the Black male student (Brown, 2009; Garibaldi, 1992). The African American Male Academy promotes the concept in which Black male teachers would foster academic achievement and personal development by exhibiting African American leadership, fostering positive self-concepts, promoting African American volunteerism, and teaching young African American men responsibility, self-love, and appreciation of human existences from an African American male perspective (Midgett & Glenn, 1993). Some professional organizations have modeled this concept and implemented programs that focus on Black male academic achievement and student development. The Black Star Project has several programs designed to uplift the Black male utilizing this ten-step strategy:

1. Inform and teach Black parents, Black families, and concerned Black community members about the importance of effectively participating in the education of Black male children.
2. Ensure that Black boys are prepared socially, emotionally, and academically between preschool and third grade with the basic skills they must have for educational success in higher grades.
3. Instill strong educational values in young Black boys and young Black men by making education the highest priority in the Black community.

4. Establish new standards in schools and communities and new teacher expectations that promote the success of young Black men to solidify their future contributions in mainstream American society.
5. Give incentives that help create and maintain nurturing, effective, supportive, child-centered, two-parent families as a model for future relationships.
6. Identify and engage strong positive role models for young Black boys and men by developing strong mentoring systems to instill positive values in Black males.
7. Instill a strong work ethic in Black males augmented with high quality technological and literacy skills.
8. Manage schools, teachers, administrators, superintendents, parents, and elected officials to produce successful outcomes for Black males in American schools.
9. Develop viable community vehicles, spiritual principles, positive values, and developmental activities to ensure the positive social/emotional development of young Black men.
10. Establish a national, nongovernmental, comprehensive response that is government and privately funded to manage the resources, programs, policies, agencies, ideas, advocacy, and people who must solve this problem (Black Star Project, 2009).

Another organization, 100 Black Men (2013), incorporated the mission “to improve the quality of life within our communities and enhance educational and economic opportunities for all African Americans.” Through mentorship programs and based on the precepts of respect for family, spirituality, justice, and integrity, this organization develops Black youth intellectually, empowers them to become self-sufficient, and

motivates them to achieve (100 Black Men, 2013). More specifically related to the Black male STEM education gap, the Center for Advancement of Scholarship on Engineering of the National Academy of Engineering held the National Science Foundation colloquy on minority males in STEM to gain input on how to address this need (Fortenberry, Didion, Cady, Jing, & Raghavan, 2011). This colloquy yielded information on the descriptions and explications of the challenges and underlying causes as to participation and success of minority males in STEM, as well as models of success in STEM by minority males in order to better understand the Black male STEM achievement gap. The outcome was that different approaches to researching Black males need to be conducted to understand their STEM exposure in elementary school, their STEM engagement in high school, and their STEM pursuit in college (Fortenberry et al., 2011). The Quality Education for Minorities Network also held a discussion regarding Black male STEM engagement. The STEM students/graduates panelists advised that Black males need to be engaged in science fairs and clubs prior to college, attend STEM summer camps, have a STEM mentor, participate in STEM research, and work in study groups to support peer learning (QEMN, 2010). From this literature review, the most valuable suggestion is “the creation and implementation of more activities for K-12 African American males that have strong motivational and learning components” to address the Black male STEM education gap (QEMN, 2010).

CHAPTER THREE: METHODOLOGY

Introduction

This study seeks to understand the motivational factors of gifted and talented Black males to engage in science, technology, engineering and mathematics (STEM). The information sought was acquired through direct discussion with gifted and talented Black males that have engaged in STEM in a residential community and those that have played a role in their STEM education endeavors. The researcher's intent is to contribute to positive professional literature on Black male that are gifted, talented and engaged in STEM. This chapter focuses on the methodology that was used to explore the factors that motivate gifted and talented Black males to engage in STEM.

Research Question

What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?

Research Design

The methodology for the proposed study is qualitative in nature; a phenomenological approach will be utilized to develop a descriptive model of motivational factors of gifted and talented Black males engaged in STEM. This approach was used to acquire multiple perspectives derived from interviews/focus groups with gifted and talented Black males currently enrolled in a STEM high School, gifted and talented Black males alumnus of a STEM high school, parents of gifted and talented Black males, faculty/staff affiliated with a STEM high school that have experiences teaching gifted and talented Black males, and literature related to motivation of gifted and

talented Black males. This approach considers human perspective, addresses exploratory questions, and is utilized to “cover contextual conditions because you believe they are relevant . . . and one in which you cannot manipulate the behavior of those involved in the study” (Baxter & Jack, 2008). In this proposed study, the perspectives of gifted and talented Black males engaged in STEM and their parents and faculty/staff who work with them will be sought; and the phenomenon of motivation within the targeted population were explored. Thus, the proposed methodology assists in gaining a deeper understanding of the motivational factors that impact gifted and talented Black males engaged in STEM.

Access and Permission

As Multicultural Education Specialist of the Illinois Mathematics and Science Academy (IMSA), the researcher is responsible for the recruitment and retention of underrepresented populations (URP) including Black males. Through the design and implementation of enrichment programs that prepare underrepresented students for a rigorous gifted education program; the researcher ensures that the students have the skills and confidence needed to be successful. A request for sponsored research to the Illinois Mathematics and Science Academy was submitted and approved, allowing the researcher to pursue research on the IMSA campus.

Further permissions to conduct this study was obtained from Argosy’s and the Illinois Mathematics and Science Academy Institutional Review Boards (IRB). Upon approval, a letter of request that describes the proposed study and its significance, as well as asks for IMSA current student, alumni, parents, and faculty/staff to participate in the proposed study was distributed. This letter was sent electronically (4 e-mails, once per

week for a month) to the potential study participants. The potential participants were provided with the contact information of the researcher and asked to communicate their interest by completing the consent to participate letter. Once the potential participants submitted their consent form to participate in the study, they were asked to complete a background questionnaire (see Appendix A), which was submitted to the researcher prior to data collection. The researcher then scheduled the interviews and focus group.

Participants

There was a convenience sample of three distinct groups utilized as study participants that include gifted and talented Black males, parents of gifted and talented Black males, or faculty/staff who work with gifted and talented Black males. Due to the limited representation of the proposed study population, a sample of convenience was utilized with 20 Black male students currently attending the Illinois Mathematics and Science Academy and 16 of their parent(s), 25 Black male alumni of the Illinois Mathematics and Science Academy and 5 their parent(s), and 27 IMSA faculty/staff from academic and student affairs departments. This provides for a diversity of perspectives on the motivation of gifted and talented Black males to engage in STEM.

Data Collection Instrument

This study may inform the design of motivation-based STEM pre-enrichment programs for Black male students. Research questions were formulated and used as a foundation to develop the interview questions for gifted and talented Black males engaged in STEM (see Appendix B) and interview questions for parents of and faculty/staff who work with gifted and talented Black males engaged in STEM (see Appendix C). These research questions were based upon the studies described below.

A related study on the multidimensional nature of student motivation in Black college students asked its nine participants the following questions: “(a) What forces do Black honor students identify as motivating them to strive for success? and (b) How do students think about and react to their academic struggles?” (Griffin, 2006, p. 389).

Another study that looked at the academic ability and gifted potential in science of nine high school students asked, “Whom do you give credit for your academic success and how has your science teachers’ expectations affected your beliefs in your gifted potential in science?” (Rascoe & Atwater, 2005, p. 894).

Data Processing and Analysis

The data collection methodology is qualitative in nature, utilizing focus groups and individual interviews to obtain information from the target population. These virtual interviews were conducted virtually utilizing Adobe Connect web conferencing software (2012). This software is secured by “SSL encryption which enables more secure delivery of data, voice and video with password protected virtual spaces” (Adobe, 2012). Two focus groups including 20 gifted and talented Black males currently attending IMSA and interviews with 16 of their parents was conducted to learn about their perspectives of motivation. Twenty-five IMSA alumni and 5 of their parent(s) were interviewed to learn about their thoughts related to motivation and STEM high achievement. Twenty-seven faculty/staff who support gifted and talented Black male students were interviewed to acquire their perspectives/experiences related to motivation and gifted and talented Black males. The focus groups and individual interviews were recorded, transcribed, and analyzed.

Adobe Connect (2012), a secure virtual web conferencing software, was utilized to conduct and record the individual interviews. The focus groups were digitally recorded using an integrated circuit (IC) device with a USB to connect to the computer. The information from the interviews and focus groups was then transcribed utilizing transcription program voice software and analyzed using a word analysis program in conjunction with a qualitative management system. A triangulation analysis approach was conducted looking for cross-case themes and patterns. According to Stake (1995), triangulation is practiced to safeguard exactness and unconventional justifications. “The need for triangulation arises from the ethical need to confirm the construct validity of the processes” (Tellis, 1997, p. 1). A word analysis of the most common responses for each interview questions was conducted utilizing a system that “analyzes text and generates lists of the most useful vocabulary words and then displays how those words are used in context.” The results were utilized to analyze the most common words to determine significant concepts and potential codes (Visual Thesaurus, 2012). The analysis of the text and generation of lists will also capture various perspectives of the most common factors of motivation for gifted and talented Black males engaged in STEM. This information was then be transferred to Microsoft Excel, which has often been viewed as a quantitative system, but has also been deemed a useful qualitative instrument (Meyer & Avery, 2009). “It’s structure and data manipulation and display features can be utilized for qualitative analysis” (Meyer & Avery, 2009). Microsoft Excel not only housed the information, but allowed for the information to be organized in a meaningful and logical manner (Meyer & Avery, 2009). The organized information was coded and analyzed for themes, patterns and trends, as well as compared to literature generated hypotheses. This

data analysis approach allows for the exploration of the motivational factors that influence gifted and talented Black males to engage in STEM.

Limitations

The only limitation is in regard to the geographic diversity of the participants. Due to the geographic location of the researcher, there was more access to the target population in the Midwest; thus the researcher focused on gifted and talented Black males in the state of Illinois. Participation from gifted and talented Black males engaged in STEM was not sought from other areas. Because there may be a more significant number of participants from the Midwest, there may be a decrease as to the value of this study for schools from other geographic locations.

Delimitations

There are several delimitations that may inhibit generalizability, but will not invalidate the proposed study. The researcher chose to utilize only Black male, which makes the study inapplicable to Black female and Latino students who have similar experiences. Also, the study only includes students who have achieved in STEM, eliminating Black males who are gifted and talented in other areas. In regards to the proposed participants, they are concentrated from one school, with no representation from other STEM academies. Thus, this information may not be significant in understanding the motivation of gifted and talented Black males engaged in STEM nationally and globally.

CHAPTER FOUR: FINDINGS

Introduction

This study examined the factors that motivate gifted and talented Black male students to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy (IMSA), a residential academy for gifted/talented students. The following research question was addressed: *What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?* Through direct interaction, in the form of focus groups with gifted and talented Black male students at IMSA, interviews with gifted and talented Black males who are IMSA alumni, and interviews with IMSA faculty/staff and IMSA parents, diverse perspectives of gifted and talented Black male motivation to engage in STEM are presented in this chapter.

Demographics

These perspectives came from 93 participants out of three distinct groups affiliated with the Illinois Mathematics and Science Academy: 45 (48%) gifted and talented Black males, 21 (23%) parents of gifted and talented Black males, and 28 (30%) faculty/staff who worked with gifted and talented Black males. Of the 45 gifted and talented Black males, 20 (44%) were current IMSA students who participated in a focus group, and 25 (56%) of them were IMSA alumni who were interviewed. The current students included three (15%) sophomores, seven (35%) juniors, and 10 (50%) seniors. The years of enrollment at IMSA for the alumni ranged from 1989 to 2010. Of the 21 parents interviewed, 16 (76%) of them were parents of current students and 5 (24%) were

IMSA alumni parents. The 27 IMSA faculty/staff who were interviewed represented all departments within student affairs that directly interacted with students, upper level administration including two previous presidents and principal as well as all academic disciplines with an overrepresentation of STEM-focused faculty. Their years of IMSA experience ranged from 25 years when IMSA opened to as recent as 5 years.

Gifted and Talented Black Males' STEM Motivation: IMSA Black Male Student Perspective

Background

The gifted and talented Black male participants were asked to complete a background questionnaire to provide additional information regarding their racial, family, socioeconomic, and geographic makeup; as well as their STEM support, experiences, and goals. All 20 of the participants identified as Black/African American with 11 (44%) identifying as only Black and/or African American and nine (36%) of them identifying as bi/multiracial, including Jamaican, Chinese, Nigerian, Caucasian, and Native American backgrounds. The gifted and talented Black males yielded from the entire state of Illinois with 13 (65%) being from the suburbs of Chicago, four (20%) from the city of Chicago, two (10%) from Central Illinois, and one (5%) from Southern Illinois; whereas, 15 (75%) classified themselves as middle class and five (25%) classified themselves as lower class. Twelve (60%) of the participants were raised in two-parent households; whereas, six (30%) came from single-parent homes and two (10%) came from other home situations. In terms of STEM background, the majority of students identified their parents and/or families as their primary support system influencing their STEM engagement. Other supports included teachers, the school system, and friends. A common factor among these gifted and talented Black male students was that they all enrolled at IMSA, a

STEM-focused residential high school for gifted and talented students. However, their reason as to why they enrolled varied from wanting to further STEM knowledge and making connections with other STEM-minded people to needing an academic challenge and access to quality education. One of the participants stated enthusiastically, “I love STEM and everything it stands for.” Prior to their enrollment at IMSA, 17 (85%) of them attended a STEM enrichment program with 12 (60%) of them attending an IMSA program. With the exception of one of the gifted and talent Black males currently attending IMSA, they all planned to major in STEM in college; several mentioned biology and engineering.

Why STEM

The participants were asked why they were engaged in STEM education and whom they accredited their interest/initiation in STEM, of which 15 responded. Several themes emerged as to why the gifted and talented Black males were engaged in STEM: (a) enjoy STEM, (b) good at STEM, (c) STEM is a progressive field, (d) to solve problems and advance humanity and (e) pursuit of scientific knowledge. The main themes agreed upon were enjoy STEM, reported by five (40%) participants, and good at STEM, reported by four (27%) participants:

One of the major reasons that I like STEM, growing up it was one of the things I was good at and I enjoyed it; so my parents decided more reading because they knew how important reading was and thorough reading. I don't know if there is some sort of correlation there. Math just seemed to come more naturally through their emphasis on reading; science went right along with that.

Based on personal interest . . . my auntie pushed me because I used to live with my grandmother because of family things. I would see her messing around with different technologies at her age, and I would ask her what was it and what was it about, and seeing how it worked made me get more interested in it on my own.

Now, I'm engaged in STEM because I love it so much; it's very entertaining and interesting to me. As far as I've been told and can remember when I was younger my parents would put me in front of the computer and have me doing math problems before I was even in preschool and things like that. So, I had an early interest for STEM and throughout the years it's become bigger and bigger. Because I have a natural affinity for it. I toyed more and more with it, and I help other people with it, and so it's just always been a part of me.

I realize I've been given opportunities to learn science facts, but I had not been taught to think like a scientist. Given this opportunity to do science really made me passionate for it. So what it comes down to is that I really like science and scientific thinking; the pursuit of this scientific knowledge is what really drives me to continue pursuing STEM.

These students had parents or family members that influenced their STEM engagement, had early exposure to STEM, or had experiences in scientific thinking that contributed to their pursuit of STEM. An additional three (20%) participants stated they are engaged in STEM because they believed STEM was a progressive field that would lend a successful future. Two of the participants put it this way:

My decision to engage in STEM was more about a decision to engage in education as a whole, rather than just STEM education. At age 10, 11, 12; I began to recognize the world around me better and see what is really important so that's where my drive for education came from. And the STEM education is such a progressive field in society, I just fell into it. I still consider myself a multi-talented person, but STEM is what's pressing right now.

I say it's a combination of having teachers noticing that if I'm not interested in things in class and giving me additional work and noticing the direction our world is going in and STEM education is becoming more dominant and more of a progressive field. I just wanted to be part of that.

These students viewed STEM as a popular, growing field that would somehow be beneficial to them long-term. Another theme reported by two (13%) students was the desire to solve problems and advance humanity. One student stated,

When I came here I did have a strong interest in science. I've never been a big fan of math; but now that I've been here for a while, I'm seeing how all the sciences fall into place. The importance of physics and biology and chemistry and medicine and interdisciplinary approaches to problems that we have in humanity, so I now see how science is important for humanity.

These participants had the understanding that STEM served a pivotal role in making the world a better place. A final theme discussed below by one student is the pursuit of scientific knowledge,

I realize I've been given opportunities to learn science facts, but I had not been taught to think like a scientist...given this opportunity do to science really made me passionate for it...so what it comes down to is that I really like science and scientific thinking...the pursuit of this scientific knowledge is what really drives me to continue pursuing STEM.

As far as whom or what these students give credit to for their STEM interest/initiation, the majority of the participants stated their parents and families; whereas, others stated teachers and various STEM experiences, which included watching Star Wars, going to space camp, and sitting in an airplane cockpit.

Motivation to Engage in STEM

The gifted and talented Black Males were asked to describe their motivation to pursue/engage in STEM education, of which nine of the 20 gifted and talented Black males responded. There were four emergent themes: (a) passion for STEM, (b) money, (c) solve problems/advance humanity, and (d) learning/discovery of knowledge. For the four (44%) participants that were passionate about STEM, they also wanted to make money as well as advance the human condition. Two of the four put it as follows:

It's not some sort of higher calling or money. It's always been a passion for STEM. Growing up I never knew what I wanted to do until I discovered my passion for STEM. The fact that I want to study STEM and my number one college choice is very STEM heavy, Cal tech, and if I get in, I will be studying STEM very thoroughly and the reason I want to do that is because I like to learn about STEM. I find it fun. I think the concepts are interesting and what I do with STEM, there is a good possibility that I will advance the human condition; but for me and motivation to do STEM is because I am very interested in the subject matter.

It's like a mix of my love for STEM and the massive amount of money that I see STEM brings. All my role models are rich billionaires that own really massive companies, like Bill Gates owns Microsoft, Steve Jobs before he died he was the

CEO of Apple; so all these massive corporations that do so many things that we do today, like we produce computers, smart phones. So it's all these things where STEM just leads to a massive amount of money and not to mention that I love STEM; so it's like, well, then I guess I'll continue on.

Although these students communicate a strong passion for STEM, they also communicated secondary motivational factors, such as advancing the human condition and financial benefit. However, for four (44%) of the participants, money was a major motivational factor originally, but eventually became secondary to helping humanity as depicted in the following statements. Two of the four stated,

I was very interested in the money originally, but now that I am doing an SIR [Student Inquiry and Research] at the University of Chicago working in the center for bionic medicine, I find that I am very interested in human enhancement. So STEM is a way to accelerate myself to reach my goal of moving human enhancement forward and advancing the human condition.

When I first began to be interested in science it was just about the money. I've seen the careers that science can afford you, like medicine. I've seen how wealthy people can become . . . now that I'm doing an SIR [Student Inquiry and Research] with the University of Chicago with a cancer neurologist and I do rounds quite often, I really see how science can help humanity, how it can literally save a life. That's a powerful thing to save a life with your own two hands, with something you've developed in a lab, and now I've gone to more of the helping side instead of just the monetary.

An additional four (44%) respondents identified solving problems/advancing humanity as a primary motivator to engage in STEM. Two of the four related the following:

With STEM, you can define everything and find a way to make anything and with that, help people; that motivates me, if I can figure things out, figure something new out and help more people. It started with puzzles, and moved up to mediocre . . . and now I'm at IMSA doing calculus and physics that I know I can apply to real life situations . . . so that's motivation to me to be able to use it in life.

During my junior year I worked in a lab at the University of Illinois, Chicago, doing research on prostate cancer. I was surprised to learn that Black men had the highest prostate diagnostic rates. Throughout my experience I focused my work on molecular and cellular biology. I was reading articles and running statistical analysis to find out why Blacks are at such a disadvantage of prostate cancer. That motivated me throughout the summer and the next year I did more research and overall my lab manager, the professor, and all others that worked with me

guided me towards STEM. That and my parents pushing me towards hard science motivated me to try to accomplish something that would benefit a large amount of people.

These students engaged in problem-solving and experienced its application to real-world issues. For other students, their motivation is simply about the acquisition of knowledge; three (38%) respondents communicated that learning/discovery of knowledge motivated them to engage in STEM. They discussed their desire to want to know everything and how there is so much information to know. Two expressed their desires as follows:

My motivation to pursue STEM education is kind of strange. I'm a really competitive person and I want to know everything possible to be known about something and to discover everything by myself; so that's why I have pursued STEM throughout all my years of learning. My parents pushed me from a young age to always to do worksheets, spelling, multiplication tables; and I never realized it, they were molding me and guiding me on this pathway to pursue STEM and because of them I have this interest; and now at IMSA, I see all this new information that I've never been exposed to before, especially in a biology course. . . . I want to know all of it. . . . I want to keep going and read all I can.

It's not so much motivational, but I do want to find out as much as I can. But I fell into STEM education; there's something unique about it that is not really relevant or apparent in any other aspects of learning. There's this knowledge that no matter how much you know, you will never know all of it; so being part of STEM education drives me to know. . . . It's inspiring to know that I'll be finding new things possibly, but there is always more to know.

These respondents viewed access to knowledge, especially STEM knowledge, as important factors in their motivation to engage in STEM.

Intrinsic Motivation to Engage in STEM

The gifted and talented Black male students were asked to discuss their intrinsic motivation defined as “behaviors performed out of interest and enjoyment”

(Areepattamannil, Freeman, & Klinger, 2010, p. 234). This question was responded to by 11 students and yielded four themes: (a) competitive nature of STEM, (b) solve problems/advance humanity, (c) learning/discovery of knowledge, and (d) obligation to

Black community. The themes that yielded the most responses included competitive nature of STEM in which six (55%) respondents agreed. The desire to solve problems/advance humanity was agreed upon by five (45%) of the respondents as evident in the following statements:

I was born with this, the desire to be the best . . . things I felt like I could do the best at. I wanted to do the best. If I'm not #1 then I would wonder what I could do, why I'm not the best. In kindergarten, first, second grade, my mom would be happy if I got an A on an assignment, but I wanted to be the first one done and I wanted to be done a minute before the second person. That was something within me, and if my mom said, "I don't think you can do all this," that's what pushed me, or this may be a little too hard, or don't worry about that, and I would want to learn more.

So whenever I fail or do something wrong, it's like "Where did I go wrong?" "What did I do wrong?" and "How can I get better?" "What steps do I need to take?" things like that, that I ask myself because I don't like to see myself go wrong. . . . So when I do go wrong I want to know how do you fix it and so it's one of those things like in STEM when coding and when you type something and it doesn't come out the way you imagine it; or maybe it just gives you a complete error, then you have to go figure out where did you go wrong and what do you have to do to fix where you went wrong.

I do whatever I can to find out more and to see if this is really something I want to explore more of in greater depth. So an example of that would be, I like to read *Popular Science* and I was reading an article about artificial hearts and how it's possibly superior to the regular human heart and how it's going through testing right now. That gave me an interest in respiration technologies, rehabilitation and human enhancement. So now, two years later, I'm doing an SIR [Student Inquiry and Research] right where these technologies are being developed.

But in terms of intrinsic things that motivate me, I've always had an inner drive to do my best. I try to think deep. I don't know where that comes from; it's just a part of who I am. So academically and no matter what, whether I'm playing sports or volleyball, I just do the best I can; and at the end of the day, I always want to know that I've done the best. So even academically I've talked to my parents about why don't you push me harder. I should have gotten an A in this class; my parents are like, your grades are good. How do you say they are good? I know I could have done better. So I've always been pushing myself, even harder than those people around me and I guess what desires me to push the hardest in STEM is the passion for me. . . .

So you can take away the competition and I will still drive, but after I've given my best, competition is like that extra 10% that makes me go past what I

am capable of. So I go out and give all that I can and the feeling of competition makes me push harder than I ever knew I was capable of . . .

I always believe that nothing is perfect so I always think something can be made more efficient or can be altered; and by thinking that, it led me to believe that more things revolving around the subjects of STEM you can make things more efficient like medicine, that's science, . . . but it seems like more opportunities and more knowledge can be opened up through STEM and sometimes your parents say "do better than me." . . . If I'm not at the top and can help people then that means I need to work harder in order to achieve the goal and make everything the best that I can before my time is out . . . so it motivates me to do as much as I can.

These students wanted to know as much as they could so they could truly advance in the world, while being in a competitive environment. An additional four (36%) students stated that mere learning/discovery of knowledge intrinsically motivated them to engage in STEM as suggested by the following remarks:

For me, it has nothing to do with competitiveness . . . part of is the aspect of learning education where there is ownership. Once you learn something and you figure out something, it feels good because I know it. I know I can do something with my knowledge and take further steps and learn something more and use it. It's about power and ownership I gain from learning and from knowing something; that fuels the drive more, it definitely fulfills a feeling in me. I feel good, I feel great, and I feel powerful!

My interest is what got me going towards STEM to do that . . . it's just education as a whole . . . keeping that whole goal in mind as I work through my education is my intrinsic motivation

Two (18%) students were motivated by their obligation to the Black community, especially their ancestors and family, to excel and be a role model:

It's more of an obligation and not necessarily to anyone around me, but to my ancestry. As I have gone through my education and gotten older, the struggle of African Americans in America has grown more and more important to me as a person; and I feel like the opportunities that I'm offered no matter how good or bad they are, they are education. The more that I am offered these opportunities and I know I need to do well because the people before me did not have these opportunities, and they paved the way to make sure I did have these opportunities. So when I do get the chance to learn something new, I take it as chance to take advantage and appreciate what other people have done for me. When I get out into the world I know that what I'm doing was someone else's dream. I know

that the work that I am doing and the knowledge that I have is because someone worked for me.

When it comes to family, my grandmother always tells me about my great grandfather who I'm named after, like he was the only Black person with a library card in his whole town. He had to go through so much more of a struggle just to get through, just to get a slight amount of education; and I have all these resources, it would be almost stupid not to take advantage of them. Also my dad has like seven kids. I'm the youngest by 6 years; he tells me I have to do better because he feels that he might have failed others in that sense, so that's always motivating I guess.

Extrinsic Motivation to Engage in STEM

The gifted and talented Black males were also asked about extrinsic factors of motivation, defined as “behaviors carried out to attain contingent outcomes”

(Areepattamannil, Freeman, & Klinger, 2010, p. 234) of which 11 responded. Four themes emerged: (a) future success, (b) STEM Enjoyment/Advance Humanity, (c) money, and (d) obligation to Black community. The most-agreed upon theme was success stated by six (55%) participants. This success comes in the form of college scholarships, job security, and ability to give back to the family as depicted in the following three statements from gifted and talented Black males:

For me, it's been a job security type of thing because my mom always jokes, “When are you going to buy me my new house?” and family has always been something emphasized in my household. So I want to do something that I like as well as something that I know down the road will be there because STEM is one of the fastest growing areas of the economy; and if you can get into that market, that is definitely something that can set you up for the future.

My friends, my parents, my family; but not necessarily in a way that you might expect. I know some people complain that their parents push them and say you have to do good, but my parents have always been so supportive and something that motivates me is that I want to make my parents proud. In addition to making them proud, I want to do my best for their sake. . . . So if I work hard I can get into one of these schools, then I won't have to worry about money to pay for college; so money in terms of scholarships for college has been an extrinsic motivator.

I want to continue and because I want to take care of my family as well and help my parents when they get older. . . . I want to pay them back for raising me; so I want to get into a field that I enjoy and pay my parents back.

Two (18%) of the students that stated future success as a motivator discussed their loss for STEM enjoyment and focused on how STEM will benefit them down the line:

Because now I find it hard sometime to see the point in some of the things I do. Some of the assignments and projects we have to do like some of the activities that I'm putting myself in, I don't see the point. I'm just kind of doing it. But I'm telling myself to do it; that is what's expected of me by parents and other people . . . and now I lost the enjoyment part; but the factor of getting a good job, raising a good family, helping your kids, giving back to your family, that all helps to overcome the enjoyment part. I'm now looking further into my future self, seeing what I want to accomplish in the future, what I want to achieve; that's kind of what the motivation is now.

Ten to twenty years from now I want to be, I guess that's what's motivated me; where am I going to be when it's my family, what am I going to provide for my kids, what kind of opportunities say if they want to go on a trip somewhere, what kind of things can I provide for them? Money helps along those lines. When you see successful African American males, like you see the guy in church give out \$100 bill in the offering and just wanting to be that guy and be able to do that, wanting to be successful and not having to work. It's like the things I want to do are be rich and not work and be able to give back to my family and parents and things like that. I would not say I'm motivated any more by enjoyment; I think that kind of ran out a while ago. Now it's kind of like a countdown to the end when it all pays off; you've come too far to mess up now you can't really stop, now see what you can accomplish.

STEM enjoyment was the second most agreed-upon extrinsic motivation theme, as related by four (36%) of the respondents:

I guess with everything you do, you always have some sort of way to help people with whatever you are good at, whatever you enjoy, and I just realize that because STEM education, or in my case math and physics, is more of what I'm better at and enjoy. So I guess extrinsically I want to help people. I might as well do what I'm good at, so I guess the enjoyment factor is still in my head. . . . I know that, or at least I feel that if I lose that enjoyment aspect, it will be really hard to dedicate myself to something.

Aside from money, like when I'm sleep at night, like I have all different types of dreams. Sometimes it's me like doing math in front of a giant chalkboard and then on other days it's like me with a giant stack of money next to me, but I'm

sitting at a computer all the time. In all my dreams, it's always a computer and it's always something that I've been working on recently. During intercession week, I was working on an app with my friends; we won the contest, but like one of the nights I was up to about 12:30 trying to figure something out. I didn't figure it out, but in my dreams I saw myself working on it again, but this time I saw my instructor who was helping me. I couldn't see what the answer was, but I saw that I was receiving help from someone . . . and it's like one of those things where I see it happening, and it's like I'm not doing it now, but I see it in the future, and it's going to affect me later and then I want to follow along with it.

Well when you talk about the future, above everything else if you don't enjoy what you are doing, then it's not worth doing so because I enjoy doing STEM related things and science related subjects,

To me, it's about having fun. I like the experience of seeing things happen. It would be really nice to have a job where I can discover new things and perform experiments.

Other extrinsic motivators included money, stated by three (27%) of the respondents and their obligation to the Black community, stated by two (18%) of the respondents:

My biggest extrinsic motivation would be money. I'm not saying money is the key to happiness or anything; but growing up, I've seen money can do a lot of things, and money is a parallel to success, and to be successful I need money. One thing specifically that my dad would always say to me is two things: "I don't have a lot of is time and money; and if you want to be successful, those are two things you got to have; time to do what you want and money to do what you want, and I think I've always taken that with me, and I feel like pursuing a STEM career will get me to that money and that success.

For me, I want to be a role model; not just to people in my neighborhood, but say people 10 years from now and 20 years from now. I want to be somebody that people can look up to just as I have looked up to other people. So I think that motivates me because I know I can make the difference in some people's lives if I put in the time now.

I feel like a big external motivator is to break negative stigmas about the African American male population; to put myself out there in a position in which I know other young African Americans who are younger than me can see what I'm doing and know that they can do it as well. And not only African Americans but other cultures as well; especially Caucasians so they know African Americans are just as good as they are, and I feel like for me to be successful I need to be in a position where I can represent my population.

IMSA's Contribution to STEM Motivation

Besides race, gender and being gifted and talented, the participants also have the status of enrollment at the Illinois Mathematics and Science Academy (IMSA), a gifted and talented residential high school in common. Thus, the participants were asked why they chose to enroll at IMSA; in which they responded (a) to further STEM knowledge, (b) for a challenge, (c) as college preparation, (d) for the experience, (e) to make connections with people like me, and (f) for quality education. They were also asked how IMSA contributed to their motivation to engage in STEM, of which 12 responded. The five themes that emerged were (a) immersion in STEM, (b) challenge/better education, (c) diverse environment, (d) self-awareness, and (e) loss of motivation. The primary theme was immersion in STEM, stated by four (33%) of the respondents:

I feel like being here is like the biggest contributor to what I want. I feel like seeing passion in my teachers in STEM has helped me to become more and more engaged in it. To see my teachers get excited in front of the classroom, jump around and hop around and get all excited over a problem or how this biological pathway works really excites me.

IMSA taught me to think like a scientist. I thought about science in a different way. A good example would be SI [Scientific Inquiry] Bio; SI [Scientific Inquiry] Bio is one of the classes I'm the most glad I've ever taken; it's one of my favorite classes. Even though it's not a class I got an A in, it's the class I feel like I learned the most from because not only did I learn biology, that class taught me so much about being a student and it's one of the classes I gave a lot of credit to my motivation for science. So basically the way SI [Scientific Inquiry] Bio works is you learn about concepts in class, like hydrogen bonds, for example, and when you get to the test, the test will ask questions that seem unrelated, but you have to think back to your knowledge of hydrogen bonds and you have to integrate, transfer problems, I think they call them; so I guess the whole idea of transfer problems had never come up before and it really emphasized for me that learning science goes beyond just the facts and because of this I really took to science more. There are also two more classes that I would credit specifically to my motivation, Modern Physics and Microbes and Diseases (MAD). Microbes and Diseases, the final project, we were given two bacteria's and we were told to identify them. Other schools would have just taught me what different tests there are. In MAD we use them and have to come up with our own experiment, and we

have to essentially take it upon ourselves to figure these problems out. The way that IMSA has really been set up is that it promotes scientific thinking. More so than just knowing science has really given me my passion for science, and that is what has driven me to continue studying STEM.

I would just like to add SIR [Student Inquiry and Research] to that; it's an extension of thinking like a scientist. SIR [Student Inquiry and Research] is really great for getting out into the field because if I was at my old school, I would have no idea what prosthesis is like or how to use CADD software or anything like that. IMSA helps me and pushes me to do that unlike any other high school.

There's a lot more computer involvement in everything at IMSA. Like my physics class, like a lot of physics is math and what not, but there's a lot more computer programs used in physics here. Like I just had my first physics class today, and we already jumped into the lab. We downloaded the software that makes collecting the data much easier for us. . . . So here STEM is a lot more involved because everyone does it. It's incorporated into every class possible, like even my physical education class has a lot more application and uses for the computer. There's always someplace for technology and use of the computer, and that's what I like about this school.

These students enjoyed not only the class content and the technology that supports the curriculum, but also IMSA's approach to teaching and learning, which includes scientific thinking, research, and inquiry-based learning. The second most agreed-upon theme was challenge/better education discussed by five (42%) of the respondents:

At my old school the only place to be challenged in a STEM sense was in the classroom, but here it's like it starts in the classroom and then after that you go back to the dorms and there are other people who challenge you. So right now my roommate is someone in which, where I am in math right now, he was there two or three years ago. So like now he's taking analysis and just having that resource, friends that are like, it's always cool to have someone who is ahead of you in that sense.

The community I come from does not have as many educational resources as some others so what really motivated me was I had not heard of STEM at all until eighth grade when I heard about IMSA so every educational resource that my old school had for me was either in the community or one town over and when I applied to a pre-enrichment program here, I actually realized the extent that technology has in the world and I heard that people were going to other countries to participate in science activities and technology competitions and that was completely a new world to me. I never knew that was possible so it really motivated me to get into the school; and when I got here the whole new world became a reality and I was humbled because when I came from my old school I

was always the best at what you call STEM. When I came here, I realized there were people better than me and that goes back to the competitiveness; I had to in a sense prove myself and be able to compete with the best and be successful and support my family.

For me, it's the hardness factor. . . . We are going to be doing things this hard in college so I might as well do it more now . . . like go through the difficulty now and have less struggle later is my goal in this high school experience.

The next theme agreed upon by three (25%) of the respondents was diverse environment with emphasis on race and intellectual inquisitiveness of students:

It's the composition of the people that are here, so when I was at my old high school it was a predominately White school and there were a lot of different interests, and it was a lot more diverse, but when I got to IMSA, there was a different makeup, being $\frac{1}{2}$ Asian. A lot more people were interested in math so I went along with that and got more into math.

From the perspective of being competitive, being around other people who are better at math than at my old school, that makes me want to be better so I can keep up with them and prove myself in a way . . . but I don't want to keep focusing on proving myself because I want to do it for me and not for anyone else . . . but just being competitive makes me a bit more motivated.

Being at IMSA, you are around people who are also really passionate about math and science. . . . IMSA has a lot of resources, SIR [Student Inquiry and Research] you can engage with and there are a lot of opportunities to continue to engage in STEM. . . . I think just being in that environment is motivational.

Being around culturally diverse students and other intelligent students at IMSA enhanced these students' motivation to engage in STEM. Another student discussed that IMSA made him more self-aware and independent:

The way I looked at and I did not realize it until right now, I'll put in work now, I'm young, able-bodied, no kids, no one to worry about, it's just me and being here I get to, I guess it's negative in some ways but then it's positive. I've removed myself from all distractions; I'm here and the only one here, no one is here from my family. I care for myself and push myself here; whatever I want to get out of this place is what I'm going to put into it. I guess being here allows you to fully immerse yourself in STEM. I can stay up to 3 a.m. if I need to.

While the majority of students communicated that IMSA enhanced their STEM motivator, two (17%) Black males felt that IMSA contributed to a loss of motivation:

After coming here, my motivation to learn and advance myself decreased interestingly enough because I kind of—it goes back to the whole competitive thing. I see these other people who are doing better than me, who are in higher classes, they know more and I just feel like, “Whoa, I don’t really know that much,” and it’s kind of disheartening, especially my first semester of sophomore year, I was kind of shell-shocked and I was really—I had no idea why I got myself into this, but after some time I stopped caring about what other people were doing and focused on myself and that really helped.

Thus, IMSA has both positive and negative motivational factors in terms of gifted and talented Black male STEM motivation.

The STEM Gap

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:

When you think of a scientist or a rich person, you usually think of a White person.

So before I came here, I came from a selective enrollment school in Chicago so one of the better schools in Chicago and predominately Black and students were motivated. Their parents were motivating them to be great and do great things in life; but the big thing in that school was the arts. Students were getting \$20,000 scholarships to the Art Institute of Chicago, that’s the direction we were going. And I think that’s what’s popular in our culture, the arts and humanities, because that’s what we have as a Black community; that is part of what we give back and that’s part of how we continue to thrive. I don’t think it has to do anything with motivation; it’s about what we have and who we are as a people.

I think there are different kinds of gaps and there are more important gaps; there is a gap of just less education overall and that gap is more dangerous. I actually went to Lindblom Math and Science Academy, and I was still focused on the humanities and arts, like more than the actual STEM education. I don’t really see that as much of a problem because there is still something productive that is happening.

I think this gap exists because a lot of males are not exposed to everything. So we're exposed to sports and we may have had a dream to become professional in that; but we don't always get the exposure to STEM; or if we do, it's at a point where we've made up our minds what we want to do rather than when we are still impressionable and young.

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 think it kind of starts in the home. . . . So based on your culture and how you are raised can influence all you want to be in life because depending on what your parents tell you, "Oh, you're only going to be this in life," or "You should only do this because this is the only way." I feel based on the hardships that certain parents have to go through, in a way you practice what you preach; so if your grandparents tell your parents to do things a certain way because that's what they've been doing and they did not really teach their children different ways . . . if you are a child and you see your mother hit, then you might grow up to do the same thing so depending on the lifestyle of the household, you can influence young males.

I think the reason the gap exists is because of motivation, not just self-motivation, but motivation of people around you. . . . If your parents don't tell you growing up that you will succeed . . . I think the White and Asian parents motivate their children differently than Black parents; they push their kids to go further in STEM. The Black communities say you go out and be whatever; they don't push their kids as much, so I think that's why.

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?

I feel like money has a good part in this. If you are in poverty, you are not going to be able to find as many opportunities to engage in STEM. I'm lucky enough to go to CTD [Center for Talent and Development] at Northwestern University every summer and that's a very interesting experience; but if the money is not available then you can't do that. Also I feel like it has to do with the parents because if your parents are not really pushing you to do better, at least initially, then you don't really have any reason to try hard or do anything more difficult than you really need to do.

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 might be the media because there are a lot of Black people usually portrayed in gangs or whatever in that aspect.

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 how to motivate their kids; it becomes almost a vicious cycle. Where I grew 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.

I've actually thought about this quite a bit in the last year or two; I really think it comes down to a mentality starting at birth. It's not the fault of most African American or minority parents. They start with it when they were younger; and their parents, they were raised with loose values in a sense, if you could put it that way, or maybe they did not know what values were and their parents did not really know what they were, and it's not their fault, and there's not been an intervention. . . .

It [racism] comes in forms of like giving people less opportunities or if you have two people applying for a job with the same resume and the exact same qualifications, one's White, one's Black, the White person is more likely to get it over the Black person.

Although this 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%), the seven respondents overwhelmingly stated their parents played a pivotal role. The reasons parents were such an integral part of their STEM development included their parents intentionally lived in safer, more diverse neighborhoods to gain access to STEM opportunities and their parents exposed them early-on to STEM. 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'm usually the only Black student in a classroom. It takes a certain type of person to do it. Until you have more numbers and get more people . . . that's just the cycle. I don't know what we should do about it though.

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 in STEM and that parents needed to play a role in motivating Black males to engage in STEM and minimize the STEM 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 nationwide STEM intervention focused on Black males to minimize the Black male STEM gap.

STEM Motivation

The research question asked “*What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?*” The answer to this yielded from gifted and talented Black male focus group responses to questions regarding motivation to engage in STEM, intrinsic motivation to engage in STEM, and extrinsic motivation to engage in STEM. Enrollment at the Illinois Mathematics and Science Academy was the primary factor that motivated gifted and talented Black males to engage in STEM, with immersion in STEM, being in a diverse community, the educational challenge, and enhanced self-awareness as valuable aspects of IMSA. Other factors that motivate gifted and talented Black males currently enrolled at IMSA to engage in STEM included:

1. Learning: Discovery of knowledge
2. Desire to solve problems to advance humanity
3. Money
4. STEM is a progressive field that leads to success
5. Competitive nature of STEM
6. Passion for STEM/STEM enjoyment
7. Obligation to Black community/Break negative stigmas about Black males

This study also provided a gifted and talented Black male perspective about the literature’s suggestion that there is a Black male STEM gap and ways to minimize that gap. Table 1 shows a comprehensive perspective of gifted and talented Black males students currently attending IMSA, thoughts of why a STEM gap existed, why they

engaged in STEM, what was their STEM motivation, and how they would motivate Black males to engage in STEM ($n = 20$):

Table 1

Student Perspective: Gifted and Talented Black Male Motivation (n = 20)

Why a Black Male STEM Gap	Why STEM for Gifted and Talented Black Males	Gifted and Talented Black Male Student STEM Motivation	IMSA's Contribution to STEM motivation	Motivate Black males to Engage in STEM
Lack of STEM vision, <i>n</i> = 6	Enjoy STEM, <i>n</i> = 5	IMSA, <i>n</i> = 11	<i>Enhances Motivation,</i> <i>n</i> = 11 –Immersion in STEM –Challenge	More Black Males as Mentors & Role Models, <i>n</i> = 5
Lack of parental support <i>n</i> = 6	Good at STEM, <i>n</i> = 4	Learning: Discovery of knowledge, <i>n</i> = 10	–Diverse Environment –Self-awareness	Early STEM exposure, <i>n</i> = 1
Negative stigma of/misperception about Black males, <i>n</i> = 3	STEM is a prominent, progressive field, <i>n</i> = 3	Solve problems/to advance humanity, <i>n</i> = 9		Nationwide STEM intervention for Black males, <i>n</i> = 1
	Solve problems/to advance humanity <i>n</i> = 2	Money, <i>n</i> = 7	<i>Hinders Motivation,</i> <i>n</i> = 2 –Loss of STEM enjoyment –Realization of not being good in STEM –Competing with other students in STEM	Educate parents, <i>n</i> = 1
	Pursuit of scientific knowledge <i>n</i> = 1			
		STEM is a progressive field that leads to future success, <i>n</i> = 6		
		Competitive nature of STEM, <i>n</i> = 6		
		STEM Passion/Enjoyment, <i>n</i> = 5		
		Obligation to Black community/break to negative stigmas about Black males, <i>n</i> = 4		

Gifted and Talented Black Males' STEM Motivation: IMSA Black Male Alumni Perspective

Background

The gifted and talented Black male alumni of the Illinois Mathematics and Science Academy were asked to complete a background questionnaire to provide additional information regarding their racial, family, socioeconomic, and geographic make-up, as well as their STEM support, experiences, and goals. The alumni years in terms of their enrollment at IMSA ranged from 1992 to 2010. All 25 of the participants identified as Black/African Americans with 20 (80%) identifying as only Black and/or African American, and five (36%) of them identifying as bi/multiracial, including Jamaican, Puerto Rican, Caucasian, and Native American backgrounds. The gifted and talented Black males yielded from the entire state of Illinois with 15 (60%) being from the suburbs of Chicago, two (8%) from the city of Chicago, four (16%) from Southern Illinois, two (8%) from Central Illinois, and two (8%) not reported; whereas 20 (80%) classified themselves as middle class, and five (20%) classified themselves as lower class during their high school years. Keeping in mind that some of the alumni interviewed were still college students, the current economic statuses were 22 (88%) who reported being middle class, two (8%) reported being lower class, and one (4%) reported upper class. The majority, 16 (64%) participants, were raised in two-parent households; whereas, nine (36%) came from single-parent homes. In terms of STEM background, 18 (72%) of the Black male alumni stated parents as their primary support system influencing their STEM engagement. Other supports included family, teachers, the school system, friends, and church and Black male organizations, including Alpha Phi Alpha Fraternity, Inc. and the National Society of Black Engineers. A common factor

among these gifted and talented Black males were that they were all IMSA alumni, a STEM-focused residential high school for gifted and talented students; however, their reasons as to why they enrolled varied, as seen below:

1. Academic challenge, $n = 10$ (40%)
2. Quality education/opportunity to learn, $n = 9$ (36%)
3. To leave home, $n = 4$ (16%)
 - a. “Too much crime, violence and low graduation rates”
 - b. “Caring about school caused problems”
 - c. “To distance self from dysfunctional family”
4. Further STEM knowledge, $n = 4$ (16%)
5. Make connections with intellectual and diverse students, $n = 2$ (8%)
6. Encouraged by an IMSA connection, $n = 2$ (8%)
 - a. “Met an alumni and saw how successful he is”
 - b. “Attended IMSAloquium”
7. Wanted to enter a STEM field, $n = 1$ (4%)
8. College preparation, $n = 1$ (4%)

Prior to their enrollment at IMSA, 19 (76 %) of them attended a STEM enrichment program with 10 (53%) of them attending an IMSA program. With the exception of five of the gifted and talented Black male IMSA alumni, they all are/were STEM majors. As far as their occupation, 13 of the gifted and talented Black male alumni were undergraduate students, one was a medical student, three were engineers, two were physicians, one was a Software Quality Assurance Analyst, one was an owner of a supply chain consultant business, one was a fighter pilot with the United States Air

Force, one was a procurement financial analyst with Boeing Company, one was a corporate lawyer, and one was an associate coordinator with the National Basketball Association.

Why STEM

The gifted and talented Black male alumni of the Illinois Mathematics and Science Academy were asked why they were engaged in STEM. From this question six themes developed: (a) STEM interest, (b) good at STEM, (c) intellectual curiosity, (d) future success, (e) problem-solving aspect of STEM, and (f) STEM is a prominent/progressive field. The primary reason agreed upon by 13 (52%) of the participants was STEM interest, as evident in the following statements:

I have been interested in STEM or rather science my whole entire life, ever since I was a child, for as long as I can remember. For me the interest has always been there. . . . because what they did was help nurture my interest in science so they made sure I had access to the books or made sure I had access to the extra-curricular, after-school programs or other activities that would help foster my interest in science.

For me, I think I give credit to the SEAMS [Summer Enrichment for Academics in Mathematics and Science] program that I attended before IMSA, so that's the first time I saw the application of what math and science could actually do and that really interested me. . . . but once I got to that program I got to see what you could actually be with that and that's what really got me engaged in STEM.

My interest is given to myself, but not in any personal way. I have always had a fascination with the body and the small differences that make humans so similar as organisms, but so different as people.

Like I remember learning about nano-technology when I was younger and thinking that was really cool and that kind of got me on the path of looking at engineering and I became interested in physics and calculus more and ultimately I think definitely going to IMSA shaped that a lot. . . . So right now I'm pursuing something in natural resources and environmental science. It's kind of been a process since I was younger, the different programs I've been in, going to IMSA. . . . I remember in seventh grade, I had a science teacher and that is really when I became passionate in environmental science; that was a big topic that he talked a

lot about because I think around that time was all the talk about global warming in the news and media and he brought that to class and I just found it interesting.

The second most agreed-upon theme was good at STEM, stated by seven (28%)

of the interviewees in their comments below:

I was always good at math. I'm good at science as well, but really really good at math and as a young child my parents were also good at math, and they identified it, and they helped to encouraged it.

My background in STEM dates back to middle school. I really picked up on math and had a good understanding of it.

I can't recall a time in which STEM was not something that I was interested in. It started off, kind of came naturally. When I was younger, math came easy and from there it ranged off into STEM. It was something I was quite good at, and I learned to enjoy it quite a bit.

I was always good in math. I was generally good in school. I had a fifth grade teacher who made science interesting and then I set a record for a math contest in fifth grade.

Without a doubt, I was good at it. I was definitely better in math than reading. I gravitated toward it. I was better than other students in it, so it's easy to like something that you're good at. I never really had much difficulty and it separated me from other students.

These students had an innate talent for STEM from a young age. Five (20%)

IMSA alumni expressed that their reasons for STEM engagement was mere intellectual curiosity as indicated in their statements below:

Just growing up I thought that science was cool and I've been exposed to a lot of things mostly via my dad having to do with science. I used to go to the MSI [Museum of Science and Industry] a lot; so when I was younger I wanted to be a chemist and an artist and since then my interest in the sciences has not really gone away especially with my dad continuing to expose me to various aspects and opportunities in the STEM field.

What I will say is I have always been curious and I think that intellectual curiosity probably was something, you know, that I don't know if I was born with, or if it's innate, but definitely my mom nurtured quite a bit of that. We regularly went to the St. Louis Science Center, we regularly did reading programs where we were pushed into the non-fiction section, and I definitely think that had a strong bearing on cultivating intellectual curiosity and giving us an opportunity to explore that.

You know I would say this, STEM, for me STEM has been so pivotal in my life and when I think back on my first real point of engagement, my earliest memories, you know I had Commodore 64 as a child. At one point in my life we had an Apple 2E, so this is late 80s, so I was probably 4 or 5. I used to have a floppy disk drive; we used to play video games and those kinds of things growing up on a computer; so I think my experience was somewhat unique for my neighborhood at the time. I really took to that, for me, especially the computer science and engineering part of STEM really spoke volume to me, but also I grew up in a household where education was I would say nurtured first and foremost but, also we were kind of driven to be great in all things, so naturally math and science and engineering and technology especially were things that my parents valued and because of that they became things that I valued.

Some of the alumni enjoyed the problem-solving aspect of STEM, including the way of thinking and the imagination involved suggested in the interviews of four (16%) of the participants:

I enjoy working through a problem and reaching new understanding from logic alone, and you don't get that as much in other fields. Math lets you draw connections and create without anything more than the mind.

I love making connections and discovering things. To me STEM education is just interesting, and I want to satisfy my endless curiosity.

It's kind of what I was just interested in, especially in seventh grade when I experienced some of the science courses. I did not really see myself going into the arts because I just don't see myself as an artistic person; I was more thinking of the fundamentals of life and how things work.

Ever since I was young, my father had circuits and electrical components lying around the house. As a curious young mind, I would often gaze upon these circuits and imagine a sort of thriving community populating its surface. The roads connected each minor component to the central hub and other larger components. It looked like a town where all of the little people were just as significant as the big ones were, a perfect representation of a symbiotic society. I wanted to help people find ways to help others and get connected like a circuit. That vision as a young child matured itself into my drive for STEM.

An additional four (16%) alumni discussed the reasons they were engaged in STEM had nothing to do with STEM at all; instead it was about future success and furthering their education. One participant provided the following testimonial:

I feel like I'm engaged in STEM, I just kind of fell into it. It's not like I had a strong interest in math or science or anything like that. But when I was in school, my parents held me to a high academic standard and they said you have to get good grades in all your classes, whether that's math, science, history, whatever. So the school that I went to for elementary was actually a math and science academy and although I didn't feel there was a real focus on math and science, there were more enrichment opportunities for math and science. So I felt like I was very good in math and science, although the work was harder. I had to work harder in those classes; I felt that I learned more. So when I went to high school I was better than my peers at math and science and that kind of led through to college when I decided to pick a major; I knew that I was already good at math and science. Although my personality is more outgoing and a lot of careers in math and science are not much people-facing and I knew I wanted to do a people-facing position, so I thought it was important to have a technical background no matter what career I chose, so I did STEM for more future purposes and things like that.

The final theme agreed upon by two (8%) of the gifted and talented Black alumni was that STEM was a prominent, progressive field; it was "the face of the future" passionately expressed by one student; whereas, the other student stated,

I engage in STEM education because it is constantly growing and the amount that I can explore is limitless. I love making connections and discovering things; to me STEM education is just interesting, and I want to satisfy my endless curiosity.

As far as whom or what these students gave credit to for their STEM interest/initiation, the majority of participants, 13 (52%), stated it was their parents and various STEM experiences; seven (28%) related the STEM enrichment program, science fiction books and television, the Space Shuttle Challenger accident, and IMSAloquium.

Motivation

The gifted and talented Black male IMSA alumni were asked to describe their motivation to pursue/engage in STEM of which the following themes emerged:

- (a) learning/discovery of knowledge, (b) to advance humanity, (c) future success,
- (d) passion for STEM, (e) STEM is a progressive field, (6) competitive nature of STEM,

and (f) break negative stigmas of Black males/be a role model. The most agreed-upon theme was learning/discovery of knowledge stated by eight (32%) of the participants:

I really like learning, I fell in love with learning at IMSA and I've always been interested in math and science, so I thought that it could be sustained throughout four years of college.

I'm not sure what I'd like to do after college, but it will definitely end up being related to a STEM field. . . . I'd like to learn as much math as possible in undergrad, because I probably won't have the opportunity to learn as much math later on in life.

Part of it is me wanting to have a STEM background so I can know how to do research for example, so I know how to use certain tools to explain certain things. So it's that mixed with my interest in the living universe which is something that gives me joy in life and understanding how things work.

My motivation is that I wanted to learn more . . . I typically did well in school, so my family and friends encouraged me to keep going and keep exploring and read more, research things, even as a kid and so I think that that motivation pushed me and put in my mind that I can do this stuff if I put my mind to it whatever it is, the science and math, being an engineer, being a chemist or whatever, that I could do that one day if I learned everything and put my mind to it; so I think that motivation from other people motivated me to try to explore the STEM areas and to learn more about it and hopefully one day pursue a career in math and science.

The next two themes that each agreed upon of seven (28%) of the Black male alumni were to advance humanity and for future success. These alumni wanted to advance humanity, wanted to help others, and wanted to contribute in a positive way in society as depicted by the following remarks:

STEM is a very potent field that already has such an important place in society. I want to help people that do not understand certain concepts like using a smart phone or navigating a website to be able to understand how to use them properly and simply. My passion stems from my desire to help others.

For me, it started just in general in that I wanted to contribute to society in a positive manner; it's like kind of what my general dream was when I was a kid, just to be like able to make some people's lives better and so it just kind of happened that STEM came in and I was good in math and science. . . . That's kind of where my motivation comes from is to be able to use that skillset and that knowledge that I'll acquire in engineering and technology to be able to make that positive impact in the future

My motivation was I knew a long time ago that I wanted to do something in medicine. I have two younger brothers who are both autistic, so from an early age I got curious about the human condition, what makes people act the way they do, what is disease. You know just going to the doctor's visit and seeing how they treated my brothers and became intellectually curious about what you need to know to get there, so you know eventually I put two and two together and realized you have to take a path that includes some science, mathematics, and technology even to get to that point, so that's what got me interested. I wanted to do something that intellectually drove me and something I felt I could do that could give back to society. Doctors do a lot of stuff, they teach their patients, they can really do a lot of stuff, they can be leaders, so I think those are my main motivations.

The alumni who stated future success as a motivator wanted to be able to pay for college, have job security, and be able to provide for their families as evident in the statements below:

I want to change the world and give my family and my future family a life that I dream of. I don't want my family to be stuck in the endless cycle of poverty that exists in poor areas. I want my mom to live comfortably and be able to retire, when her time comes, with no worries. I want to be a leader and a role model for my two younger brothers to look up to and chase after. Lastly, I want to be able to help and change the lives of many people, and I my passion as well as the ability to reach all these goals lie in STEM education.

So I do research and stuff because, one, I want to learn more, just kind of a natural curiosity and, two, because it allows you to see different sides of STEM; and, three, something that I can be successful in and enjoy it, so I don't want a job that will be boring, but something that I enjoy doing.

I think for me I knew that if I wanted to go to college, knowing that my family was not in a great financial situation that I would most likely have to get a scholarship, an academic scholarship to make it through college, so that was a big motivation for me, just doing well enough in school and STEM to be able to choose which college I went to and hopefully get a sizeable scholarship to ease the burden from myself and my family. I really had the interest in school and STEM was just a major part of that; I really like the objective aspects of STEM and math was straightforward for me and I was able to understand it. My main motivation was being able to support myself and choose my own route and I thought being educated in STEM would give me a lot of options for the future.

If I want to be financially stable for my future family, I need to work hard. My interest in STEM is just my own interest, but my motivation is not really related to STEM itself; it's be successful, work hard; and that comes from my grandpa because he had to raise five daughters, and sometimes when I think on that it was

really hard for him; he had to work his butt off; and then I think to myself, I can't just sit around and watch TV, I can't do nothing, I have to work for my grandfather, work for my family.

My motivation has always been wanting to be successful and trying to be the best that I can be. My motivation in STEM is the same as it would have been without STEM, except STEM was more challenging, and I had to be more motivated.

An additional six (24%) alumni discussed their passion for STEM and the desire to be in STEM due to it being a progressive field as indicated in the statements below:

My desire, it's really tough for me to put to words why I do it, what's at the crux of that, but what I will say is I love that technology is ever-changing. I love that it's not static, I love that when I wake up tomorrow there will be someone that has figured out something that did not exist yesterday; when I think about the type of programming that I do and the work that I've done in the past, whether that be professionally in my career or just in my free time, none of this existed ten years ago; when I graduated from college the version of systems engineering that I work with currently did not exist and so for me that's one of the big, big pushes that's kept me there. I'm an intellectually curious person and literally these things keep evolving and evolving.

As far as motivation is concerned, I like the idea of kind of shaping the future to be completely honest with you and to see— There's a certain excitement that I get from the possibilities of technology. Take, for instance, when the first iPhone came out I could see some of the possibilities of what they're doing today when that happened seven years ago; that's very exciting to me, so I decided that's the way I wanted to go many years ago at this point.

I feel like STEM right now is probably one of the most stable fields you can be in; there's a lot of growth in that area and when I was kind of figuring out what I want to do with my life, I wanted to get into a field where I would have room to grow and a field that was actually growing as well; so I think I'm in STEM education for a greater purpose which is more long-term. So I don't know if I have a strong interest in STEM itself, but I think it's a great avenue to get towards more lucrative fields and stuff like that later in life.

So they [parents] were like you should choose some sort of hard science, not hard as in difficult, but something that is very specialized as far as your value on the workplace being high; and so science and technology were two of those fields, so for my future plans that's why I chose to get into that because that made a lot of sense to me.

The final themes that emerged were the competitive nature of STEM stated by four (16%) participants and to break the negative stigmas about Black males by being a role model as stated by three (12%) participants, as indicated in their comments below:

My motivation is self-propagated. I refuse to be as good as I was yesterday. And there is so much knowledge to be obtained regarding the unknowns of biochemistry that I have no power to refuse the call.

That's a good question, I think the first, in hindsight, now that I look at it, we are very competitive, my goodness, were we competitive. I remember being in middle school and whomever got the first opportunity to raise their hand and ask a question, we were competitive, we wanted to compete, see who would come out as a top student and valedictorian and I think this probably typical of a lot of kids.

I'd also like to expand my mathematical knowledge because it will provide me with the opportunity to become a role model for children sometime in the future, as an adult Black male with a strong knowledge of math.

Being an African American male, growing up on the south side of Chicago and later moving out, it's something that I realized I had that my peers didn't have. I felt like I had the weight, and we joke around, but in all seriousness I felt like I had the weight of the hood on my back. I felt like I had to do it, like I had to do it for the guys that were in jail. I had to do it for the guys that didn't make it on the street hustling. I had to be that example, that minority of Black men successfully doing something. I had to be better than everyone else because nothing was ever expected of, not me personally because things were expected of me, but me as a representation of Black males everywhere because not much is expected of us

Intrinsic Motivation

The gifted and talented Black male IMSA alumni were asked about their intrinsic motivation to engage in STEM of which four themes emerged: (a) learning/discovery of knowledge, (b) solve problems/to advance humanity, (c) obligation to the Black community, and (d) competitive nature of STEM. The most dominant theme agreed upon by 11 (44%) alumni was learning/discovery of knowledge, as communicated in their statements below:

You know [my brother] for him it was "I'm going to know seven languages." For me it was "I'm going to program in seven languages," and I think they look really different on paper, but I really think they are the same thing. I think you give a

kid a seed and you see how it grows, whether or not that's a cucumber or a tomato and so when I think about what's intrinsic to me about STEM, STEM is really the food that you give the seed, right. Once you have told that kid there's something to this whole learning thing, there's something to this whole being something greater than simply a rapper or an athlete, or I think that's the seed and out of that you have to guide the plant, so I think that's really where STEM comes in and so [my brother] used his very different . . . my younger brother used his different and he's in technology as well; even my youngest brother who teaches, I think it's just all really the same seed, watered differently.

I explained earlier about my interest in taking things apart and attempting to put them back together. I never really participated in STEM extracurricular activities other than science fairs when I was younger. Another thing that makes STEM interesting is my natural curiosity for how things and the world works.

I can remember playing with ants, grasshoppers, and June bugs. Then while in school we would learn about the different classifications of thing. I also remember reading about the human body for fun and also solving math problems for fun. I was a poor reader, but I would actually read about the brain, cells, and the types of plant "tropisms." I remember doing this stuff on my own, without a teacher or guide.

I love to learn as much as I can, especially in STEM fields, and I try to do so even when it's not directly applicable to my future career. In high school I attended summer camps at Stanford that focused on math that high school students typically don't see. I was very interested in the subjects that were taught, and I was eager to learn as much as I could while I was there.

Just those values that I grew up with, not competitiveness, but just a drive to learn more, just curiosity a lot of times; because I've been in positive academic settings, that's just what I expect of myself. It's not a highly straightforward reason; this is what I was exposed to and this is how I feel comfortable progressing; it's what feels right to me. Aside from desire for knowledge, it's being curious.

That is my only motivation. It's led me to pursue research in protein discovery modules for drug optimization at a top engineering school.

As far as my intrinsic motivation goes, when I was younger, my motivation came from just wanting to learn. Whenever I learned something new, I had an addicting "growth" feeling, as if I was surer of what happens in the world. Now, my motivation comes from learning about the universe that I am a part of. . . . I see us human beings being the scientists of the world; and even if you are interested in the arts, you are still an observer of life and use all of your senses to kind of understand what the world is all about; and for me what keeps me going is that I'm a scientist, the world is amazing. I can't simply live—I have to live and think.

The second most dominant theme was to solve problems to advance humanity, as indicated by nine (36%) alumni in their remarks below:

My motivation comes from my interest in the healing processes of the human body. Two of my most impactful classes at IMSA were Movement and Relaxation and Physiology and Disease.

My intrinsic motivation for STEM come from my love of charity and helping others and is manifested through education and other assistance. My goal as an engineer is to one day create a device that is able to easily and safely harness electrical power at a low cost to distribute to low income families and third-world countries. While I cannot fully see the path that leads to my goal, I am motivated to persevere in my studies and investigation in STEM because of my goal.

It sounds weird to say, but I want to be something positive. I like the idea of being able to impact something. I don't want to say the world because that's broad and cheesy, but the ability to change lives. I don't want to change everyone's life, but I've always liked the idea of being able to change one or two and so I feel that basically the motivation to help others kind of goes with being successful and doing what I'm good at. I don't know how to define an internal drive; it's something that I have always had ever since I was young, and it's kind of doing better and being better, but I don't know how to put that to words or why that exists.

Do I believe that when I'm writing this paper, this is the end all be all truth? No, not really. So I feel that's not really an issue when it comes to science and math. I really like for things to be concrete, so I think it's more so my inclination towards those things. It really bothers me when people can't problem solve or solve problems on their own, so I think that's something I get in science and math education, the problem-solving aspect; that's something that I really like, and I think it is an important skill. So that's what drives me towards STEM education.

I would say that would probably be a two-pronged answer. First it would be the desire to solve problems first and foremost, just the deep desire to understand the way things work and that tends to lend itself best to science technology more so than the softer sciences and humanities because in most cases as far as technology, there is a definite answer as far as how something works, the way it should work as opposed to humanities in which there are many different ways to get there and it's more subjective and I like the fact that in general technology is very objective and there's not a lot of interpretation aspects because that's not my best area and secondly just it kind of allows me to be creative in a certain way. Just to be able to take what I know and what I've learned and create something different out of that and let that grow is very appealing to me internally.

The next most agreed-upon theme was obligation to others, discussed by six

(24%) alumni:

Just like the community and the environment around me and just my own upbringing seeing everything that I've had the opportunity to be able to do and like the support and everything that I've had growing up and all the inspiration around me and being able to apply that to things and people who don't necessarily have that and to see where there are areas or things or people that might not have that, those opportunities to do those type of things and be able to engage in STEM; that is like the core of my drive to be doing that.

So early on in high school I got to go to New York and see firsthand what their educational system was dealing with; so it struck me as being in the position that I was in at IMSA, having parents that were positive in pushing me forward, I could see that in the future I needed to be in a position to give back to the community that I came from and specifically help people that didn't have the things that I had, the opportunities that I had.

One alumni who discussed this theme of being obligated to others saw STEM as a way out of his community and something that was unique for his community, as stated in the following testimonial:

But on a very basic level I think growing up, knowing that technology was a pathway out really resonated with me, knowing that college was a pathway out really spoke to me as a child. I think growing up poor was probably one of my greatest assets; when I look back. I don't even see it as something that was unique to me. I think that it's something that if you are taught at a very young age this is all there is. My parents didn't frame it as, "Oh you have 10 options or 15 options," or you can be anything. No, no, no that wasn't even presented that way; my parents felt there were a selection of careers and a selection of opportunities that were available to us and math and science simply offered the highest percentage, the greatest possibility of success.

Another student emphasized his belief structure and values that were instilled in him by the Black community as an intrinsic motivator to engage in STEM:

I'm a Christian and I believe that God has given me skills and I think that God has given everyone skills, so I think that my goals should be to maximize the gifts that I have and that means trying to do a good job with whatever skills that I have that I could provide both to my close community and my bigger community and just in a belief to work.

The final theme that emerged was the competitive nature of STEM, stated by two (8%) alumni, evident in their comments below:

I hate failing at anything, so for me I can't stand failing at something, I can't stand losing. I'm not a sore loser, but I don't like to lose, I don't like to fail. Once I find something that I want to do, I'm going to do it I'm almost obsessed with it until it gets done and until it gets done right. I hate failing and I'm my own worst critic.

As a child, I was a perfectionist, a sore loser, I wanted to get 100's on everything.

Extrinsic Motivation

The gifted and talented Black male IMSA alumni were asked to discuss their extrinsic motivations to engage in STEM of which seven themes emerged, including (a) break negative stigmas about African American males, (b) obligation to Black community, (c) future success, (d) STEM enjoyment, (e) STEM exposure, (f) self, and (g) money. The primary themes that emerged dealt with breaking negative stigmas of Black males and their obligation to give back to the Black community, both stated by eight (32%) of the alumni. Below are the statements from those that wanted to break negative stigmas of African American males by being role models:

I think it had to be tutoring and mentoring students. When I was able to make learning STEM topics fun for them I realized that a STEM career really was my passion.

I go into organizations and encourage members of those organizations to pursue STEM activities and invest in STEM programs.

I had really close contact with many young African American kids, and I was the youngest person in the program, so I was able to connect with the students that we worked with in a way that nobody else could, and I could see myself in so many of them and I felt like for a while, I had kind of failed them in a way because of the opportunities that I had and I kind of really didn't take advantage of that. That motivated me to be successful going forward after I had that experience, for the kids that I worked with, to be an example for them, for my little brother and sister. . . . I talk to some of the kids that I work with and stuff on Facebook and that really rejuvenates me to show them what they can do.

A lot of the accomplishments and things that I see from my peers, that inspires and motivates me; in turn that kind of motivates me to just want to be successful for the sake of people who might look up to me so that I can be a role model to other people the same way that other people have been a role model to me. So like at school, I'm part of the National Black Society of Engineers so I can be a positive role model to all the underclassmen; especially going to a school where there's not a lot of Black people in general, especially in STEM.

Of course, my brothers, I remember when I was a kid just looking around and seeing other kids my age, some of them seemed like they were interested in education. Those are the ones that I really bound to and became my friends and then also I remember another group of kids that almost kind of criticized others who tried to progress as far as their education, so I guess I put them in the camp of people who thought I couldn't do it, to prove to them that education does give you power, does give you influence.

My job is STEM related and that partially motivates me, as well as the desire to instruct and lead the next generation.

Then I think about that and I look around in my classes and there are not that many African Americans in those classes, especially African American males; so I think it's important to continue where I'm at and try to motivate other people. Like my mom is a counselor for CPS [Chicago Public Schools] and she always wants me to come to her school and encourage the students so I try to do that when I can and so that overall is a very big motivation for me to be a leader and to be an example of what people can grow up to do.

I spoke about being the one Black person and I went to Boston College, which has a reputation for not being so respectful to African Americans in general, and one of my things is I don't want to come here and take the easy courses. I don't want to come here and take an easy major; I want to go seek to a challenging major. I want to be something different and unique so I think that was a big part of it but I also think society tells young Black men that you will never be successful in science and in technology. It's constantly reinforced everywhere you look and for me I like that thought that I could buck that trend . . . even in my experiences, I worked for Adobe and taught for a while, you don't see the African American. Like I've never in a technical field worked with anyone that is African American, ever! To date, I think I've only met three or four Black people who program in any capacity and only because of my interest in NSBE, [the National Society of Black Engineers] and even within that, we are the strict minority, so I look at that, it disappoints me in some ways.

Those that received a push from others and in turn understood it was their responsibility to pay it forward made the following remarks:

I think a lot of motivation comes from a lot of pressure from friends and family, you don't want to disappoint anybody and you don't want anybody disappointed in you.

I think that one big person, I had a teacher in middle school who also taught my brothers and she was very influential in that she believed in me more than I even believed in myself. She really saw a lot in me and there was one point in middle school I was trying to be with the cool people and I don't know what I was doing, but I just was not as focused as I should have been, and she pulled me aside and told me I could be anything that I wanted. I could be the first Black president; she really saw that in me and when she looked me in the eyes and told me that. That was a big difference maker for me because it made me feel that if she had that amount of confidence in me and she had years of experience of teaching and I knew it came from a sincere place; it boosted my own expectations of myself and confidence in myself.

Parents, teachers, and peers, both positive and negative reinforcement, church community, media; everything has motivated me and its negative factors and positive factors. Like I had a teacher, my middle school social studies teacher, Mr. Henderson, was a major motivator as far as encouraging young folks to be more than just the next drug dealer on the street, so he's actually one of my biggest influences growing up outside of my household, outside of my immediate family. I also had some teachers in high school as well as college that were great motivators in having us achieve more than just the average.

I think it's encouragement and being told that I will do great things and the STEM fields that's where you need to be headed. I get a lot of push, not just from my parents, but from family friends who look at me and look at my position. They see that I'm doing well in college and they're proud of me and see me doing great things and they want to see me succeed. I feel like that's part of the external motivation, but sometimes I don't like the idea, because I feel people try to put everything on me or me and my friends.

First and foremost I got to say my parents; the first relationship starts off with your parents; they are kind of like the captain of your ship if you will, until you go to school. Aside from that, I point out a couple of really solid teachers I had growing up. I had an eighth grade English teacher, which I know is really strange, but she really helped to foster that intellectual curiosity. I had a third grade sort of general purpose teacher who was a pivotal person in my life. Even at IMSA, I don't know if Dr. Eggebrecht is still there or Ms. Yates—there were a number of other teachers that were there back then that were key—I would say that their purpose there was sort of opening up additional doors . . . I think about those people who were the very crux of and, of course, there are other people I'm . . . leaving out, but there are different people who reinforced the same thing again and again and again and that on a very basic level there's that person who constantly comes up and says, "Hey, have you looked at this?" "Have you examined this?" . . .

To not let those around me down, like my parents who really pushed for me to get an education and be successful; so I didn't want to let them down and show them that I can be successful.

An additional four (16%) alumni were extrinsically motivated by the desire for future success and viewed STEM as a means to an end, as indicated in their voices below:

You've got to want to succeed as bad as you want to breathe. These are words that motivate my actions.

I think that my parents had to struggle to provide the things for our family. They never made their struggle clear to the kids because those aren't children issues; but I wanted to get into a field where I can get a good salary, immediately after college without having to do further school, and engineering is one of the only fields like that. So I wanted to be able to provide for my family and things like that. . . . I think of college as a pre-professional development opportunity. . . . I think that whatever you learn in college should be applicable to some position to some job in the future, and I think that you definitely get that in science and math education. . . . So, I wanted to pursue something that would have some sort of tangible benefit for me, some type of return on my investment.

Most times my parents complain about paying bills and how much money we can spend. I want to be financially stable and independent so my future children won't have to worry about money. My family, my grandfather, even though he has passed away, he still motivates me in spirit.

STEM enjoyment and STEM exposure, each stated by three (12%) of the alumni, were other extrinsic motivators to engage in STEM. For the alumni who enjoyed STEM, they discussed the concepts of discovery, solving problems, and helping people as the reasons for their enjoyment, as indicated in the following statements:

It's always going to be a need for programmers and people to push the human condition forward and frankly as we grow forward, 10 years, 50 years from now; technology will be the only way to save ourselves as a culture because there are so many problems and not to sound, to have such a downer, but there are so many problems, and technology is going to be a way to fix a lot of those problems and not just technical problems, but problems with democracy, problems with communication, problems with just meeting people. In fact, science and technology is the way to solve a lot of those.

I'm thinking about applying to medical school in the future, so I'm enrolled in pre-medical classes in college. I probably wouldn't have taken some of these classes otherwise, but I'm still motivated to learn in them. While I might not have taken evolutionary biology, if it weren't for the fact that I was considering medical school, I also found the topics very interesting, and was definitely engaged in the course. The same goes for many of the other pre-med courses that I'll take if I decide to continue on this path. Although I might not have taken them if it weren't for a specific outcome I'm hoping for. I still value them for the educational worth they possess, and value the knowledge that I gain from them.

My extrinsic motivation for STEM education lies in my end goal for my STEM research. I one day wish to construct a device capable of generating electricity simply and safely. The construction of this device would demonstrate my mastery of my expertise in STEM and would manifest my desire to aid others through the use of technology.

The students who had early STEM exposure discussed that their parents and communities ensured they had access to STEM opportunities:

I guess I grew up in an upper middle class neighborhood and community and environment in Naperville, Illinois, and I think I enjoyed it, and I enjoyed the opportunities my parents had for me and I always thought I wanted to give my kids the same opportunities; and just sort of enjoyed, we call our station in life and thought that I could improve it, and I thought I could do some interesting fun things.

I feel as though growing up my father and mother fought very hard to make sure that I had access to a good education. I had access to communities that have the resources that I would need to grow as a human being; so starting there, being enrolled in schools where there were good teachers and good programs and resources, I was exposed to other students who were also looking forward to accessing these resources and I was exposed to teachers who had enthusiasm. I think the desire to do well academically came from the quality of education that I was introduced to by my parents when I was first enrolling in school.

One of the two extrinsic motivation themes, agreed upon the least, was self, only stated by two (8%) alumni:

My extrinsic motivation comes from actively supplanting myself away from any comforts, allowing myself no leverage for failure or mistakes. I financially and emotionally support myself on my own laurels without the aid of my family being over 1,000 miles away with no direct connections.

I'm sure there are some out there, but I didn't need any, so I didn't pay much attention to them. I had a ton of support, I can say that, but it wasn't necessarily

motivation. I started flying when I was 13, and my mom would take me to different camps; my family would tell me about summer enrichment programs and it was actually my uncle who was a tennis instructor and had a student who was going to IMSA and he told me about IMSA; and since the day he told me about it, I was trying to get into it. I was probably in fifth or sixth grade. I was pursuing it on my own.

IMSA's Contribution to STEM Motivation

Besides race, gender, and being gifted and talented, the participants also had in common the status of being alumni of the Illinois Mathematics and Science Academy (IMSA), a gifted and talented residential high school. Thus, the alumni were asked why they chose to enroll at IMSA: responding to a challenge, quality education/opportunity to learn, to leave home, to further STEM knowledge, and to make connections with people like me. They were also asked how IMSA contributed to their motivation to engage in STEM. The five themes that emerged were (a) immersion in STEM, (b) diverse environment, (c) challenge/better education, (d) self-awareness, and (e) loss of motivation. The primary theme stated by 10 (40%) participants was the immersion in STEM that IMSA offered:

I think that curiosity around math and science further developed when I went to IMSA. In ninth grade I had really reached kind of the apex in that because I didn't know there was anything greater and at IMSA it kind of opened a lot of doors for me, to see that math didn't stop at calculus or it didn't stop at trigonometry. There were more things beyond that and knowing there was this gateway to high level math for me was very pivotal. . . . By the time I left IMSA, I knew that I would major in math in college and so I first attribute a big part of it to my parents for providing me with the intellectual curiosity; my high school and a lot of the teachers I had were fostering that curiosity, and then just by my own desire to be involved in various things really kind of brought me to where I am now so.

Yeah, it definitely has. By going to a gifted residential high school I was able to see and experience math and sciences that I would have never have experienced elsewhere.

IMSA gave me a taste of what the professional field would be like years before I entered college. This allowed me to be in the proper mindset during my search for higher education and continues to influence my decisions in subjects I wish to learn and the type of work I wish to do in the future.

I was able to reach my full potential . . . in math I was able to double up and take pre-calc and calc on the BC level in one semester. That was a huge challenge and I was able to get through that, so I knew I could face any challenge academically . . . that opportunity and the opportunity to take physics classes . . . I would not be able to get all those interests if I was not able to go to IMSA.

I think it actually impacted me a lot and not that it is negative, but being in the physics and calculus classes I realized that just wasn't my interest; like I don't really like the kind of thinking process behind it. I really enjoyed the bigger picture, like I look at environmental science. I took EBE [Evolution Biodiversity and Ecology] and I enjoyed that class; I think it was the biologies that usually interested me, like chemistry not so much, but biology definitely, the bigger picture biology or even looking at diseases and Microbes and Disease, how your body works with the different things that go into it. So the biological parts of science was what really interested me, and I think being at IMSA I was exposed to so much of it and different types. There are so many different types of biology; you have doctors, but then you have veterinarians and you have ecologists . . . there are so many things IMSA exposed me to, which I think was really important, because it helped me figure out exactly what I'm interested in because if I had gone to a different high school, I probably would not have had those same opportunities and I may not have been exposed to everything.

You know, IMSA just really opened my eyes to STEM and above all I would say that IMSA really provided the resources. You know when I think about the biggest difference between where I grew up in East St. Louis and IMSA, I would say that it's hugely a matter of resources, and I don't just mean physical resources, I also mean people resources. At IMSA I had exposure to teachers who coded in 10, 15, or maybe 20 different languages. At my home high school, I knew one person who wrote C; so when you think about the difference there, it is just astronomically different. So in that sense IMSA just really changed my entire world-view from a technology perspective. It would have been largely impossible for me at my home school to do any significant programming; they don't have computers, they don't have the resources, they don't have the people. I would have had to reach out to school programs in St. Louis or it would have required a very, very high level of diligence on my own part . . . Whereas at IMSA, technology is everywhere, it's all around you. It is in the classrooms, it is in the work study; it is even in the insignificant interactions that you have with your friends; it's all sort of funneled through technology, technology is the catalyst.

The next theme most agreed upon was the IMSA environment, suggested by nine (36%) alumni. They enjoyed the diversity of people and being around intellectually inquisitive students, as stated in the following remarks of the IMSA alumni:

The first thing about IMSA and the reason why I went is that it got me out of where I was. So disregard all the special things about IMSA, but the fact that it was a residential school meant that I got out of my hometown, which was almost the single best thing for me and the one thing that helped to get to where I am; . . . and go to IMSA a place where like-minded individuals, where it wasn't bad to be good in school or at least care about it, I would say was the biggest thing to getting me where I am now and was extremely helpful in my development.

IMSA reinforced my love for science. I can never forget one of my favorite teachers at IMSA, Dr. Don Dosch; he was not only a great teacher, but a great motivator. At IMSA I wasn't the best student and I admit that; a lot had to do with not immaturity, but not being 100% focused. He always motivated me to strive more than just the bare minimum, to seek more out of myself; he was always trying to drive me to do more because he expected much more of me. So he definitely was one of the main factors for me wanting to continue my pursuit of science, despite some of my shortcomings at IMSA and just the environment itself fostered that. IMSA tends to foster greatness; . . . so it makes you want to step your game up, so IMSA has a ton of extrinsic factors that makes you want to be a better student because the competition is so darn stiff.

That's really easy and I've said it many times, but a lack for a better way to put it; being in school at IMSA, I was surrounded by the smartest people I've ever been around in constant concentration at any time in my life. Granted I've been around smart people since then, and I work with smart people now; but being around a bunch of kids who are just genuinely smart and imaginative and for 16 year olds, forward thinking was inspiring, to say the least, to put it simply, because it was all this motivation, sort of a competition.

I remember the biggest thing that I loved about IMSA was that I could have conversations, like real intelligent conversations about things that are going on in the world with kids that I couldn't have back at home with kids my age, and just the fact that these people were like me in that they thought about the world in that way; that motivated me to try to stay on top of things and I appreciated that.

I think just going to IMSA in general just opened up my eyes to an entire world that I never knew existed previously just of all the potential that I had and the potential that everyone else there had. It kind of just opened up my eyes to your smart, okay, you can get good grades, but what are you going to do with that and everyone there was just so driven to utilize their potential to their fullest and be able to contribute to the world in some sort of manner and be a success story and

that kind of really opened my eyes to there is more to being smart than just being smart.

I think having a real core of people, students who also have that intellectual curiosity and who are also into technology was really just mind-boggling for me and the variety of ways one could use it was again mind-boggling to me. Some ways were good, some ways were a questionable reality, but I think you don't get to the person who has a successful career in a STEM-based field without running the entire gamete of possibilities within technology and within science. . . . I don't know if I would have done half the things I've done, one-third, even without that exposure. . . . I took six math classes my senior year at IMSA alone, and I dropped my foreign language course so I could take more math; and so when I think about that experience, that taught me a lot about critical thinking, a lot about where I wanted to go with my career as a whole. So, honestly when I think about the difference that IMSA made it's really about opening the doors to and exposing people to different types of technology.

Other alumni discussed the IMSA environment in terms of the interrelatedness of the curriculum and the teaching and learning approach of inquiry/problem-based learning, as suggested in the following comments:

What can I say about IMSA? IMSA was probably the best formative years of my education, I think I was able to do things here at IMSA that I wasn't able to do at another school. I think at IMSA they give you the freedom to kind of be your own thinker. They give you the freedom to really inquire. They don't just point their fingers and say remember this or just give you random facts; they say if you want to learn about it, here's the materials and now you go and figure it out. That's how it was presented to us, so I think they taught us lifelong learning which is important because when you get older, there's not always going to be a teacher, a curriculum, or a syllabus to make you learn what you have to do, especially in medicine. . . . But here the teachers are just as hungry as the students are, like further your education. And then I remember the Wednesday's were like inquiry days. . . . So I think it's pretty wild that you have a day that you can do your own research, whatever it is, that interests you. No matter the discipline, you have a whole day to four years to carry out your research, present it, and further it in college. They really give you an opportunity to seize where you are.

IMSA, you know I think that IMSA, well, first of all I was part of a program that is probably no longer there—called Perspectives, which was a program developed to integrate not just our math and science curriculum, but also our history and literature course; so if we would read some literature about the middle ages and then we would study the history and in science class, look at science from this perspective of the middle age period and one of the things that I credit this program with doing is just showing the interrelatedness of everything; and for me

in my world now, years, decades later, it has proven like to be able to see the world and understand its interrelatedness has been huge, you know. . . . IMSA gave us so many opportunities. I remember taking math classes and there was no textbook, we weren't just given the answer, we were given problems and it's problem-based learning. . . . It was a much more focus on our individual learning, our individual discovery and I think the teachers and the school and the system all worked together to really bring that out of us. . . . technology is all those things; it's using science and math to solve social problems or to advance some sort of item or issue or whatever; and to do that you have to have a deep understanding of people, but also the science and math behind it, so I think IMSA does a very good job at preparing you for this.

Although 21 (84%) alumni believed that IMSA contributed positively to their motivation to engage in STEM, four (16%) alumni believed IMSA hindered their motivation as depicted in the following comments:

I think that was really one step along the path, I went to IMSA already knowing I was really good in math and could be good in science, not really thinking I was that good at humanities or other things like social sciences. I was not a big reader. I was really good at reading to learn something, like I did read a textbook, but not just generally a good reader, and at IMSA my other non-math, non-science teachers were phenomenal. In every regard they were just as good as my math and science teachers, and so I think I was most inspired by an English teacher and a history teacher and both of those teachers just woke up my interest in other things, and so that's when I actually started reading more and trying to become a better writer and expresser of my opinions and beliefs and just, you know, breaking down ideas into their different parts and a sense of synthesizing arguments; all the things that in addition to my analytical skills that I've always had and I always identified that make me good at what I do now.

I liked science and math a lot more before I went to IMSA. When I realized, "Hey, I'm not that great at this. I'm not really good at science as much as I thought I was." I thought I was really good at science before I came to IMSA and then I realized, "I can do the math classes kind of, but I really couldn't do the science classes." I went to gifted schools all through my education. I feel like the residential part was the only way I would have been able to go through a curriculum like IMSA just because I would not have been able to spend that type of time on homework and stuff at home. I wouldn't have been able to participate in so many extra-curriculas as I was doing; it was easier to do more because I was living at school.

The motivation factor was big for me. . . . I didn't appreciate it as much when I was there. . . . I wasn't really on top of things and having people competing with their grades and such kind of turned me off a little bit.

It's actually weakened my interests in the field, giving it an era of triviality and complexity with regards to the subject, the triviality being a result of the endless nature of the study where full knowledge can never be obtained.

Although four of the alumni suggested a decreased STEM motivation as a result of their enrollment at IMSA, two of them continued a STEM path. Other themes that actually motivated the gifted and talented Black male alumni to be engaged in STEM at IMSA included challenge/better education and self-awareness, both expressed by three (12%) participants and evident in their comments below:

It was definitely the challenge that I was looking for, so it did motivate me greatly. I don't think when I first got to IMSA, I was so sure as to how—IMSA STEM program has motivated more than any other STEM program I have been in. The quality of the classes and the diversity of the materials have made me a lot more excited than if I would have been if I had not attended IMSA, largely through all the experiential type classes that we've had. I took a lot of the biology classes at IMSA, and those were very hands-on. They were all lab-based and I really enjoyed that. So overall, it definitely did motivate me because of the opportunities that IMSA presented

I always believed that I can compete with anybody, and IMSA helped me with that, especially physics class, learning how to deconstruct and reformulate, and great formulas that apply to all physical situations. Being able to think with the same thought process that these great scientists think with, that gave me the confidence that I can think—it might take me a little longer— but I can think. It gave me confidence to go to college and I knew that I could finish the engineering degree when I saw the understanding I had about what it takes to get good grades.

It introduced me to a world of hard work and many sleepless nights. From this, I learned the value of time management, discipline, and focus. For me, IMSA was, and still is, a useful tool for achieving my goals.

IMSA shaped my success in college, the Air Force Academy, and then also in future training efforts. IMSA is really the first time that you truly understand how much there is; it's an eye-opening experience. IMSA brings about STEM as well as character and leadership if you allow it; it's an academically focused institution, but the opportunities to grow as a person, . . . Whether its leadership development, your own personal time management, whether its interpersonal skills, . . . to me, that was my biggest impact from IMSA, . . . so I really think the awareness you get from IMSA is one of its biggest successes.

It allowed me to develop a more independent sense of motivation. At IMSA there was really no one to urge you to do your homework or urge you to study for this

test; but rather you had to push yourself and that was one of the more challenging aspects of the STEM education was having, to be there always to push yourself to be successful.

The STEM Gap

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 a lot of students, Black male students, I don't think we see the other things that students may say that say go to private schools or out in the suburbs. I remember growing up and the teachers were so overwhelmed just trying to get through a day's work they didn't seem like they were really vested in our education per say and I think that kids can kind of read that, they can kind of tell. So if the student doesn't feel like what they're learning is valuable or that you care or that you're vested in them then that desire kinds of wanes.

I think about this sometime and for example when I look at U of I, and I don't know this for a fact, but when I look at other colleges, like the College of Business, I definitely see many more African Americans; but then when you look at the sciences or even my area, the College of Agriculture, you don't see them. I think African Americans just are not exposed as much.

I think there is a disproportionate number of Black and Latino students in general that come from low socioeconomic backgrounds. With that being said, statistics show that you are less likely to graduate grade school and even high school and if you do get to college, whether you pursue science or not, when there or so many more easier degrees to pursue. I think it starts in childhood being properly nurtured throughout school. I think the interest may not be there and that goes

back to being fostered to do that. Exactly why the gap is there, I'm not sure if it's because of the difficulty that lies inherently in math and science and/or engineering. But I think the educational gap is there and is evident based on state test scores.

I feel that the gap exists because so many Black males are unaware of the entire process of becoming a STEM worker. Some just say they want to be an engineer or a brain surgeon and don't understand the years of schooling, the subjects, and concepts that comprise that career. I feel that Black male students need to be better educated on the path they wish to choose and to see if what they desire is worth the effort they have to put in to achieve it.

When I think about the typical collegiate class everyone is discouraged from it. If you're not really passionate about, if you're not someone who is fascinated with math or engineering or whatever, you are discouraged from pursuing that. I think partly because the rigor of the type of classwork, I don't think that's a reflection on Black males, per say, but a reflection on the method of teaching and the perception of it as well.

That's definitely a difficult question to answer, but I think the most important factor behind this gap lies in access to quality education from a young age. For most middle- to low-income Black students, the hard truth is that it's impossible to be prepared at a high enough level to be able to compete in a rigorous college STEM curriculum. When the best high school that you have access to has 10% of its students at grade level, and an average ACT score of less than 16, schools like this do exist, and they tend to be in Black/Latino neighborhoods. You can hardly be expected to perform at the same level as someone who went to a well-funded high school with outstanding teachers. As long as access to education remains at its current level in low income Black neighborhoods, there's no way we can expect young Black males to suddenly take it on themselves to compete at a high level. There's too much of a disadvantage as it is.

The gap exists in my estimation typically because as Black males, geographically speaking, are in urban areas more often than not and funding for schools in general in urban areas tends to be less than suburban areas. One, to get into STEM and not be scared by STEM, you have to have a very good foundation in terms of math and science and more specifically math, really, and most kids don't get that now and if you don't get $1+1 = 2$ and multiplication and division, it becomes a very scary experience and they're turned off from that in my estimation, now.

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.

It's because at the base not enough people in their environment, in their day-to-day environment that they are interacting with are expecting them to go to college and that they personally are not expected to go to college; and when you're expected to go to college, I think you make different decisions. . . . So I think that the whole mind-set shift is the only thing that would increase the number of people that are motivated enough to even want to go to college, but they not only have to think, "Do I want to go to college? Is it possible? and Are there people who I can ask for help who are fundamentally invested in my future? once we get to the people who are actually going to college. I think the Black men are less prepared by a lot. I think if you look at the percentage of their parents who went to college, the White male sample size would have a higher rate of those whose parents went to college than the Black men and I think that influences people's confidence as well as people's access to resources and knowledge about the entire process. So I think Black men are less prepared to enter college on day one because they know fewer people that have been there, they know less of what to expect, and they have fewer people that are connected to them back home that are invested in their success and have done it before, so I think it becomes more difficult.

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 the gap exists because some are not really urged to pursue an education in science or math at a young age . . . I guess Blacks are always kind of discouraged by difficult math and science work.

I think a lot of our students don't prioritize education. I think they care about different things, like sports, or looking good, or trying to fit in, or being popular, so sometimes it falls down on the priority list and sometimes you're even teased for pursuing education. I know I was when I was younger, I got teased a lot because I was trying to do my work, turn it in on time, ask questions, you know, so I think that was another reason.

You know when I was growing up and decided I wanted to get into a career, I looked around for successful people of color and I tell you, you have to do a lot of digging, a lot of digging. I remember wanting to be like E. Stanley O'Neal who is the first Black CEO of Merrill Lynch back before he kind of wrecked that one; that tenure wasn't quite so rosy, but I will say that a lot of it is about perception. Young Black men don't see technology or science or engineering or math as being those glamorous areas; it's not like rapping. . . . We are told that if you want a house in the suburbs, if you want a 7 series, if you want a nice family with a kid

that goes to a really nice school, you need to be a rapper, you need to be an actor, you need to be a ball player of some sort, basically you need to be a celebrity and I think STEM gets a really bad rep. . . . Now, so let's talk about legacy, on the legacy side, people who are Asian and are White and in technology, they often have parents who foster that, they buy them tablets when they are five years old, they got the latest in computers back when computers cost \$10,000 . . . so the pedigree is different; they have a legacy of being in technology. Their parents knew what summer camps to send them to.

It exists because the Black community allows it to exist. I don't believe it is a matter of socioeconomic status because many Black people of all socioeconomic status are subjected to the social stigma of being businessmen, artists, and communications specialists.

I think there is kind of a vicious cycle that stems from a lack of representation of African American males in STEM and just kind of like a stigma of STEM in general in the African American community—that it's just not for them, that it's just not for us. It's like both of those kind of feed off each other and it's just a vicious cycle that keeps people out of it.

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.

I think a lot of people have the wrong idea about STEM and people think that it is so much harder than everything else and in Black males, you get a lot of times people saying around them "you can't," "you can't." The gap I would say exists and from my personal experience because of how the African American culture looks at education, it has never been viewed as a good thing to be smart, to care about school, and so I think that that mindset will be one of the biggest things that keeps African American males down and makes that diversity divide because I know that once you get up further in higher education there are less and less African Americans, especially in STEM, and I don't have a reason for why STEM is any worse than other higher education, but that mindset that a lot of African Americans have and the culture kind of precipitates is why I think that there aren't more African Americans in higher education and STEM fields

I think its culture and history that is causing this gap. Black people have always had to overcome adversity and at some point we become okay with mediocrity in our educations. I saw that when I went to school in an all-Black schools. The culture was that it's not "cool" to be smart, you must make it playing sports, in music, or you get caught up in gangs.

If Black males are introduced to STEM with the same frequency as they are introduced to sports or violence, then more students will pursue STEM fields.

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 would say this, a large, large, large part of it is about perception, so I speak about perception and I'll speak about legacy, perception in the sense that Black men in the media, on television, even in real life are often not portrayed as being highly technical and when we are it's always in a negative way,

Let's say, take for example Asians, Asian Americans, their models, societal media, so forth, so on promotes success for them as doctors, lawyers, and as a culture our community says success for you as a Black man is an athlete or some other professional along those lines. I can think we have to change because I'm a big believer in the fact that media plays a huge role in part in who we are, whether we believe it does or not because frankly you're exposed to it constantly, radio, TV, internet; just images are shown to you constantly. . . . What's the word I'm looking for, reinforcement of negative images or not even just negative images but non-productive images can be very detrimental to us.

I think it has to do with the persistent stigma of being a book worm or a nerd or uncool. I think all of these things contribute to why or what's causing a gap. In addition to inherent, institutional, or generational gaps dating back to slavery times, but that may be a different discussion.

I believe that in America, pop culture and racial subculture targeted at Black males are counterproductive towards an emphasis on the merit of education. There a great deal of pitfalls set in place within our society to ensure the perpetuation of the under-education and failure of the Black male to advance himself in society.

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 alumni (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, the gifted and talented Black male alumni having more Black males involved as mentors/role models was stated by 14 (88%) of the 16 respondents, and exposing Black males to STEM inside/outside the classroom, stated by four (25%) of the 16 respondents. Of the gifted and talented Black males who stated there needed to be more mentors and roles 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.

STEM Path and IMSA's Contribution to STEM Persistence

The gifted and talented Black male alumni were asked to discuss their reasons for continuing or discontinuing a STEM path, and for those that continued a STEM path how IMSA contributed to their persistence in STEM. Twenty (80%) of the alumni were still engaged in STEM; whereas, five (20%) of the alumni were no longer engaged in STEM. Two themes, when addressing reasons why the alumni engaged in STEM, included (a) interest in STEM and (b) STEM is who I am. The most agreed-upon theme was interest in STEM, reported by 14 (70%) of the respondents in their comments below:

It happens that my interests fall within this category. I merely wish to advance my interests and to impact the world with positive momentum for both myself and others. STEM is merely a label to encompass a variety of studies in my eyes, and though it describes what I am studying, my vision transcends the words.

I continued the STEM oath because I was shown with all the opportunities and everything you can do with a STEM path; it just really interested me and inspired me. I found my passion and that's why I continued with it, and I had the support and knew I could continue with it and face all the challenges that lie ahead.

I knew that, in order to get to med school, you have to do your premed course work; there are certain things that are unavoidable and classes you have to take and surprise; surprise a lot of them are tied into STEM, so that was one reason, I had to do it. But secondly, those are the most exciting types of classes to me. I

feel like STEM pervades everything that you do, even the literary arts. I think STEM is a way for you to communicate as a professional, you have to have some sort of competency in STEM, especially coming from a place like IMSA and I love it so much, so it makes sense that I would want to go to a school to continue.

I think I continued this because it interests me a lot, but overall what I've noticed with all the classes I've taken at IMSA and in college, I'm actually more interested in the humanities. I had an American Studies Class and Modern Theater and I like the English classes and I really enjoyed French; and a lot of times those classes seem more interesting to me than some of my science or STEM related classes, but I think because I built a river for myself in pursuing a career in STEM. I like natural resources and I like thinking about how I can improve the world and I think because I created this river I have this drive just to continue in that.

Coming out of IMSA, because of my interest in life and the way it works, I've always been interested in biology. I took cognitive science, because I thought it was a way to delve into other areas. I really like the framework that it presents in thinking about the world and thinking about what it means to be a living organism and the many different ways that can manifest itself. I also have a passion for social issues and I want to do something in my life that is more accessible for those that are underprivileged; in that because of the framework that cognitive science builds for learning and how we see the world, I want to take that and do something with education in general and I think that cognitive science is a good way to keep me connected to the sciences and have the tools to make compelling arguments and test hypothesis, but also give me a framework that I can use in education-type settings to understand people better and understand how to convey information and help people develop in their own way.

The secondary theme agreed upon by six (30%) alumni discussed that STEM was innate in them; they had spent a lot of time invested in STEM engagement as indicated in their authentic voices below:

I continued with STEM because I honestly couldn't see myself doing anything else. Most of my education to this point has been very STEM focused, and my high interest in STEM subjects has led me to continue to study them in college.

Honestly for me at least, I don't think there is any other direction I could have went into. I mean grant it I write poetry and I do musical stuff, but at my core I believe that I am very much a logical problem solver and so I think that was really the only other path I could have gone down, whether it was engineering or some sort of mechanical engineering, or some of sort of software engineering which is what I do. I don't think there was any other path I could have went down because it made too much sense to me. I have a talent for seeing solutions, give me a problem and see the solution.

I continued a STEM path in college because honestly I could not see myself doing anything else because like I've already had this background at IMSA pursuing goals in STEM education . . . like getting an A on that paper in science or reading new research papers.

For me, early on, probably sometime at IMSA, it really just became sort of this intrinsic part of me. It would have been really, really, really hard for me to go into something that's not STEM focused. I don't think it was ever a thought, you know, maybe I would have gone into something like finance, . . . well why did I continue? I continued because I did not really see it being any other option. . . . I couldn't see myself being outside of technology. Maybe I would teach, but I don't really know much outside of STEM. I wouldn't consider myself teach worthy other than technology. I'm so entrenched in it now, it's no going back.

I never really considered in any other thing except math and science . . . I was passionate about math and loved science; so it was just kind of a natural fit. . . . I knew I could get a good job and put my knowledge to use.

For these gifted and talented Black males alumni who were currently engaged in STEM, all of them reported that IMSA contributed to their persistence in STEM. Several themes emerged, including (a) perseverance/confidence, (b) higher quality STEM engagement, (c) problem-solving ability, (d) life skills, and (e) diverse environment. The dominant theme was perseverance/confidence, stated by eight (40%) of the 20 alumni respondents, as evident in their comments below:

I feel as though IMSA exposed me to so many things in the STEM field in such intricate ways that it gave me the confidence to keep pursuing those things in the future.

IMSA was rigorous. While I failed at times, I grew immensely overall. I learned to persevere despite how difficult or daunting a subject is. I also learned how to start and finish something, further demonstrating perseverance. I feel that IMSA played an integral part in my current stance on STEM education.

I think that challenges that I faced there and the difficulties taught me how to work hard. There were weeks when you had history papers and math tests and you don't know how to get through it. I think being on the other side and you get through it, you gain that self-esteem and know that you can pretty much get through anything.

I know IMSA had some problems with students dropping out, and I know it's a very difficult thing, and it doesn't get any easier, but at the same time having

survived three years of IMSA makes college a breeze, but it's still a lot of work, but you are prepared for it, and you're ready for it so getting hit with a slice of homework and understanding the effort you need to put in is no problem so having done it through high school has kind of made college not a surprise.

Attending IMSA, I'm 100% positive that I wouldn't be an engineer, studying engineering if I didn't go to IMSA because IMSA prepared me both academically to be able to pursue it and continue with a STEM field and gave me the courage and support to know that I could take on whatever; that I would be able to get through it as a Black male, that I had the support network to learn everything and without that I don't think I would be able to continue STEM.

think another good thing about IMSA is if you do make mistakes here, it's not the end of the world; they kind of expect you to make mistakes. I think it's a very safe learning environment. I think it really cultivates the best of you, you can only get to the best of you if you make mistakes. So I guess you get knocked down at IMSA a lot, it didn't make me afraid to be knocked down in college and med school.

I learned the value of perseverance at IMSA. The rigors of IMSA's education and the support presented there made me feel like I could make it.

An additional six (30%) alumni suggested that IMSA provided them with a higher quality STEM engagement by being exposed to STEM literature, topics, and careers as reported in the following comments:

I find that the exposure to scientific literature and the ability to understand it, the ability to abstract, and the identification and management of variables are all skills that have directly applied to various courses while at IMSA.

It introduced me to a wide variety of STEM topics which allowed me to decide what I like and what I don't like.

IMSA prepared me by giving me access to a higher quality of STEM education that I wouldn't have received otherwise. The quality of teaching at the school, and the resources that were given to us made the transition from high school to college very seamless, and definitely led to a higher level of success in higher pursuit of STEM knowledge.

I think the exposure to different opportunities. I remember at IMSA, just the different labs we had and biology, I got a chance to take MCB [Microbes and Cellular Biology] which most people don't see till college. I had a chance to take Environmental Chem, and I think that IMSA prepared by providing the different types of classes,

It helped most in that it gave me an awareness of the plethora of knowledge I will never obtain, to give me a rational basis to make the decision to go into STEM understanding my limited ability to completely grasp all there is to know. I will fall short, and knowing that is my greatest strength.

I became more aware and confident of what STEM fields are about and how I can succeed in them. When I first came to IMSA my sophomore year, I thought there was not a point, but as I progressed I saw the light at the end of the tunnel. So I thought if I'm going to have those ups, I'm also going to have those, downs and I thought it was worth it.

The gifted and talented Black male alumni also indicated that the development of problem-solving ability learned at IMSA also contributed to their persistence in STEM, as stated by five (25%) participants. They discussed the ability to conduct research and think analytically as discussed in their remarks below:

My STEM high school experience was not easy. I was not a straight A student, but I understood the value of working to solve problems. In the real world, organizations reward problem-solvers; this is what my STEM-focused high school taught me, the process of solving problems.

IMSA definitely gave me the ability to do research and write in a research style. I've never been great at creative writing, but now when I write anything, it has that research taste to it; it's very scientific and I really appreciate that. I know how to go online and look for a journal and extract what's important and be able to produce my own results and describe it in a way that is meaningful for the scientific community to see, so that's one big thing that IMSA prepared me for through MSI and SIR [Student Inquiry and Research] and just in the classes. IMSA's math program did get me thinking about math in a way that I would not have learned had I been taught traditionally. . . . The math program got me thinking about the way I receive information and how to use it even if I don't plan on doing a lot of math in my future. . . . Just the entirety of my experience at IMSA, the inquiry-based model and hands-on experience that I got have really prepared me to take on so many different challenges. I feel comfortable going into a lab and knowing the materials, even the computer science classes at IMSA has given me confidence.

The problem I think in the inner city and especially among Black males is just that we simply aren't taught to think critically in a lot of ways; rather, we're not taught to think critically in the right ways. We're very critical thinking when it comes to getting away with something. If you've ever met someone that's dealt drugs for a long time, there are some very critical thinking people; it's just misapplied, you know, that knowledge is just used in a way that's not benefitting anyone except maybe that small self-benefit, so I think IMSA just really fostered

that. IMSA is very good at convincing people to think critically about everything, anything no matter what that is.

The analytical thinking and the systemic approach and the way I analyze things and answer questions can be applied to a lot of things, including business; it carries over and there are a lot of ways in which I benefited from IMSA.

A few of the alumni discussed how IMSA made them a better person by giving them a foundation that prepared them for life, as evident in the following statements of three (15%) of the alumni:

. . . but also how to learn, how to study, how to manage your time because a lot of times in STEM-related fields, there is a lot you have to do especially if you decide to be an engineer or doctor and it's going to require good time management skills and I think that being at IMSA you definitely learn how to manage your time; you learn how to choose, how to choose your battles, you learn to have other interests, so I think being at IMSA helped build upon those skills.

IMSA was absolutely critical in my success and provided an incredible foundation that I still rely upon today. The foundation that I got at IMSA helped me in college. In life IMSA's biggest success or benefit to me was whole person and leadership development; but academically specifically. I'll admit I was probably one of those guys that came in probably average in the IMSA realm. So I came in doing MI [Mathematical Investigation] II, I hadn't taken geometry yet, but I was on pace to complete three semesters of calculus at IMSA. . . So IMSA showed me just how difficult it is to excel in math and science, and it really helped me count the cost, if you will, . . . I got to the academy and I started to realize more so than anything it's still that life experience, you have to manage your own time, no one is there to tell you to study. You have to go in for extra help when you want. I think that the academic schedule of IMSA is absolute phenomenal.

Looking back on it and some of the stuff we did at IMSA, it's like, "Wow, I really learned a lot." What was great about IMSA, at least looking back at it now, even though it was not the most pleasant experience during, is that the classroom was one-stop learning. I got all the tools I needed and time management, the study habits, just having hard work and having to navigate the hard work, that was one facet. Being in a multicultural environment that was another facet; as far as being able to exist and interact with other ethnicities, being away from home and having to handle that, basically having to grow up at a very young age, trying to balance a budget, going across the street to Eagle getting groceries and doing all that stuff. All those things both inside the classroom and out are without a doubt what made me a better person from a work ethic standpoint, from a worldview standpoint as far as self-awareness and awareness of others, respect for others and all around for

me, a better person. So I think IMSA helped me in every facet of my life as much as I hate to admit that.

The final theme that emerged, suggested by two (10%) alumni, had to do with diversity. One respondent stated, “I think that in the case of IMSA, the thing that prepared me best was two things: the experience with students of other cultures and other thought processes kind of broadened my own.”

Although the majority of the gifted and talented Black male IMSA alumni were currently engaged in STEM, there were five (20%) alumni who did not continue a STEM path. The primary reason was that the alumni developed other passions; some still enjoyed STEM, but did not have a STEM vision for themselves as indicated in the following remarks:

I really don't like working in front of computer with computers 40 hours per week. . . . Once I realized I didn't like that I was kind of back to square one; what am I going to do with my life? I didn't know what else I liked and so I did an internship at Microsoft and saw something else. I saw people who were problem-solving lawyers in an engineering environment with a business team, so it was like the engineering team, the legal team and the business team and the lawyers were the ones trying to move the ball forward for a project and it involved all three groups, and I saw their ability to work the room, their ability to creatively problem solve. . . . We do some business stuff in that we talk to both sides and try to figure out financially what are the different drivers and decisions, how to split up the money, what constitutes dissolving the relationship, and what business terms should be used, and then we have to focus on the concern, what is allowed, and how to protect the client, and I absolutely love it, and it's not actually a STEM field, but it's using the same core skills that I've always known I was good at, which is finding solutions to problems. The math, the background I have now is applicable to finance and it's using communication, writing, and talking that I never had going into IMSA, but that IMSA helped me get!

I think that I gained a lot from time in STEM and there were a lot of benefits of studying STEM such as the analytical thinking, but for me I had a great passion for chemistry. I never really saw myself as an engineer. I think that business was an area I was really interested in and so I kind of applied it to the sports industry and that's the role that I'm in now; but I did not avoid those fields because I did not have interest in them; it was more I just found other passions.

It's a pride thing. I remember being at IMSA and struggling with my math and science classes and I remember thinking, "Last year I was killing these classes." . . . I had too much pride to say I'm really not getting this stuff, I need you to sit here with me until I understand it." . . . I didn't have the type of analytical mind for those fields, as far as working with numbers, number crunching, and all the things that go into engineering and things like that. I see myself more as a humanities guy. But I feel as if I could have been more successful in the past if I did not have that pride blocking me from actually reaching out and getting the help that I needed, and I feel like that's the case with a lot of kids, a lot of Black males especially, in any field.

Well, I think it all stems from two things: one was you come from a poor family and you're curious about the world. I mean when I was a kid I wanted to travel. I wanted to go abroad and see things and I didn't know how I was going to see things, so I did the next best thing which was go to the library and go the foreign section and read books about foreign languages and foreign lands and foreign places; and by the time I got to college and I was actually able to travel abroad and the college was going to pay for it. I never looked back; studied in China, Beijing, Paris, Morocco, and volunteered in Nicaragua and performed with an acapella group throughout Europe. . . . China, so I went to China and I thought I would make millions, but China didn't open up the local equity market to foreign investors, so that opportunity never came. So . . . I moved from product side to sale side which took me to places around the world again: Brazil, Dubai and Jordan, Poland, South Africa and again there is always this dialogue of understanding your customer and customer needs to be able to take those needs and desires and translate it into a product spec. Of course, these are real people so you want to satisfy those needs and desires . . . so that was sort of my path . . . I mixed two things. I mixed culture and all things abroad with wanting to create a product that people enjoy or changes their life for better, whether it's a solar panel that powers their cell phone or a filter for being able to convert dirty drinking water to clean drinking water.

I did not continue a STEM path, because even when I was young, my family was in business and I knew I wanted to pursue a finance path. I kind of knew that before I came to high school so then once I came to high school I really realized that I liked math and math is useful, but I wasn't really interested in science as much; and as my STEM education continued, I came to realize I was not that huge of a fan of math as well, whether it be because I didn't see the application aspect of it. I thought it was a lot of theory. Also, I didn't see my career going in that path. I knew I wanted to work in the financial services industry, so I stopped my STEM education, stopped taking science and math classes, simply because I don't really see the application aspect and I don't see the exit opportunities from STEM.

STEM Motivation

The research question asked, *“What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?”* Alumni interview responses to this question by gifted and talented Black IMSA males regarding motivation to engage in STEM yielded an overall intrinsic motivation to engage in STEM. Being alumni of the Illinois Mathematics and Science Academy was the primary factor that contributed to Black male motivation to engage in STEM, along with immersion in STEM, being in a diverse community, the educational challenge, and enhanced self-awareness as the most significant aspects of IMSA’s contribution to their STEM motivation. Other factors that motivate gifted and talented Black male alumni of IMSA to engage in STEM are listed as follows:

1. Learning: Discovery of knowledge
2. Obligation to Black community/break negative stigmas about Black males
3. Solve problems/to advance humanity
4. Success
5. STEM passion/enjoyment
6. STEM is a prominent/progressive field
7. Competitive nature of STEM
8. STEM exposure
9. Self
10. Money

This study also provided a gifted and talented Black male perspective about the literature's suggestion that there is a Black male STEM gap and ways to minimize that gap. Table 2 below shows a comprehensive snapshot of gifted and talented Black males alumnus' thoughts of the STEM gap, reasons why they engaged in STEM, authentic voices regarding their STEM motivation, how IMSA contributed to their motivation, and opinions about motivating Black males to engage in STEM ($n = 25$)

Table 2

Alumni Perspective: Gifted and Talented Black Male Motivation (n = 25)

Why a Black Male STEM Gap	Why STEM for Gifted and Talented Black Males	Gifted and Talented Black Male Student STEM Motivation	Why STEM major or career	IMSA's Contribution to STEM motivation/persistence	Why Not a STEM major or career	Motivate Black males to engage in STEM
Lack of STEM vision for Blacks, n = 13	STEM interest, n = 13	IMSA, n = 21	STEM interest n = 14	<i>Enhances Motivation,</i> n = 21 –Immersion in STEM –Diverse Environment, around more culturally diverse and intellectually inquisitive students –Challenge/ Better Education –Self-awareness	Development of other passions, n = 5	More Black Males Mentors/Role Models, n = 14
Lack of STEM Exposure, n = 13	Good at STEM, n = 7	Learning, Discovery of knowledge, n = 17	STEM is who I am, n = 6		Like problem solving aspect of STEM, but STEM is a hobby n = 2	STEM Exposure inside outside of the classroom, n = 3
Negative stigma of and misperception about Black males, n = 6	Intellectual curiosity, n = 5	Obligation to Black community/ break negative stigmas about Black males, n = 16				
Lack of Parental support, n = 2	Success, n = 4	Solve Problems/To advance humanity, n = 12		<i>Hinders Motivation,</i> n = 4 –Not that good in STEM –Triviality and complexity of STEM –Competitive nature of STEM –Development of other passions		
	Problem solving aspect of STEM, n = 4	Success, n = 11				
	STEM is a prominent, progressive field, n = 2	STEM Passion/ Enjoyment, n = 8				
		STEM is a prominent/ progressive field, n = 6				
		Competitive nature of STEM, n = 5				
		STEM exposure, n = 3				
		Self, n = 2				
		Money, n = 1				

Gifted and Talented Black Males' STEM Motivation: The Gifted and Talented Black Male Perspective

Thus far, there has been an examination of the motivation of gifted and talented Black males engaged in STEM from the perspectives of students currently enrolled at the Illinois Mathematics and Science Academy (IMSA) and from the perspective of their alumni. This section takes an intricate look at the collective thoughts of 45 gifted and talented Black males who have been engaged in STEM at IMSA. It also looks at patterns that exist between the groups as well as differences regarding STEM motivation, STEM support, IMSA's contribution to STEM motivation, STEM achievement gap, and the minimization of the STEM achievement gap.

Why STEM

The gifted and talented Black males were asked why they were engaged in STEM education, yielding a 100% response rate. The dominant patterns that arose between the two groups was the enjoyment of STEM/STEM interest, reported by 18 (40%) participants and being good at STEM, reported by 11 (24%) participants. Other patterns that were established included to be successful, to solve problems in an effort to advance humanity, and that STEM was a prominent/progressive field. As far as differences, the current students stated their parents pushed them along with their pursuit of scientific knowledge and having intellectual curiosity. When asked about their STEM support network, the common responses included parents, family, teachers, friends, and the school system. The gifted and talented Black male alumni also discussed being members of various organization, other IMSA alumni, and the church as part of their STEM support system.

Motivation

Responses were given by 34 of the 45 of the gifted and talented Black males who were asked to describe their STEM motivation. From their responses, three distinct patterns emerged that included learning/discovery of knowledge stated by 11 (32%) respondents, solve problems to advance humanity stated by 11 (32%) respondents, and passion for STEM/STEM enjoyment stated by 10 (29%) respondents. There were quite a few differences. As motivational factors to engage in STEM, the current students discussed money as a major STEM motivator; whereas, the alumni discussed success, the competitive nature of STEM, and the breaking of negative stigmas about Black males.

Intrinsic Motivation

The gifted and talented Black males were asked about their intrinsic motivation to engage in STEM, of which 36 participants responded. There were four patterns that arose: learning/discovery of knowledge reported by 15 (42%) participants, solve problems to advance humanity reported by 14 (39%) participants, obligation to Black community reported by eight (22%) participants, and the competitive nature of STEM reported by eight (22%) participants. There were no differences, but an interesting finding was that the current students, six (55%), reported a competitive nature as their primary intrinsic motivator; whereas, two (8%) members of the alumni reported their competitive nature as the last intrinsic motivational factor.

Extrinsic Motivation

The gifted and talented Black males were asked about extrinsic factors that contributed to their motivation to engage in STEM, of which there were 36 respondents. Several patterns developed with success and to break negative stigmas about Black males

as the most common between the two groups, both reported by 10 (28%) participants. Other patterns that developed were STEM enjoyment reported by seven (19%) participants and money reported by four (11%) participants. Although money developed as a commonality between the current students and alumni, only one gifted and talented Black male alumni reported it. In terms of differences, the gifted and talented Black male alumni also discussed obligation to Black community, STEM exposure, and self as factors related to their extrinsic motivation to engage in STEM. A major difference for the current students was they indicated a loss of STEM enjoyment as a factor of extrinsic STEM motivation. Although these two current students no longer enjoyed STEM, they still viewed a value of it and planned on pursuing a STEM major/career.

IMSA's Contribution to STEM Motivation

Besides race, gender and being gifted and talented, the participants also had the Illinois Mathematics and Science Academy (IMSA), a gifted and talented residential high school, in common. Thus, the 45 participants were asked why they chose to enroll at IMSA, generating a 100% response rate. The primary patterns were for a challenge reported by 16 (36%) participants, to receive a quality education reported by 14 (31%) participants, and to further STEM knowledge reported by 13 (29%) participants. Other patterns that developed were to make connections with people like me, wanted to enter a STEM field, college preparation, and to leave home. In terms of differences, the current students also discussed their desire to make a difference, their parents made them, and one student passionately responded, "I love STEM." The gifted and talented Black males were also asked how IMSA contributed to their motivation to engage in STEM, of which 37 participants responded. The majority of the participants agreed that IMSA enhanced

their STEM motivation, stated by 32 (86%) participants; whereas, five (14%) reported that IMSA hindered their STEM motivation. For the participants that reported IMSA enhanced their STEM motivation, the current students and alumni identified the same reasons:

1. Immersion in STEM, $n = 16$ (43%)
2. Diverse Environment, $n = 13$ (35%)
3. Challenge/Better Education, $n = 8$ (22%)
4. Self-awareness/Independence, $n = 4$ (11%)

The participants who stated IMSA hindered their STEM motivation indicated that they did not like competing with other students in STEM at IMSA; they realized they were not as good at STEM as they initially thought; they did not like the complexity of STEM, and/or they developed other passions at IMSA as factors that decreased STEM motivation.

The STEM Gap

The gifted and talented Black males 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. Forty participants addressed reasons for the STEM gap, developing three patterns that included lack of STEM vision for Black males reported by 19 (48%) respondents, negative stigma of and misperceptions about Black males reported by nine (23%) respondents, and lack of parental support reported by eight (20%) respondents. The respondents also mentioned lack of STEM exposure as a contributor to the Black male STEM gap. So, what makes these gifted and talented Black males different than those

who have not engaged in STEM? In terms of differences, the current students discussed how they had typically been the only Black male in academic classes; whereas, the alumni discussed how they were exposed to STEM early, were good at STEM, and had determination. To minimize the gap, the primary pattern that arose was more Black males were involved as role models/mentors reported by 19 (78%) of the 24 respondents. The other pattern that arose was early STEM exposure inside and outside the classroom reported by four (17%) respondents. In terms of differences, the current students also discussed the need for a nation-wide intervention and parent education as initiatives to address the Black male STEM gap.

STEM Motivation

The research question asked, *“What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?”* Regarding motivation to engage in STEM, intrinsic motivation to engage in STEM, and extrinsic motivation to engage in STEM, the following are focus group responses from the collective voices of 45 gifted and talented Black males currently attending IMSA and gifted and talented Black male IMSA alumni. Being a current/past student at the Illinois Mathematics and Science Academy was the primary factor that contributed to Black male motivation to engage in STEM, with immersion in STEM, being in a diverse community, the educational challenge, and enhanced self-awareness as valuable aspects of IMSA. The patterns that developed as factors that motivate gifted and talented Black male alumni of IMSA to engage in STEM included the following:

1. STEM is a progressive field which leads to success, $n = 28$ (62%)
2. Learning/Discovery of knowledge, $n = 25$ (56%)
3. Solve problems/to advance humanity, $n = 21$ (47%)
4. Obligation to Black community/break negative stigmas, $n = 16$ (36%)
5. Passion for STEM/STEM enjoyment, $n = 10$ (22%)
6. Competitive nature of STEM, $n = 8$ (18%)
7. Money, $n = 8$ (18%)

This study also provided a gifted and talented Black male perspective about the literature's suggestion that there is a Black male STEM gap and ways to minimize that gap. Table 3 shows a comprehensive, collective snapshot of gifted and talented Black males that were currently enrolled at or an alumni of IMSA perspectives of the STEM achievement gap, reasons why they engaged in STEM, their STEM motivational factors, and how IMSA contributed to their motivation and opinions about motivating Black males to engage in STEM ($n = 45$):

Table 3

Black Male Perspective: Gifted and Talented Black Male Motivation (n = 45)

Why a Black Male STEM Gap	Why engaged in STEM	Gifted and Talented Black Male STEM Motivation	IMSA's Contribution to STEM motivation	Motivate Black males to engage in STEM
Lack of STEM vision for Black males, <i>n</i> = 19	Enjoy STEM/STEM interest, <i>n</i> = 18	IMSA, <i>n</i> = 32	<i>Enhances Motivation,</i> <i>n</i> = 32	More Black Males involved/Black mentors, Role models, <i>n</i> = 19
Negative Stigma of and Misperception about Black males, <i>n</i> = 9	Good at STEM, <i>n</i> = 11	STEM is a progressive field which leads to Success, <i>n</i> = 28	–Immersion in STEM –Diverse Environment –Challenge, better education –Self-awareness, independence	Early STEM exposure: Inside/outside of the classroom, <i>n</i> = 4
Lack of parental support, <i>n</i> = 8	Success, <i>n</i> = 7	Learning/discovery of knowledge, <i>n</i> = 25		
	Problem-solving aspect of STEM/To advance humanity <i>n</i> = 6	Solve problems/to advance humanity, <i>n</i> = 21		
	STEM is a prominent, progressive field, <i>n</i> = 5	Obligation to Black community/break to negative stigmas about African American males, <i>n</i> = 16	<i>Hinders Motivation,</i> <i>n</i> = 6	
		Passion for STEM/STEM Enjoyment, <i>n</i> = 10	–Realization that I'm not that good at STEM – Competing with other students in STEM – Development of other passions –Complexity of STEM	
		Competitive Nature of STEM, <i>n</i> = 8		
		Money, <i>n</i> = 8		

Gifted and Talented Black Males' STEM Motivation: IMSA Faculty/Staff Perspective

There were 27 faculty/staff interviewed from the Illinois Mathematics and Science Academy, with 16 (59%) faculty representatives, eight (30%) staff members, and three (11%) administrators. Six (22%) of them also identified as faculty/staff of the IMSA PROMISE (Providing Opportunities to Engage in Mathematics and Science) pre-enrichment program. The majority of the faculty/staff interviewed held at least a Master's degree, which is a faculty requirement at IMSA; whereas, 10 (37%) of them have a doctoral degree. In terms of the faculty, there was an intentional overrepresentation of them from STEM-related departments, with five (31%) from Science and four (25%) from Mathematics. Other faculty from various academic departments included three from Social Science, two from English, one from Foreign Languages, and one from Wellness. The staff interviewed were all from departments that had direct and regular interactions with students, including Student Life, Admissions, College and Academic Counseling, Information Resource Center, Enrollment and Academic Opportunities, Residential Life, and Professional Field Services. The administrators yielded from both the Principal and President offices.

Perception of Black Male Males Engaged in STEM

The IMSA faculty/staff were asked to discuss their perceptions of gifted and talented Black males engaged in STEM education, which generated a diversity of responses. There were several ambiguous responses that ranged from struggling with STEM content, to being nerds/geeks, then to needing to act cool, and from there finding no unique characteristics at all. The following 12 diverse themes emerged:

1. Struggle with STEM rigor, $n = 7$ (26%)
2. Hard-working/passionate, $n = 5$ (19%)
3. Wide range of giftedness, $n = 5$ (19%)
4. Lack STEM encouragement, $n = 4$ (15%)
5. Must act “cool”/identity conflict, $n = 4$
6. No different than any other student, $n = 4$ (15%)
7. STEM is who they are, $n = 3$ (11%)
8. Tries to take advantage of perceived victimization, $n = 3$ (11%)
9. STEM encouragement, $n = 2$ (8%)
10. Nerds/Geeks, not the “cool” guys, $n = 2$ (8%)
11. Leaders, $n = 2$ (8%)
12. Self-aware, $n = 1$ (4%)

For those that stated gifted and talented Black male struggle with STEM curriculum, they believed it was a result of inadequate STEM preparations and disadvantaged academic backgrounds, as suggested in the following statements:

Not always, but often I feel that the African American students don't have terrific academic background. They haven't been challenged to the level they need. This causes a lack of study skills or knowledge of what to do. Not having to work hard to get good grades or be successful in their home school seems like it is more for African American students. Having a lot of praise in their home school for being the smartest has hurt them. They are not accustomed with dealing with not being as successful as they've been. They want to stick to the things that they've done before, and are not sure about taking that step to try new things. They want to stick with the old ways.

Overall, I believe that they struggle in STEM areas. Their background, educational experiences may cause them to struggle here. Black students have the capabilities of being at IMSA and have to work harder than they did at their home school. With hard work and consistent study habits, Black males are usually fine at IMSA.

I teach MI1:2 which is the lowest MI math class that is offered at IMSA. I see a number of kids who are probably gifted, but just did not have a lot of opportunities at their old school to go to advanced math classes. I see a number of them in that class. I think that attitude when they come in is different when they leave. They probably were at the top of their class, at their old school; here they are kind of at the bottom so they have bigger strides to make. Some of them resent it, initially, because they always fight with placement, or that they maybe did not get placed correctly. What I find the most rewarding for me is that they really appreciate your help. They do want to learn, get caught up with their peers, or advance.

The general African American male does not have the academic resources and is not academically prepared as much as their counterparts to take advantage of the opportunities that we have at the academy. One reason is their high schools are under resourced, not giving a lot of opportunities to pursue STEM. It is not encouraged, pushed, or going into STEM is not popular in these settings. In suburban high schools, African American males believe that STEM is not possible or not looked at as to be successful in STEM fields. They aren't encouraged by teachers, counselors, or accepted that the African American male would be suitable for a STEM field. Black males are passionate about math, science, and engineering. Given the opportunities and given the encouragement, mentorship, and guidance of, "Yes, it's okay to enter STEM fields, they will be more equipped."

Other faculty/staff discussed that their various academic backgrounds resulted in a wide range of giftedness in terms of their academic achievement status; "They usually fall into three categories: excelling, struggling, or meeting expectations" and "in terms of their giftedness, attitudes, or focus they have a wider range than the other students."

Another IMSA faculty/staff further stated,

The Black males that I see varies a lot, just like White males do. Certainly there are a larger number or a disproportionately larger number in the lower level classes or have difficulties getting through the classes. On the other hand, there are some Black males that come in and cruise and are very good students and mathematicians all the way through.

Complimenting this range of giftedness, some faculty/staff believed that the gifted and talented Black males were hard working, driven, and passionate. Several participants stated, "Young Black males are hard workers"; "They were hard workers and always

willing to support one another”; and “Black students are very passionate about what they want to do and pursue.” Not only were they hard-working, but they had a STEM vision in which they viewed themselves as part of STEM:

They like STEM education and see their place in it. Especially in classes that I have taught such as engineering classes, environmental chemistry classes. They feel like they are a part of the class, have a say in the class, and can direct their own learning by choosing the projects that they want to work on. They are very active classes and not classes that they have to listen to someone for a long time.

Some of the faculty/staff believed that gifted and talented Black males lacked encouragement to progress in STEM as suggested in the following statements:

Males that are talented in math and science, sometimes I feel like they are lacking the encouragement that they need to go forward in their field, possibly not having the mentors that they need, and possibly not seeing more people that look like them in positions that could be just encouraging to see something like that. Even if there were one or two math or science teachers, I know that we have some people that are in positions of authority here, but not necessarily in the field of math and science ,and I think that would be just encouraging to see something like that.

Because there are so few Black role models for STEM, because the role models that are typically elevated and illuminated relative to Black males, my perception is that for a Black male to intentionally and aggressively pursue STEM requires a level of confidence, bucking of trends, resilience, not caring what other people say, or following your own desires. My perception would be to understand that you have passion, interests, and desire to pursue STEM education. In the current culture or at this time as a Black male, when roles models are illuminated in sports or entertainment, it would take a level of knowledge of oneself, desire to create your own identity, and going against what is typical in your cohort group.

It is not encouraged, pushed, or going into STEM is not popular in these settings. In suburban high schools, African American males believe that STEM is not possible or not looked at as to be successful in STEM fields. They aren’t encouraged by teachers, counselors, or accepted that the African American male would be suitable for a STEM field. Black males are passionate about math, science, and engineering.

The perception was that because there were fewer Black males involved in STEM to serve as role models, thus discouragement resulted for Black male STEM involvement. However, there were Black males that were encouraged to engage in STEM, in which

IMSA faculty/staff attributed this STEM encouragement as to someone helping them, as suggested in the following remarks:

My perception is that African American men that are engaged in STEM education had someone there to help them. They had someone that knew the importance of math and science education, knew the importance of STEM, engaged them in math and science, taught them and shared with them how smart they are in math or science. For the most part, there was someone who was there for them that provided support, assistance, guidance, challenge, and all of those things that are important to education. Primarily with the African American male, I see that it is not something that they don't see in themselves. For the most part, there has had to be someone who was there as their champion.

One of the things that I have heard many of them discuss is their mothers. I find it interesting that most of the young men, who I have had conversation with, talked about how strong and talented their mothers are. I see them, like I do for many students that the role model of the model is extremely important in all students. One of the things that I found interesting is that the mother and social economics makes students successful in schools. I really think that mothers play an important role. All of these young talk in reverence about their mothers; in how they have been very instrumental and pushing them to go forward. I also see that many African American males are extremely curious. They have wonderful number sense. I also see those characteristics in all of the students I have had.

These gifted and talented Black males who were engaged in STEM eventually become leaders of the next generation, as reported by one IMSA faculty/staff:

Then 15 years later and working with these gifted and talented young men, my entire perspective has changed. These are the individuals who are going to lead, not only our country, but us as a people into the next generation. These are, as W. E. B Du Bois described, the talented 10th. These are the individuals who are going to come up with cures for what ails and design different platforms to help our lives be much easier. I look at them as driven, talented young men who are taking advantage of the opportunity that they have so that they can better themselves, better their family situation, and make a difference in the world.

In terms of perceived identity of the gifted and talented Black males, the IMSA faculty placed them in three categories: nerds/geeks, acting "cool," and victimized. For those identified as nerds/geeks the IMSA faculty/staff reported:

Before, I would see Black males in STEM and they were the nerds, geeks, or the ones that were not the cool guys especially growing up in an all Black community.

On the flip side of that, you have the African American males that tend to be nerdy. They are very good students, tend not to directly associate with the other type of student mentioned, and tend to join the nerdy clubs. They tend to fit in and fit the typical IMSA student or student that I associate myself with. My friends were more books smart and we did activities that were more academic based. We did not participate in “cool kid clubs” like cheerleading, basketball, and football. I’ve observed this in the males and females at IMSA.

However, for some of the gifted and talented Black males, this label of being a nerd/geek resulted in them questioning their identity, to which they responded by trying to act “cool”:

Some Black students don’t want to give off that they are being too smart even though they are pursuing or work hard at their passion. Black students tend to be more social. They have different approaches to STEM. When I was a student, a lot of my Black male friends who went into STEM are doctors now.

I got another kid who . . . my sense of [this student] and this is something worth putting in the thing is that he’s quite good at math, but he’s really frightened of other subjects. And so where he almost flunked himself out was sort of being the cool math guy on campus and helping everybody with their homework and things like that instead of getting his assignments turned in.

The African American males at the academy tend to fall into two categories. Those that want to be known as the popular guys, and seem to think that studying or doing well is not cool. Having students like this in my classroom, I’ve observed the talent and lack of effort that they put into class. I am not sure of their motives for attending the academy. In many cases, their motive is to not pursue a career in STEM. . . . It seems that the guys who want to have the reputation of being a cool figure, that being smart and getting good grades doesn’t go with the role displayed, having had many of them, they’ve had the talent and ability. It’s just something, probably societal, which keeps them from taking that next step.

Keeping in mind, the perceptions about gifted and talented Black male identity struggle and the struggle with STEM curriculum discussed earlier, there were some IMSA faculty/staff who believed Black males act victimized in order to not reach their full potential, as alluded to in the following remarks:

Some of the kids come in with obvious gaps in their knowledge, and they try really hard to make up for those gaps. I've seen some kids who have a sense that they don't have to do much in order to stay here. I don't know if it is because they see themselves as a targeted demographic, and they want to utilize that role, or if it just happens.

What I think happens is that when they're being called upon to take on new tasks that their sense of themselves is insecure enough. I don't think it's a question of laziness or anything else. I think it's a question that there are some things that other kids have better preparation with and rather than confronting that they try and bluff it out.

Here's what I think about Black boys at IMSA. I think they come here carrying huge baggage, none of which matches. They bring a negative cultural stereotype of the Black male; sexualized, often predatory, street smart, fearless, etc. They bring their parents' breathless hopes for them that they will escape the pitfalls of being Black and male in third millennium America. They bring a wider social legacy of slavery; that their color announces to one and all that once upon a time, they could have been bought and sold. They bring a sense that the mainstream is owned and operated by White people, and that the mainstream is where economic success lies. They bring a loyalty to their race as a culture, its language, its physicality, its values. They bring a sense that success may ask more of them than they are willing to pay, especially in terms of "being disloyal" to their culture. They bring a statistical awareness of the data on blackness: dropout rates, rates of incarceration, rates of teen pregnancy, rates of unemployment, SAT/ACT race data; and the fact that the President is Black does not outweigh the other data. They bring the certain knowledge that they are smart, but the secret fear that they're not smart enough.

Although some IMSA faculty/staff believed gifted and talented Black males take advantage of this perceived victimization, there was one that believed the gifted and talented Black male is aware of self and does not utilize this victimization negatively:

Black males have a great sense of self and self-awareness. Black males are eager to seek new opportunities and are self-starters. They look for opportunities and don't look for opportunities to find them. Finally, they are articulate and can present well formally and informally.

The IMSA faculty/staff provided a diverse perspective, including both positive and negative thoughts, as well as conflicting perceptions. However, there were some participants who did not see any differences in the gifted and talented Black male students engaged in STEM from their other students:

I would not say that I recognize any major differences.

I don't see them any different than any other gifted students engaged here. It's almost like I am colorblind to their race. I see unique characteristics of the student, but it's unique to them as individuals. I can't say they fit in any category.

Each Black male is motivated in their own way and have their own mathematical background. I work in their background and study habits for math. I don't see any differences with Black males and other students on an individual basis.

These faculty/staff looked at their students individually and did not want to label them in any way.

Perception of Intrinsic Motivation

The IMSA faculty/staff were asked about their perceptions of the intrinsic motivation of gifted and talented Black males to engage in STEM, responded to by 26 of the 27 interviewees. Several themes emerged that included (a) good at STEM/STEM interest, (b) success, (c) obligation to Black community, (d) learning, (e) challenge, (f) break negative stigmas of Black males, (g) leadership, and (h) competition. The primary theme agreed upon by half of the respondents was good at STEM/STEM interest. The IMSA faculty/staff discussed how STEM exposure and unique learning experiences helped to develop the interest and skills as stated below:

My perception is recognition of what you think you're good at and what you really like to do. Ken Robinson who is noted in education talks about being in your element. He says, "What you're good at and what you love come together, and then you are in your element." My sense would be that young Black men who pursue STEM has a sense of "this is what I love and good at, and so I am going to go for it." I think that is probably born out in what they choose to do at IMSA.

It's probably something that they were exposed to as a child that stuck with them. As they develop, they probably noticed that an aptitude, ability, and a passion for the science they are pursuing.

Another student at IMSA is the same way. He has interest in STEM, but he also has the same support at home that helps provide him with that. He has developed that interest now because he was introduced it at home. He had that chance to

build that desire to learn about STEM at an early age. I think it goes along with a lot of the Black males that I've worked with in the program. They are given the opportunities when they are young. They are not coming to STEM and taking STEM classes and developing interests when they are in seventh and eighth grade; they are getting it at a young age and growing up with it.

There are kids who come in are pretty good at math, want to keep going, they enjoy it, or like the rewards. Some like math because there are puzzles, problems, and there is a sense of "Yes I got it," when they finish some of them. They can get it and make sense of ideas. I teach a lot of calculus, and there are a lot of kids find that as a cool subject much more so than pre-calculus. It's academic achievement. I don't have a sense of math rather than anyone else. Certainly there are students who come in here that are interested in math or STEM in general that keep going with that just because of the nature of who we are.

For example, a lot of the students that take IMSA don't take classes like this at that home school. They are involved in doing original research with an original inquiry question and work the majority of the semester on a research project. I think that experience motivates students to become involved in STEM fields. Students are more likely to be a part of SIR or higher level science courses offered at IMSA. Students are likely to major in STEM disciplines, if the experiences are provided earlier on. . . . Unique learning experiences also help intrinsically motivate students. In my EBE class, I offer field trips. . . . We focus on the natural history of plant and animals in the fields that motivates them to learn more about environmental, biology, and ecology. . . . The sophomores enter IMSA and take the MSI class that allows them to be involved with the process of science. . . . SIR [Student Inquiry and Research] is a high level science course that starts off as an extrinsic motivator to display on transcripts, but turns into an intrinsic motivator that help lead students into STEM fields.

The IMSA faculty/staff believed that this STEM exposure needed to occur early in a student's educational career to cultivate STEM skills and nourish STEM passion.

One participant discussed whether or not Black males had a mindset that suggested they may not only be good at STEM, but also had the initiative to further develop STEM skill-sets. It was the perception of seven (27%) IMSA faculty/staff that gifted and talented Black males were intrinsically motivated by success as reported in their comments below:

For example, a student at IMSA, he came in MI1-2. He struggled and had a little bit of attitude coming in, "I can do this and don't tell me how to do this." Towards the end of MI1-2 when he started seeing his quiz scores, he realized that he had to work hard. I feel that he's kind of a success story. He really worked hard, changed

his attitude, and really worked hard with all of his teachers. You could just see that he really had a desire to succeed. I think that it could be the influence of other IMSA kids around him that he wanted to not be at the bottom for all three years. He came in with a mind that he really wanted to improve and make himself as good as any other IMSA student. It's kind of personal for most of them.

When they are successful, then they want to do more. Examples of that would be students at IMSA go up against a teacher that they feel that they never could communicate with or that teacher will never listen or help me. Once they realized that the teacher is there for them, and willing to help and guide them, the teacher is there to work with them or sometimes banter with them. Then I believe that is when the tables turn a little bit. Confidence is built, and that they are finding success. It's also that sometimes it is fun. Sometimes I see the students doing different experiments with different peers, which looks like they are having a lot of fun. I think that's where it comes from. IMSA students study STEM and their intrinsic motivation is also the fact that they know they could do it . . . There is something beyond what is in their community. For others, it's there because they want to be better or learn.

Intrinsically, the students who have been successful associate well with STEM. The math part of STEM, I don't see as much. I do see it in the science and technology, and engineering fields. It's how they view themselves in the classrooms. They don't feel like another student is better than they are in these types of classroom stated above. Even when the other student may have a better grade, they see that when they are in a group of students, they are not intimidated, feel like they can just as much say; or in the outcome of the project, and often become leaders in the projects. They don't rely on the book work or the book work that have been assigned; they seem to have a feel for where the project needs to go. Especially here at the academy, most of our African American males are very vagarious. They are not shy kids which I think is a part of the selection.

One respondent talked about the need for teachers to be conscious of how they identified their students in terms of success and failure:

No matter the student, they should be able to find something that they are successful in. In the end, I think that motivates kids that they are able to find something that they are successful in. In some ways, we dampen it a little bit because we are very grey conscious, in saying this is success and this is failure. As soon as we say that you are a failure, it's hard for a student to keep going, even though it's all relative. If you talked to the physic teacher, which the majority of them are former U of I students with masters in physics, you ask the kid, "What grade did you get?" They will respond, "I got an A or a B." Then you ask them, "That means that you must had a 80% or higher on your last assessment." They will respond, "Oh no! Usually the top grade is a 40% and they will have to curve it." That shows that it's all relative. We don't do that as much here as they do at U

of I. We have some issues with judging what success is, and having the kids figure out what is success. We kind of shut the door on it sometimes. We put extreme focus on 90% success, and we don't recognize that 50% is a lot of success in some of these classes.

The next theme that emerged was that gifted and talented Black males were intrinsically motivated by their obligation to the Black community, especially their families, agreed upon by six (23%) of the IMSA faculty/staff. This obligation was focused on helping the family and advancing the Black community as suggested in the following remark:

His motivation stemmed from his younger brother being autistic, and that was his drive and factor to go into the medical field. From the day I met him and the conversations that we have today, he says "This is my motivation. This is why I want to be a doctor because he sees different things that have taken place; not only with his brother, but also in society as a whole that Blacks in general are not well served in the medical community or represented as nurses or doctors. The opportunity to have early diagnosis, he wanted to participate in that so it was his motivation to become a doctor. So his motivation was purely internal from the environment that he was in.

Another emergent theme was learning, perceived by four (15%) of the respondents and expressed in the following remark:

Their intrinsic motivation comes from their confidence, knowing and learning and wanting to learn more, but it is also when they are successful. When they are successful, then they want to do more. Examples of that would be students at IMSA go up against a teacher that they feel that they never could communicate with or that teacher will never listen or help me. Once they realized that the teacher is there for them, and willing to help and guide them, the teacher is there to work with them or sometimes banter with them. Then I believe that is when the tables turn a little bit. Confidence is built, and that they are finding success. It's also that sometimes it is fun. Sometimes I see the students doing different experiments with different peers, which looks like they are having a lot of fun. I think that's where it comes from. IMSA students study STEM and their intrinsic motivation is also the fact that they know they could do and that it is something else out there. There is something beyond what is in their community. For others, it's there because they want to be better or learn.

These IMSA faculty/staff believed that most students had a desire to learn, just for learning's sake and that discovery of new information built confidence. Beyond learning, four (15%) IMSA faculty/staff discussed challenge as an intrinsic motivator, as stated by one participant:

From what I've seen, probably individual interests in different areas, the challenge to be in an atmosphere like IMSA and to be able to have the chance to be in a place like this. I've talked to students who just have interest in those areas. Some of them said, or one in particular said, that he would have not had classes like we offer here that he could have had at his home school in the areas in or related to STEM.

These participants felt that gifted and talented Black males want to be challenged and see IMSA as offering that challenge. The following theme that emerged that served as an intrinsic motivator was to break negative stigmas of Black males, expressed by three (12%) IMSA faculty/staff. These faculty/staff discussed interactions with Black males in which they were told that society did not think much of Black males and that was why they worked so hard, as communicated in the following statements:

His motivation is basically society, always saying that African American males are not capable of. He feels like they are not put to the test. If there is a White student that is in the same class as them that they are not expected to do as well as, and so he feels that he's motivated by hearing that you're not able, and he says that I am able and that I am going to succeed. I think that goes for a lot of our youth. I think if they keep hearing, sometimes the more you hear that you can't do something, you know that you can do something. That's the motivation for a lot of our Black males right now.

Going above and beyond and wanting to break the stereotype of not going into STEM that might be prevalent back home. By home, I mean in the house. If parents have sent their students here and given up three years before they go to college, the home, neighborhood, town, and city are probably very supportive. I've seen students go above and beyond. For example, one of the students did things in advanced chemistry that really very few students have ever done. He created study guides for upcoming tests and shared them with me to give to other students in the class. He was clearly intrinsically motivated to learn the material because he did things that were above and beyond what typically students did. I usually only have one or two students asking to do an independent study.

Another student comes from a weaker school district, not many family members attending college, and less opportunities. In his college essay, he stated he feels that people don't have faith in him. I have high expectations and strong belief in him and we've created a great relationship. His expectation or intrinsic motivator is to prove people wrong, which I feel is sad.

The final themes that emerged were leadership, stated by two (8%) participants, and competition, stated by one (4%) participant. The IMSA faculty/staff perceived access to leadership opportunities available outside of STEM when they do well academically, and healthy academic competition served as intrinsic motivators for gifted and talented Black males as indicated in the following responses:

They came from a relatively stable background, good and educated parents. They wanted to become a part of student government or political club. They are concerned about grades and doing well in school. If they are doing well in school then they gravitate to being a leader, but if they are doing poor in school they tend to pull away from leadership roles.

For example, there was a Black male who was the first African American male to be the president of the student council. His impact on the Black males at the academy was immeasurable. The way he carried himself and operated as student council president set the impressions. A clear example to young Black males that they can achieve and attain if they put their minds to it. With the student being the student council president, leaders have birthed this year within the Black males at IMSA. They are taking leadership roles in clubs, which they would have not done, if the student had not been student council president. The student became the president to make his mother proud. He came from a single home and his mother was a driving force in his life.

One student that come to mind talks about how he really enjoyed being in the science fair and being able to compete really motivated him. It's really interested because we talk about how we want our kids to collaborate. I agree that this is true, but I find that my male students really enjoy competitive work. I think the competition drives them to do better. As much as we can say that competition can be detrimental, I think when competition is used correct it works well.

Perception of Extrinsic Motivation

The IMSA faculty/staff were asked to discuss their perceptions of the extrinsic motivators that led gifted and talented Black males to engage in STEM, of which 26 of 27 responded. The following themes emerged: (a) obligation to push from the Black

community, (b) the Illinois Mathematics and Science Academy, (c) future success, and (d) peer acceptance/competition. The primary theme that emerged stated by 12 (46%) respondents was the obligation to push from Black community. There was a perceived push from parents, teachers, and mentors for the gifted and talented Black males to engage in STEM and a perceived obligation to family and society to be successful in STEM as reported in the statements below:

As a Black male here working at the academy, if I could speak for every Black person here at the academy, I would think that we feel it's our responsibility or duty to make sure we push them to their limits. Also, encourage them at the same time so that they can make it. It is not easy going into a STEM field when people are telling you that you are not supposed to be doing X, Y, and Z. You're just supposed to be in this particular category, and that encouragement from us as faculty, staff, and family helps keep those spirits up when they have those down days and pushes them more towards their goals.

When there is someone who could be a champion or help them. I realize that they are smart, realize that they have a talent, passion, or a gift for math or science. Also knowing that oftentimes it is when a whole community is behind a child. It could be a person, community, or church. I truly believe that is where the extrinsic motivation comes from. For many of our IMSA students, when they know that someone else believes in them and when they realize that there are a lot of people cheering them on, praying for them, and kick you in the butt, they feel a sense of responsibility. It's when they feel that they have a sense of responsibility to my community, family, or themselves to use talents or passions.

I would imagine that the most critical would be, first, parent, saying it's an important line of work, endeavors, breakthroughs can happen in STEM, and fascinating careers could happen in STEM. . . . I think parents have a huge role to play in giving kids opportunities to go to museums, muck around, and take apart and put things back together. I would think another extrinsic motivator would be role models. Sometimes kids would be excited to go to plays, a Black astronaut, and Black people who have done amazing things in technology. External factors of seeing someone who looks like me doing things that are important is brilliant. Hopefully, there would be teachers to be encouraging and tell discouraged Black males that they can do it and you have a right to be at this table. I would think that extrinsic motivators would be driven by proximity to people, parents, ministers, grandparents, friends, and culture.

I think it is pleasing the parents. The parents give that intrinsic, but a lot of them want to really succeed just to make sure that the parents are happy with them.

Parents are a huge force in Black males' lives. One of my students has a strong bond with mother and father. He has a really strong bond with his mother.

One of the things that extrinsically motivate them is the sense of pride that family members have in them. They've been told that they are bright, gifted, and talented. The desire to live up to the expectation or belief in them highly motivates students. I don't know about the other external ones because I have not addressed future plans with Black students. I have a feeling that Black students take a huge step and leap by coming out of their home environment to come to IMSA.

Our President being Black plays a huge part on our Black males. The alumni interacts with our students, give them a broad perspective of what is out there, and giving advice on what they could achieve in STEM fields. There are male role models that provide external motivation for our students through casual conversation on various issues and navigate difficult terrain in regards to attaining their achievements.

Family, I think, having family around and pushing them as well as having the community of other students at school.

The second theme to emerge as an extrinsic motivator that led gifted and talented Black males to engage in STEM was the Illinois Mathematics and Science Academy, reported by nine (35%) faculty/staff in their statements below:

The best way to answer this question is the faculty and staff encouragement. As small as we are, the minority staff does a great job motivating our students to continue on their endeavors in STEM education. Looking at the opposite side of the topic, I've seen the increase in our African American females pursuing degrees or training in STEM more so than our African American males. I think it is because they see something tangible. They see someone who looks like them in STEM. It engrains in them that they can do it too. So I think that the absence of that figure for African American male is part of the issue that we have here.

I try to motivate them. The students tend to like me and willing to put in effort because I've asked them to. It's good to have students put in more effort because they don't want to disappoint you. Some of them want to do well because they are in a place where they should be doing well. I am not sure if this is Black males. They are competing with their friends by saying, "Look how well I've did."

Here at IMSA, we try to encourage them as much as we can. We may not be faculty, but we are staff members that know that they are more than capable of succeeding in whatever task. We just have to continue to encourage them. I know that being the only one, that's just a hurdle that they're just going to have to

get over it. We are going to have to continue to let them know that they are capable so that they can be successful in that field. Even when people are saying that it's going to be hard to succeed, it doesn't matter, and it may be hard, but you could still do it.

IMSA is a big motivator for pushing towards those STEM fields even more now than when I attended. They understand the idea of STEM. On a larger or state level, IMSA bridges the gap in STEM programs like other countries, like Japan.

Another theme that emerged was future success stated by seven (27%) IMSA faculty/staff. They discussed their perceptions of IMSA pushing students towards STEM, preparing them for college, and having a successful future in STEM as extrinsic motivators:

Extrinsic motivators are to get into a really good college, get into a good career, and make good money. There is nothing wrong with that, but some of the things that people do here is to get good grades, impress their teachers to receive good letters of recommendation, and get into a really good college.

Mostly it is competition with others in the class. Extrinsically, some people talk about jobs. That they want to be in the medical field because it pays more. Most of them are motivated to learn.

We see more students in STEM because it is the way of the future. Not having some sort of STEM background in the future, you will fall by the wayside. This is a concern for a lot of our students.

The final theme that emerged expressed by three (8%) of the respondents was peer acceptance/competition was an extrinsic motivator that led gifted and talented Black males to engage in STEM as provided in the testimony below:

The one thing I see is that males are not extrinsically motivated by grades like females. I find that kind of interesting. I think it's more of the praise or acceptance from other people, male students. Thinking, this is a capable competitor. Being able to have their peers realize that they are very intelligent, coming to them and telling them that they don't know how to do assignments, and being able to tell someone else something that they know how to do is very motivating. I don't think that it's grades. All of our students want to get good grades because it helps them get into a better school. Boys are more motivated about their learning and others' perception of this is a capable kid. Not necessarily that this kid has an A, but this kid knows what he is doing and does it well.

Perception of IMSA's Contribution to STEM Motivation

The common factors among the faculty/staff interviewed was that they were all employees of the Illinois Mathematics and Science Academy with at least five years of experience working with gifted and talented Black male students engaged in STEM in a residential community. Thus, they were asked about their perspectives of IMSA's contribution to motivating gifted and talented Black male students to engage in STEM. The IMSA faculty/staff believed that IMSA both enhanced motivation, stated by 25 (93%) interviewees, and hindered motivation, stated by nine (33%) interviewees.

Regarding IMSA's enhancement of motivation, the following themes emerged:

(a) diverse environment, (b) collaborative support group, (c) opportunity, (d) independence/leadership, (e) competition, and (f) challenge. The most agreed-upon theme was diverse environment, reported by 18 (67%) of the IMSA faculty/staff. They perceived that IMSA's ethnic-based diversity and being around inquisitive minds served as a positive motivator for gifted and talented Black males to engage in STEM as depicted in the comments below:

They also learn how to work with people from other ethnicities. Even though this is a small institution, it's a reflection of the global society that you have to learn how to work with folks and to move along, mean learn how to network so you can get ahead. You can navigate through the wilderness when it's dark outside. You can find that way or aim at that point to succeed.

They see other students that are like them. They are with them 24/7 in the residence hall at nights. With IMSA being diverse in many ways, not just the African American population, but our Asian population or White population.

Being in a residential environment takes that element of kids that is saying it is not cool to be a good student away. I think everyone here accepts that it is very cool to be a good student.

Everyone works together and solves problems together because diversity is really connected in problem solving. Only connected diversity is one that motivates us

to do more. If Black, White, or Latino kids only launch together that in my view is healthy diversity. Diversity has to be connected around common purpose. What we do here is make it very clear that our common purpose, regardless of who you are or where you've come from, is advancing the human condition in STEM. We here to make the world better. We are going to use STEM as a vehicle to do that. We are going to help develop creative minds and ethical leaders. I think the fact that kids can live together and learn from one another is enormously healthy.

This environment is safe for students. This school provides good training and teaching, which is typically not found in their neighborhood schools. Since the environment is safe and accepting, Black students are encouraged to think more, take risks, and be open to new ideas. The ideal at IMSA is to go to college, graduate school, and possibly back to the community to be a good example. They have to abandon or leave some of the ties from the old community school behind. Black males could be comfortable with being gifted or sounding gifted at IMSA.

When you bring bright students together, they feed off each other. There will be students that are above others with others aspiring to be like him. There will be others that will push him to remain high. They help motivate each other being in a residential campus.

In a residential setting, they learn how to interact and work in a diverse environment. It gives them an advantage and critical for their success by exposing them to different cultures (gay/lesbian, Indian, White, Asian, and different socioeconomically culture). Dealing with adults, how to work with adults, and communicate with adults. They are amazing gifted students working with other amazing gifted students. It is accepted to be gifted, culturally different, and you learn how to work with others.

The next theme to emerge was having a collaborative support group, stated by 10 (37%) of the interviewees. The IMSA faculty/staff discussed their experiences hearing academic conversations occurring after class and how having positive support groups made students want to do well, along with being in a residential community allowed for deeper thought as suggested in their statements below:

Black male students come from areas where they did not have access from advanced study in STEM or where achieving was success but excelling was not expected. The hope is that students come here and are in community relationships in a place where it is okay for them to excel. It's almost expected. There is a sense of pride, competition, or a pride in achievement. Black students have opportunities to work hard and achieve things because there weren't such goals in their community.

I think being around people by living, eating, and doing everything in a community allows them to develop deeper relationships with other guys who have similar priorities and goals.

I think a lot of it comes from their peers. They see other Black males at IMSA. They see that they are not the only one. They need a home school. This goes across the boards; they don't want to be identified as a nerd, geek, or something like that. They are in a community where they do have the peer group that supports the idea of growth in STEM.

The learning and discussions that revolve around academics do not stop because the students are around each other. The students are more likely to work with one another and go to each other for help because they are having the same experiences or hardships. In a regular school, kids go home and may work individually on homework. At IMSA, the kids are around each other and they don't go home. I think there is a potential for learning, discussion, and collaboration that you don't get in a non-residential environment. I think that would be a big plus to the residential aspects. You can also offer learning experiences that go beyond the early morning or mid-to-afternoon session.

Residential programs allows you to become independent and access to Black males from other environments. At a neighborhood school, you would usually go home and would not have access to other gifted Black males. At a residential school, you have access to other gifted Black males where you could get advice and bounce academic ideas around. They can also build camaraderie and trust in regards to the issues they are dealing with.

I think the biggest benefit that they get is the cultural positive peer pressure and the 24/7 while they are here is a benefit for all of our students at IMSA. . . . The students walk out of class and sometimes another student talks about something that carries over from another class discussion. I hear these discussions when I am driving from other activities. It's okay to continue those discussions. In fact, as they hang out with other kids, it's kind of expected. You wouldn't see that in a typical school. I suspect that a typical school there may have been negative pressure that is on them in the classroom.

They see their peers and that makes them want to do well. They probably see their teachers very different than their old school. Some of them have told me that their teachers at their old schools did not have time or would have office doors closed during lunch time. As you know, the IMSA math office is always open if I am not able to help them.

There a lot of kids that are here who have a friend or roommate down the hall that wants to get work, math done, do well, or study for this test. There is a lot of bringing kids along because of other students.

The tertiary theme to emerge was STEM opportunity, expressed by eight (30%) IMSA faculty/staff. The opportunity to conduct STEM research/inquiry, engage in STEM learning, be involved in STEM organization, and motivate gifted and talented Black males to engage in STEM as community in the following remarks:

The exposure to the type of education that a lot of our students have from very affluent areas of the state, that's the separation point. It's not the intelligence of an individual; it's the opportunities that an individual has received from earlier on. From a residential perspective, I think that it gives our Black males an opportunity to play catch-up from the standpoint that they can see and observe and ask questions. I didn't learn this stuff in my home town, but you already know this stuff and how do you do it? That gives them the jump by the time they're able to go to college. They have now caught up in the process of how to study, how to do rigorous work, and how to write that long paper. The other advantage that our students have is that living away from home aspect.

I truly believe that our African American students here realize IMSA as a gift and opportunity, not an entitlement. I think they realize this even more when they see how some of their peers act. Sometimes you don't see them act that way until in the residence halls at night and they think it's just stupid. Plus, it gives them an opportunity to bond together. Although they are diverse within themselves and have diverse friends and interests, I think they are closely responsible for each other. When one goes down, they all go down. I really believe that they are here for one another. Even though they are from different parts of the country, come from different backgrounds, and different educational opportunities they are also a group to be reckoned with.

There are opportunities for unique learning experiences other than the regular scheduled school day. The biggest difference is all of the students are here experiencing the IMSA academic environment. Since they stay together, a lot of the discussions about learning, class work, or content doesn't stop at the end of the school day and then go and learn in isolation. They still communicate with each other about learning and their experience even when the school day is over.

Providing opportunities to Black males earlier as early as third grade are powerful motivators to move into IMSA. The students enjoy living in an environment that is different than their neighborhood school. The research program is a great opportunity. Opportunities for overseas travel and SIR [Student Inquiry and Research] are great advantages to Black males. Promise Programs allow students an opportunity to be a part of STEM in such a short time.

There are way more opportunities. Kids take advantage of the opportunities such as extracurricular like robotics and math competition. I feel like there are a lot more Black males at IMSA who could be doing these activities, but feel like they

don't want to or that it is too much work. I do not think that this is a result of laziness, but simply it is trying to stay ahead of the game for all of the subjects rather than one.

Four (15%) of the IMSA faculty/staff further stated how the being in a residential environment allowed for independence and leadership as indicated in the following statement:

Being in this residential environment gives them that exposure of semi independence . . . that they learn how to balance their time wisely and how to be an active learner instead of a learner that just sits back and waits for things to come to them. It gives them the benefit of participating in programs that they otherwise will not have the opportunity to participate in. Like, our students' oriented-research programs or delivering curriculum in our promise program. So I think they get more of a leadership position being in a residential situation.

The final themes that emerged were competition, stated by three (11%) interviewees, and challenge, stated by two (7%) interviewees. These faculty/staff believed the IMSA environment to be not only a challenge, but also a competitive undertone, which serves as a motivator for gifted and talented Black males, as evident in the following remarks:

The challenge has to be the motivation. If you're back up against the wall and if you are away from home, you have to tell yourself that you can do it. Sometimes you have to actually encourage yourself. If you're the only one and there are people that you may think are smarter than you, maybe it is all about opportunity. The opportunity just has not presented itself, but possibly here at IMSA you do have a chance. Those opportunities do present themselves and probably more than or definitely more than they would at your home high school. I was talking to an African American male student this morning and he was saying that he was going to China. How many 17-year-old African American do we know that are going to China? Not a lot. My response to him when he told me that he was going to China was take advantage of all opportunities that are presented to you right now.

There are those that look at it like a challenge and step up to the challenge. I can think of some students who will do well and pursue STEM education. We are trying to instill in them that they are here for a reason. They're here because their teacher saw something in them. It's not just that they were at the top of their

class. There was something about them that through their application or working in the promise programs, they had the talent or ability to be here.

I think it motivates them or provides a kick in the pants. They get here and they are not the smartest person or the hot shot like they were at home. The competition is here. They see that everyone is smart and good at math. They look around and see that everyone wants to be doctors, lawyers, or engineers, or go to graduate school and get a Ph.D. in physics. I think it motivates them because it raises the bar. They get to see what is really out there. They get to see the competition, and observe what it will take to succeed. That's a push. The environment is a push or motivator.

The atmosphere that they're in, I think that it is probably competitive from day one. Even though our students would probably not believe that it is not that cut throat, the kids still compare their grades with each other. They still talk about their grades the second that they get their papers back. That always blew me away at this school. When I taught college and they get a paper back, they usually throw it in their bags. Here, they are like, "Well what did you get?" or "What did you get?" Having the atmosphere of the school surrounding them and seeing what they'll have to do to stay at that level is at that best level that they can. That's what I always try to motivate my kids to do. I almost rather have a kid, who is somewhat behind in areas that we're at, but will work really hard and understand what they need to do to get to the next level and to want to work hard at it.

Although the majority of IMSA faculty/staff perceived IMSA to enhance motivation in gifted and talented Black males, nine (33%) believed that IMSA hindered their motivation. The two major themes that emerged were (a) rigorous STEM curriculum and (b) perception of not belonging. In terms of rigorous STEM curriculum, seven (78%) of the IMSA faculty/staff respondents perceived that Black male students get to IMSA and discover that they are not as smart as they initially thought; there were others that were smarter than them so they became discouraged. One of the interviewees stated that the gifted and talented Black male is not only unmotivated to engage in STEM, but used this discovery as an excuse to be perceived as a victim:

Then when they've been here for a short time, I think they are staggered by the disparity between their education and that of the top students at IMSA, who are almost always Asian or White. They did everything that their schools asked of

them, and yet there is the cruel “reveal” that it wasn’t nearly enough. Since they gave everything that was asked of them, it is impossible for them to imagine what more it would take to “catch up.” They wrestle with a disheartening suspicion that they, and their Black brothers and sisters, will be assigned to last place forever. By the end of sophomore year, they have devised a strategy, and too often it is this: “Every even minimally progressive institution needs Black faces. I have a Black face. I will be a face instead of a brain. I will go to Springfield and give Sunday-church-type speeches about the importance of an education, while blowing off my assignments. I will guide groups of Black middle-schoolers on tours of IMSA, telling them about the intellectual challenges, while not accepting any of those challenges myself. I will be silent and passive in class, knowing that a liberal faculty will see me through regardless of the mediocrity of my work. I will offer complaints about racism rather than offer academic achievement. And this will probably become the pattern of my life.” At graduation, I think many Black boys are filled with a conflicted kind of gleeful despair. The glee comes from having successfully scammed the system: “Okay, America, wanna make trouble for me based on the color of my skin? Well, guess what. I just made it through this supposedly upper-school on nothing more than the color of my skin. Eat that, America.” The despair comes from exactly the same source: “I slid through on my race card. I cannot or will not do the kind of work required to be a real academic star. I will deal with self-loathing the rest of my life because I have been forced to say, at least to myself, ‘No, I’m not as good . . .’”

Of those who believed IMSA hindered their motivation, five (56%) of the IMSA faculty/staff who perceived when Black males sense they do not belong at IMSA, it leads to a decrease in motivation to engage in STEM, as suggested in the following comments:

There are times where they get the response that you don’t deserve to be here, you barely made it here, or you’re taking lower level classes. What folks truly don’t understand is that they’re just as gifted and talented as anyone at this academy.

I think the parallel is when the students feel like they are not here, but don’t fit, or don’t belong. I don’t know if I am talking about Black males, but if a student says, “I don’t know if I belong here or somebody made a mistake,” that’s when it’s a problems because they disengaged the culture, support that comes with it, the motivation, and tend to shut down.

I think being in the environment with other students is a motivator. For some it is a motivator, and others it is a hindrance. They are coming from an environment where they were on top, leaders, or where other people came to. Whereas now, the fact that they need help and are struggling is more of a demotivator than a motivator.

Other kids, I also see their work and not just the one or two kids but Black kids in particular. I see them working, but I think sometimes that they may find it

difficult to ask questions. . . . I think that teachers, especially the math team, really make the students feel comfortable with asking questions and getting help. We've also got better at monitoring their progress, providing them resources, and getting them into the math office for interventions. . . . I tell my kids that you know that you could be better at many things. It's like me; I have to struggle to learn English. That doesn't make you dumb; it's just that you didn't have opportunity to learn a certain way. I am always going to have an accent because it reflects where I come from and I shouldn't be ashamed of that. Just because you have to struggle to learn math that does not mean that you aren't exceptionally good at something else. Just tell yourself that I have to work hard.

The STEM Gap

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:

Math and science and technology are not pushed, even in my family, when we're dealing with educators as much as other subjects. . . . Math you could do without and science, I am good at it, but wasn't my passion. Also, you have to compete with "you need to be a football player, basketball player, fireman, policeman, construction worker, and mailman because there is a lot of jobs working at the post office. . . . So those stories of successful Black males who are in these STEM fields, that picture isn't painted often enough. . . . I've never had a Black male science or math teacher. It was either White or Black females. So those examples are gone. Didn't have those examples. . . . We did not target STEM. . . . To where the community I grew up in and it's very similar to the community that a lot of Black males are growing up in, it was "just get an education, graduate from high school and go to college." I got that speech where some people are getting the speech to just graduate from high school. That STEM piece wasn't

there. . . . Wherefore our White counterparts, you are going to be a doctor. There is no if and or buts about it. From birth, you are raised to be this physician, raised to be the scientific research, raised to be the chemist, physics, or mathematician. Therein lies the difference between the two.

It reflects who we are as a society in that where do we see African American scientists, mathematicians, or noble prize winners in math, physics, or economics. I think that we need to embrace those individuals that have come up through the ranks.

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 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.

We live in a White privileged society. There is a lot of ignorance to what is easy to a White student oppose to a Black student. Parents for Asian students are hands on and encourage them to find the passion that would be rewarding in the long run in STEM. Black males are not achieving those career paths. How often do we see Black scientist or in the news being honored for doing great things. There are a lot of White scientists, Asian doctors, and White doctors in the news and broadcasts. We don’t have a lot of those good/positive role models for the Black community, which is essential. Generally the message says that only White or Asian people are qualified for STEM positions. With having a Black president, it opened the door for youth to see opportunities. I think racism hasn’t disappeared, but gone underground. We disregard culture or culture sensitivity as American people. . . . The American culture doesn’t make it easy by the lack of exposure to Black scientists or doctors in the media.

STEM is not a cool thing to do among gifted Black males.

You want to think things are equal for people, but they are not. As a White male, it is easy for me to say things are getting better because of being at the top of the heap. In the stereotypical urban Black family, the emphasis is not on education but survival. There are more one-parent home families, lot of children, and students dropping out at 16 to help feed their family. It is not that opportunities are denied; they do not even exist. We have to fight poverty to have an impact.

Once poverty is removed, we need to change the family outlook. The difference lay in the historical logical type of differences. If Black males want to succeed like White people, they will have to be like White people because they have power and money in this country.

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:

The gap exists because they haven't had many of the right experiences to direct them into those fields. I think opportunity and right set of experiences are needed to get Black males into STEM fields. The learning experiences and opportunities prior to making the choice of entering a STEM field could possibly be responsible for a lack of Black males in STEM fields. I think if I provide Black students with the right set of learning experiences will shift them into STEM fields.

I can't say that there isn't any singular reason why the gap exists. I would say that one of the reasons is under resources. One of the reasons why you want a place like IMSA and want to be able to recruit really good Black students is do you offer them opportunities that they haven't had. I know that they're different areas in the state that are under resourced. Within the under resource, there are a lot of things that can go amiss. Students are not getting the preparation and inspiration that they need. As a consequence, we have students who are not going into STEM. They probably did not have the background or the inspiration.

A lot of it is the type of education that they are growing up with. It's their education environment as well as their living environment. The problem is what is valued in those areas. If they're in a school where being smart is not valued, it does have a big effect on the kid. . . . I also don't think that they don't have Black males that I have worked with or at the schools where I have taught in; their teachers are not as qualified. Their teachers are not really strong in the STEM areas. Even though they teach it, they don't have that real skill for the STEM program or for what STEM has to offer. Their teachers don't understand or don't have a real good base of knowledge in STEM which would reflect in their teaching. It is going to affect the students because they are not going to get that STEM interaction. It is necessary to promote STEM learning. . . . When STEM was brought into an environment for them, they were given a lot of opportunities to experience true STEM work. That is a way to motivate the kids. To bring it in and to really see its value and see what can be done with it. For example, if it's making movies, real science experiments, real work, using inquiry, and higher level math skills or courses available for the kids. . . . Getting more experiences for the kids. It's a dire thing that will help improve the number of African

Americans going into the STEM field, males and females. Especially the males, if they see what's available or what they could do, I think it would help. . . . How are we going to get Black role models in STEM fields, if the kids are not interested in STEM to begin with? . . . 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.

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.

The gap exists because of our educational system. It is very obvious that it is not equal to what White and Asian males are obtaining. Black males come in with a deficit because they have not been exposed to some of the same academic opportunities. They come to the academy and they don't see anyone who looks like them. There isn't that factor that says, "Here I am. I've done it, and you can do it too." Here at the academy, we have people doing the exact opposite. We have people looking at them and telling them that they can't do it because of what they look like instead of taking the time to give them what they need to be successful or point them into the right direction. There are people who do these things, but they can only go so far. We had situations in place to try and move that along, but we faced opposition. I still can't wrap my brain around why and how all of those things transpired. I think we need more role models. We need to tap into our alumni more or the industry to show these young men that it's still cool to be smart, mathematician, scientist, or engineer. Coming from the communities that they do, they are not seeing that. Their role models are the same as the role models in the White and Asian communities.

The gap exists because of the reality of schooling. Certain schools in the inner city of Chicago motivate students to graduate high school, not becoming a physicist.

Black males proportionally come from weaker high schools. There are a lot of issues with math and STEM education across this country, but if you are from a weaker high school you do not have many teachers that are as engaging; they may not know the subject well, may not ask interesting questions to make kids think. . . . If you have boring or inadequate teachers, you don't have sufficient working laptops or computers in your school, interesting videos where they're being shown things about what other people are doing, or what research could be done. . . . They sit in school in classes that are very boring or mechanical where nothing

is open. Usually math is taught that this is how you do it; or if it looks like this, then you are doing it correct so you memorize things. . . . They see teachers who don't seem interested in what they're doing. Some of the kids that come from that environment come here and see a different world, but some of them, it is just too much too fast. . . . Its inadequate schools and teachers, number of kids in classroom, lack of technology, lack of books, and teachers who are just minimally prepared. When you put all of those things together, there is a lack of interest. I can't blame those kids because I don't know what I would have done. There are a lot of Black males in that type of environment as opposed to Whites or Asians.

I think the gap exist because of backgrounds, the difference in the school districts. Students coming from the inner city of Chicago, East St. Louis, even areas like Elgin compared to suburban schools, they are behind. I'm speaking of the potential students who are coming to IMSA, they are still behind. They get here and are placed in science and math courses with students who are not behind and don't do as well as other students. This causes them to choose a different path. They choose a path of least resistance. There might be majors that are not as challenging academically which they feel that they could more successful in. That's one part of the answer. The second part of the answer relates to the students who are not coming to IMSA. The whole culture in the inner city or East St. Louis is not a culture that values becoming an engineer. One part of the answer is being behind and choosing a path that is less resisting because you are behind. The other part of the answer is the culture and what's valued in their culture.

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:

The nurturing given at IMSA to African American males sometimes evaporates at the college level. At IMSA, they are given choices and could choose less rigorous math and science classes to fulfill the 16 credit requirement. In college, African American males are put in rigorous environments and they don't have choices. Colleges do a great job at the retention of African American males because they intervene and offer other majors unrelated to STEM. Freeman Hrabowski says that he will not accept students who have not received a 5 or higher BC calculus AP exam. He only takes students that show an incredible level of math competency. At IMSA, AP is not a requirement and students usually receive a 2 or 3 on the exam. One of the factors is you must have a 5 on the BC calculus AP exam. If you don't, you are going to fall apart in any STEM-related field.

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:

One of the things that came out in the recent National Science Foundation is that the best indicator why students are not going into the STEM fields is because they don't have parents in the STEM field. If you have parents who are not in the STEM field and you're Black, you are not going to enter the STEM field based on what the data states.

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.

Being Asian, I genuinely feel it is the family. When I was growing up, the emphasis on education was strong. It was told that you have to get this bachelor's degree; there was no other way around it. We never thought that we would not do it; it was the given. Here when I see Asian parents, they have come to another country. They have left their country to come here. Their whole goal is to excel at stuff and they want their kids to. . . . That gives even more motivation to our kids that we have provided all of these things to you for your generation. You were born and brought up here so you don't have language barriers. You have all of the other luxuries that all other American kids have. The least we expect from you is to excel or do well and we are here to support you. I think that for Black kids, it probably is not there, the family support or ability.

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 discussed Black males being exposed to

STEM through involvement in clubs and research would help to minimize the STEM gap:

Our staff should say yes you are smart enough to be here, it is good that you are here, and you could succeed in STEM fields. You did not have the opportunities but I will provide them now. I will catch you up by providing you with certain skills that will make you successful in a STEM field in college. Not you got in here or not interested in this so why you are in these classes. Black males need to supported and receive positive reinforce in that passion. It will keep them going and foster those behaviors. We don't have Black males on the robotics team, Why not??? Chose some Black males and encourage them to pursue great programs as the robotics team. We are not encouraging Black males by saying "I think you should get involved with this or you will be good at SIR [Student Inquiry and Research] ." This will help bridge the gaps and move Black males into higher level math or science classes at IMSA.

Having younger students come and view the campus as kids, 9 or 10 years old, would help in developing relationships and make it easier to mentor them when they arrive as sophomores. Since Black males come into IMSA behind, we should complete programs like excel two years before instead of two weeks. This will help in catching them up academically so that they could be successful in rigorous classes offered at IMSA.

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 s 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:

Black males need role models in STEM areas to peek their interests, access to programs, and people that are willing to mentor.

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.

Our African American scientist, engineers, or technology people need to be highlighted more. The reason is because it is more realistic to be a math or science person versus Kobe Bryant or Kanye West. It is more realistic that they can succeed in a math or science field versus that. I truly believe as we move that way and have more African American involved in getting degrees in stem fields and seeing the success, then that will trickle down. Until we get to that point, we need to take responsibility and do this. We need to put the pictures of science and mathematician on the walls because there are people doing great things.

I think we need more role models. We need to tap into our alumni more or the industry to show these young men that it's still cool to be smart, a mathematician, scientist, or engineer. Coming from the communities that they do, they are not seeing that. Their role models are the same as the role models in the White and Asian communities.

STEM Motivation

The research question asked, *“What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?”* IMSA faculty/staffs' perceptions of gifted and talented Black males' motivation to engage in STEM, both intrinsically and extrinsically, were yielded from interview responses to questions. The study found that IMSA faculty/staff perceived the motivational factors of gifted and talented Black males to engage in STEM were as follows:

1. Obligation to Black community, $n = 15$
2. Success, $n = 13$

3. Good at STEM/STEM interest, $n = 13$
4. IMSA, $n = 9$
5. Learning, $n = 4$
6. Challenge, $n = 4$
7. Competition/peer acceptance, $n = 3$
8. Break negative stigmas of Black males, $n = 3$
9. Leadership, $n = 2$

This study also provided an IMSA faculty/staff perspective about the literature's suggestion that there is a Black male STEM gap and there are ways to minimize that gap. Table 4 shows a comprehensive snapshot of IMSA faculty/staffs' thoughts about the STEM gap, their perceptions of gifted and talented Black male STEM motivation, how IMSA contributed to that motivation, and how to motivate Black males to engage in STEM ($n = 27$):

Table 4

Faculty/Staff Perspective: Gifted and Talented Black Male Motivation (n = 27)

Why a Black Male STEM Gap	Perception of Black males engaged in STEM	Perception of Gifted and Talented Black male student STEM motivation	IMSA's contribution to STEM motivation	How to motivate Black males to engage in STEM
Lack of STEM vision for Blacks, n = 15	Struggle with STEM Rigor, n = 7	Obligation to Black community/break negative stigmas about Black males, n = 15	<i>Enhances Motivation</i> , n = 25 –Diverse Environment –Collaborative support group	STEM Exposure, n = 10
Lack of quality STEM education, n = 14	Hard working/passionate, n = 5	Success, n = 13	–Opportunity –Independence /Leadership	Black male Mentors/Role models, n = 9
Lack of parental support, n = 5	Wide range of giftedness, n = 5 Lack of STEM Encouragement, n = 4 Must act “Cool”/ Identity conflict, n = 4	Good at STEM/ STEM Interest, n = 13 IMSA, n = 9 Learning, n = 4	–Competition –Challenge	
	No different than any other student, n = 4	Challenge, n = 4	<i>Hinders motivation</i> , n = 9	
	STEM Encouragement, n = 2	Competition /Peer Acceptance, n = 3	–Rigorous STEM curriculum –Perception of not belonging	
	STEM is who they are, n = 3	Leadership, n = 2		
	Tries to take advantage of perceived victimization, n = 3 Nerds/Geeks, not the “Cool” guys, n = 2 Leaders, n = 2 Self-aware, n = 1			

**Gifted and Talented Black Males’ STEM Motivation:
IMSA Parent Perspective**

Parents of gifted and talented Black males were interviewed to better understand their perspectives regarding STEM engagement motivational factors. Twenty-one parents were interviewed; 16 were the parents of current IMSA students and five were

parents of IMSA alumni. Eight of the parents stated they were in STEM fields and all of the parents stated they fully supported their students in pursuing STEM.

Perception of Black Male Engaged in STEM

The IMSA parents were asked to discuss their perceptions of gifted and talented Black males engaged in STEM education, which generated a variety of responses. Their responses ranged from being curious/inquisitive about STEM to lacking a STEM vision. The following nine themes emerged:

1. Curious/inquisitive, $n = 5$ (24%)
2. STEM encouragement, $n = 5$ (24%)
3. Self-motivated/independent, $n = 4$ (19%)
4. Few Black males in STEM, $n = 4$ (19%)
5. STEM interest, $n = 3$ (14%)
6. Early STEM exposure, $n = 3$
7. Lack STEM vision, $n = 3$ (14%)
8. Stereotyped /break negative stigmas of Black males, $n = 2$ (10%)
9. No different than any other student, $n = 1$ (5%)

The most agreed-upon themes included gifted and talented Black males were curious/inquisitive and had been encouraged to pursue STEM, stated by five (24%) parents. The following three parents discussed how their students always questioned life and wanted to solve problems, as evident in their statements below:

You noticed things that, like, you know, “Man, he did that?” Or “He did that, that way? Wow, that’s really interesting.” . . . He had created and cut out all the planets, then put them on the wall, . . . and he had a pointer. He was pointing up to me the different planets and telling me exactly what these planets and how far they were, the characteristics of these planets. I’m like, “What? Are you kidding me?” And I was like, “Wow. That’s interesting.” . . . His vision was interesting.

So he can see things, . . . like a needle in a haystack. . . . Little things like that caught my attention. I think that's the same with a gifted child, . . . a special gift, where there's something he can do better than someone else, you know.

Well, in general, there's a sense of curiosity, questioning, a constant resilience; they might not necessarily be school focused or book smart and I'm talking from the perspective of both our sons, but questioning and engaging at many different levels of their experience. For our son, starting him off very early reading and learning sign language has helped him to want to learn more. It has encouraged him to seek out other opportunities for learning and putting them position, getting them involved in activities has caused them to learn something.

Just someone who is academically prepared and inquisitive, can solve problems, interested in the world and exploring their environment.

One parent further perceived their student as wanting to advance humanity, as indicated below:

My perception is that, in my son, I think that he is motivated from within, so he tends to question things, things about life, how things work, why things are the way they are. Just that curiosity that really plays a big role I believe in science, engineering, and technology because the way I perceive STEM—I perceive STEM to be at the ground level of individuals who are engaged in that. Like my son, they want to find ways to basically improve life and improve the function of life, so that inquisitive nature plays a big role.

This natural curiosity was nurtured and encouraged by parents, teachers, and mentors, as suggested in the following parental remarks:

I don't know how to answer that, for kids in general working—with kids in education, it is rare that you find kids that are interested in math and science, so when you find kids that are interested, you try to find things that would push them more towards working with things in science,

As a parent you have to recognize it early in your child and be involved with the school system that they're in. I was fortunate enough for the first two years that my son was in a charter school; the teaching was similar to the way IMSA does their teaching when it was recognized, and they had the resources to do more for the gifted children. As he entered third grade, it was a little bit more challenging because we went to a public school. . . . I was very fortunate in his early education that my job was such that I was able to volunteer with the school during the day time, so I was able to see what they were doing to make sure that he was not getting bored. I think as parents we have to engage with the teachers and administration to find out what they are going to do to make sure that the gifted and talented students don't get caught in the shuffle.

Going back to my perception, my perception would be that they have someone in their lives that is putting this material in front of them, somehow they got excited about math and science early, and somebody nurtured that. That could be the parent, teacher, administrator, a cartoon. My son grew up playing Blues Clues and they would do the clues, the investigation and the thinking and the wheels turning was all part of his growth and we just kind of latched on to it, for us in particular. My assumption, my perception is that somebody in their life helped spark that.

Some parents focused on how there were few Black males in STEM fields:

I think it's very important for African American men, especially gifted African American men to show their talent. I think it's wonderful that they're interested in the world of math and science because there's not a lot out there and I just see a bright future for them if they continue to go down this road. It's not a lot of Black males who are pursuing, going to college, or even studying this type of field so I think it's wonderful, and I personally said my son is not going to be a statistic so I'm doing all I can to make him succeed in life and be successful.

Some in our culture think that gifted students are a rare thing, but we never thought that. I needed the questions ahead of time. I think that in some circles it is perceived to be a good thing because they can take it to the rest of the community and make it positive, but I don't think we're to that point yet where the majority sees it that way.

My perception is that there should be more, of course. As far as my son, I think any student can achieve and should pursue a STEM career. I'm a little biased because I'm an engineer myself, but if you look at what we need in the world or society, there needs to be more technically minded students and people pursuing those careers.

There were so few Black males in STEM because they seemed to lack a STEM vision, suggested by four (14%) parents. The parents believed that Black males did not view themselves as scientists, engineers, and mathematicians, nor did they see anyone that looks like them in those positions, as evident in their comments below:

What you typically find that most students look at whatever vision is laid before them and unfortunately for most Black males, the vision they see is one that plays professional sports or is into music, rap in particular, or unfortunately some who are engaged in nefarious activities for a living and within that critical age of 5 to 12, they see those as the right vision, that seems attributable, that seems promising and by the time they get into teenage years, they've basically lost interest in academic challenge and curricula . . . I think the problem is we don't give them that vision for them to see during that critical window so they can embrace it and

run with it. . . . You have probably heard about the “tiger mom” phenomena, where these mothers simply says, “You are going to be an engineer,” right from the time the kid is 3 or 4; it’s math and science and weekend activities and all of this. If the average John on the Southside of Chicago does not have such encouragement, do we expect that they suddenly get to the ninth grade and then fall in love with STEM, maybe not. So, I think we certainly can say there are not enough making use of that appropriate time, age range who have sowed the seed and have them see what’s possible for the future through STEM.

I would say we don’t have enough from the, you know, early years that focus on African American boys . . . They just see them doing something they love with passion and the boys want to do that, so I think with me, more role models for kids out there. I don’t know how that is going to happen. You know for them to see, you know, they’re not focusing on how much anybody is making. . . kids see you do what you do with love and passion and they want to do that, so I don’t think we have enough of that in front of the, you know, Black boys.

We have talked about that because—well, I just think it is in the Black community . . . but especially the young Black men. They’re expected not to do much. They’re expected to not value education and I think [my son] experienced that in home school—it wasn’t popular for the young boys. The girls took their education seriously but the boys didn’t. So that was an issue, so to have him here in this environment and to be around other young Black boys excited about math and science and pursuing it to possibly want to go into a higher level is fantastic.

The Black males are often stereotyped; however, there were those who tried to break negative stigmas, as indicated in the interviews of two (10%) parents:

As far as Black students, I know there are always those stereotypes that they can’t achieve. So that’s one thing that we tried to do, make sure we have positive images for my sons, let them know there is that possibility; they can’t buy into the stereotype.

Not just fighting for a higher education period as a kid, cause most kids don’t do that; they do whatever their parents tell them to do. But to do that period and be a young Black male going through all these stereotypes, all these distractions and all of that that says a lot about them. They are strong and they think they are; they know they are. They really don’t know the light and it sounds cliché but the light that shining on them but it’s the truth.

For those that were involved in STEM and have combatted these negative stigmas, they were self-motivated, stated by four (19%) parents, and have strong STEM interests, stated by two (10%) parents; as indicated in their statements below:

The perception is that these young men are focused and they identified early in their education that they have strength and interest in the STEM programs.

I've never been the type of parent that would push them into doing something that they wasn't interested in and always giving them options and let them choose, and he always was interested in science, he was always interested in math., so you know you just try to put things in their path that would kind of help them go in that direction. If you know that they have a strong desire and love for it, you just do what you need to do to help them go in that direction.

I think that the child would have to be very self-motivated, independent, hard worker, and willing to make sacrifices to excel.

My perception, I think any student that pursues STEM academically is a driven kid, someone who sets goals for himself, someone who sees beyond his neighborhood, his community, and looks at the world at large and sees himself in it doing something positive.

I want to get back to the perception. So I think they're strong minded, I think they are strong willed; they obviously march to the beat of their own drum because as my wife talked about their environment isn't supporting that so for them to be able to forge through that and to stick with it even when their peers are saying, "Hey, man, that's lame why are you into that?" And they are still going through it; they have a vision for themselves that they are not buying what everyone else is saying. They are self-motivated, I guess is the word.

This passion and drive for STEM was a result of early exposure to STEM,

suggested by three (14%) parents, as evident in one of their statements below:

My perception, I'm excited for my son's opportunity and the fact that he's is involved in STEM, which is something that is so important in our country, and in our world, and it provides it seems like the most opportunities being involved in those type of curriculums; but to be quite honest with you, we weren't the kind of parents who steered Jordon or our other son towards STEM; it just happened to work that way. We were just more interested in providing all the opportunities that we could afford so that they could find their passion and they could find out what they were truly interested in, in life; so they were involved in all kinds of things from writing to math to science from the time they started school. . . . We always believed that summer was the key to great education and successful education, so ever since they started school every summer, they were involved in some sort of summer enrichment program; and so again my perception of steering them toward a STEM profession, that wasn't our goal or intent. Our intent was to provide the vehicle for them to find out what they're truly interested in.

Although the majority of the parents discussed unique characteristic specific to their perceptions of Black males engaged in STEM, one parent indicated that he saw no difference in Black males when compared to other students engaged in STEM. He went on to state,

I guess I don't see race as being a real factor when a gifted young person pursues science. I think they're inquisitive and enthusiastic. W

Where does that come from? . . . I think exposure early on and parental guidance have a lot to do with it.

Perception of Intrinsic Motivation

The parents were asked about their perceptions of the intrinsic factors that motivate gifted and talented Black males to engage in STEM in which seven themes emerged, including (a) good at STEM/STEM interest, (b) challenge, (c) competition, (d) curious/inquisitive, (e) determined/self-motivated, (f) success, and (g) learning. The most agreed-upon theme was good at STEM/STEM interest, suggested by nine (43%) parents. The parents discussed how their students' motivation increased when they realized they had a talent for STEM, which helped to develop a passion for STEM, as suggested in their comments below:

Ever since he was a kid he thought it was fun, he really did. I don't think it was the— it's going to make me a better person, it's going to make me smarter than people. He thought math was fun ever since he learned it. When he was a kid, he was two, and I would ask him, "What do you want to play?" "Let's play math." "Let's do subtraction," because we had the flash cards, adding, subtracting, dividing, multiplying, and we had money. "Let's do multiplying," and I would say, "That's not a game; that's for study time." He would say, "That's what I want to play." It was fun to him, and at first we were just like "okay," and so that was his motivator, he got it. I have always told him he has this gift when it comes to math because he sees it differently than all of us. For us we have to learn it, study it, make it make sense. To him it just made sense, it literally is fun. The boy has slept with a math book every night for the last, eight, nine, ten years . . . I really have to fight him to do something outside of math, and he takes it upon himself, he enjoys it. That's his thing!

I think the motivation started when because we understand the value of education for success so we exposed our son from the very beginning of life to STEM experiences. I am in the medical field, my husband was in the medical field, and mathematics field with his accounting; so that led to sharing with him some of the things that STEM offers. He inherited a good brain of doing math and curiosity of science.

I have my doctor of pharmacy and my husband is a medical doctor. He is a physician . . . Like I said it goes back to my perception: kids follow what they see and [my son] has always been interested in sciences. I will say more than math. . . . He wants to be an astronaut from—you know, if you ask him when he was really little what he wants to be, he wants to be an astronaut. . . . My sister-in-law subscribed him to NASA magazine and he is getting magazines from—I think it's an aeronautic school in Alabama, Huntsville, Alabama, it is. So he's, you know, everybody is planning for him to go to summer school there and whatnot; so everything, you know, may be because of upbringing and his surrounding is always, you know, have the interest in math and science, especially sciences.

I think, first of all, he has a strong work ethic no matter what work he was doing, even at a young age. If homework was assigned to him, he made sure he got it completed. From that, as he took math and science classes and saw that he could achieve in those, they became the classes he wanted to do well in. He does well in all his classes, but as he grew older, things that interested him had math and science involved. . . . For example at one point he wanted to design video games as a career and we actually had him during the summer about three years ago took a C++ class through an on-line program, so I think his motivation he wants to do well, wants to do his best. We've had him in advanced classes or honors classes since elementary school because otherwise he seemed to be bored with the regular classes. So work ethic, and as he's continued to grow and saw that math and science was worthwhile and he had some career goals that demanded that he have math and science under his belt.

I think one motivator is strength in the area so typically I think that if kids do well in a certain particular area it's one that we're always as people in general are motivated to areas where they have strong talent and ability. Specifically for my student, he went to Lindblom Math and Science Academy prior to attending IMSA so he had already been involved in something that was focused on accelerated education in the areas of math and science.

Well, I think when he was younger, when he was about 2 years old and he was counting real high and I was amazed he was counting to like 200 and 300 and he recognized patterns with numbers right away; and when I saw that, we just kept going with it. He enjoyed that he was so good at it so he wanted to keep going with it and find out how far he could go with it. He would get books on his own, he would try to solve problems in different ways, other than what he was being taught in school . . . and he just liked being able to do this and he noticed right

away that other kids were not able to do it; but what I think made it intrinsic in him is that he knew he was good at it . . .

Now, going to IMSA, it opened the doors of some science fields and math fields and I think when [my son] had to participate in the presentation and they had to do the research program and more importantly he was involved in a program called the research apprentice program at the University of Illinois in Champaign where he now attends. He got excited about the area of preservation of water and food quality and how the fact that throughout the world, we have a shortage of water, and that somehow peaked his interest; and from there he has been pursuing this whole thing with science and natural resource studies. So I think from an intrinsic motivational standpoint, it was the fact that he found something that peaked his interest and that he's interested in. He's been pretty good at almost everything that he has tried, so that's the best way I can answer that question.

So, I think for my son, he is very creative and has an enthusiasm for design and then at the same time, science, biology . . . through the programs he was exposed to, but I think really the driver was he intrinsically has the ability to pick up design and really find differences in design. And we saw that early on, you know. This goes back to him growing up, maybe 3 or 4 years old, he intrinsically could do math beyond his age and able to recognize the differences in design.

Six (29%) of the parents believed that having a curious and inquisitive nature helped to develop engagement in STEM and motivated the gifted and talented Black males, as evident in their comments below:

When he was a baby we use to call him curious. When he was born, his eyes were huge. We would always joke that he would soak in everything; he was trying to see everything that was around him. They use to call him *baby curious*; he always asked questions. He wasn't the average kid where he would ask, tell him, and blow it off. He would have follow-up questions. He's going to grill you. You're like, "I don't even know! Slow down, let me do the research." He has always been curious and we have always fed that. We have never blown him off. He would ask a question and let's get into it. "Come on over here and let me show you this." He has never been afraid of books, to read. He just loves learning! He loves teaching as well. You'll catch him on the white board teaching his baby brother.

She read to them quite a bit in the wound, but he reads a lot . . . He's always curious . . . he always read a lot . . . I can probably say he's read more than anyone in the house, even me at my adult age and she at her adult age. He's the kind of kid, early on—you know how you get kids involved in different activities; he was the one who sought out opportunities to put him in this program or put him in that program ever since third grade. . . . He did the Math bowl activities regardless of us trying to suggest it. He picked up an instrument, he was doing

spelling bees, he was in the chess club. . . . When we had him involved in the University of Illinois extension program— prior to that he expressed an interest in astronomic, aeronomical engineering; and all we could do is find programs he could attend. He went to space camp in seventh grade. He started reading at age 3 and from then on he was pulled out of his classrooms in elementary school because he was head of the class because we encouraged him early on to get involved in things.

My son was always and still is an overachiever. When he was given a task to do he would complete it and he always wanted to know why and he asked a lot of questions; of teachers, me; he visited his dad on the weekend and always made sure that his dad was kept in the loop to keep it simple of what was going on in school so he went to visit, he was able to do that follow-up also. My son was a very inquisitive young man; he always wanted to know why for whatever subject it was. . . . When he was in the fourth grade, they took a trip to the conservatory. He came back with a million questions; they gave him the seed to grow. When he was given papers to do on specific people, he always went above and beyond with additional information. He always did more than what was required.

My perception is that, in my son, I think that he is motivated from within, so he tends to question things, things about life, how things work, why things are the way they are; just that curiosity that really plays a big role I believe in science, engineering, and technology because the way I perceive STEM—I perceive STEM to be at the ground level individuals who are engaged in that. Like my son, they want to find ways to basically improve life and improve the function of life, so that inquisitive nature plays a big role.

Not only were the gifted and talented Black males believed to have an innate curiosity, four (19%) parents also perceived them to be determined and self-motivated, as evident in their remarks:

Once he gets something on his mind he is just really self-motivated and driven. He will put in the time; he will study for it. Literally since second grade the conversation is what high school are you going to? I am going to IMSA, dad. What are you going to do to go to IMSA? I'm going to study, turn in my work on time, I'm going to work hard, I'm going to learn.

I think from early on, we pushed and always gave him opportunities to do more than was just asked. So he was always in extra programs, reading, math, and things to enhance whatever he was doing in school. I just always had a concern if he was bored or if he wasn't very busy, so we just wanted to make sure that he was kept busy. He never seemed like it was too much . . . he never complained. He just kind of accepted that this was what he needed to get ahead and move forward and excel.

As I think back to go any younger, I can't think of anything specific that would differentiate him from other students with the exception that he's pretty self-motivated and has always been focused and serious about education and learning.

He has always been the one to just do it; it's never been a second thought; he was always a go-getter . . . and he always been that child, I'm going to do it, this is what I want to do and I'm going to do it, and I like that strength in him. And then there's a strength in him that I don't like; he feels like he can handle things on his own and do things on his own without others help. But over the years he has realized that he can't do it all by himself, but he just has that drive and it's been in him for as long as I can remember; that determination that this is what I'm going to do, to strive and do better, . . . when he fails at something, he tries to do something better or he strives to do something different so he never gives up. He hits obstacles, but at the same time he never gives up; he always finds a way to do what it is he needs to do.

These self-starters also have a competitive nature, perceived by three (14%) parents, and enjoy being challenged, perceived by two (10%) parents. Both the competitive nature and being challenged motivated the gifted and talented Black male STEM engagement, as evident in parents' thoughts below:

I think first of all he's a little shy, but as he's been at IMSA now for two years. He's really began to come out of his shell and he's always been one to help people, and I think as he sees himself getting into science and technology. Not only he likes to be challenged, he likes the opportunity to solve things that are not necessarily there, and I'll give you a couple of examples. It started back in elementary, I would say puzzles, any kind of puzzle, anything that gets his mind going to solve something. He's always been gravitated to and when it comes to helping others rather it be through tutoring, he's always been one to volunteer for those types of things, and I think he gets a lot of joy out of helping others and again solving mathematical or science types of things, equations, problems, that gets him going.

His love and joy for math . . . has always been good in numbers . . . likes being challenged . . . never into athletics . . . competitive, but not in extra-curriculars . . . enjoys being in an environment around other intellectual minds.

I think in his 4th, 5th, 6th grade, apparently his science teacher encouraged them to do projects in his elementary school. She should be given some credit for this because frankly I have to say that I didn't discuss in depth with him about STEM or whatever he wanted to pursue. I just more—well go to school, earn good graders, . . . so I think the first time I saw him show interest was when he had to represent his school for a city-wide math competition, and I think a second time when he had to do some type of science project. He certainly, you know, showed

a flare for competition at that stage, so I think this would be what I consider the early influences I observed.

I am going to tell the chess story . . . this is going to sound crazy. He has been playing chess since 2 years old. I taught him the moves. I am a chess player so he has been sitting on my lap since we were in college. As he got a little bit older I would let him make the moves. I would tell him, "Move that pawn here." He would move it, and I would say, "Where is the knight?" He would say, "The knight's right here." I would say move the knight to this square; he would ask to move the knight to this square; "Yes move it there." So at 2, the last piece I couldn't get him to get was the bishop and that seems like the easiest piece but for whatever reason he didn't get it. But once he got it, that was it. We started playing chess. She would come in and say, "I can't believe you're playing chess with a 2-year-old." By 3 he got pretty good. By 4 we joined a chess team in Chicago on the North Side. . . . We would get in there and they would be like little kids can't join this chess club. We would say, "Just let him play," and they would let him play on the chess team. He got in and he is good. They were like, "Oh My God, this kid is good." He would always wear this oversized Cubs hat, in chess tournaments playing these bigger kids. . . . The chess team went down to Navy Pier and they won the Navy Pier championship. He was on there; we have pictures, it was amazing. He would come home and bring out the chess board; he wanted to play. He would play chess by himself, teaching himself but that goes back to his intrinsic drive of wanting to know, wanting to be better, that competition.

Two (10%) of the parents believed that learning in general motivated their students to engage in STEM. Their gifted and talented Black male students would read science magazines and were constantly engaged in solving puzzles, as stated in their comments below:

My husband and I both read a lot and we would have books for the kids and read to Joseph like the Dr. Seuss books and take him to the library, all the kids, and magazines like *National Geographic* for kids and *Ranger Wreck*, and we would sit there and read with him; they were at a level that he could understand and even the toys we bought for him; we got Legos and he loved Legos, . . . and we would get books on how to build a dinosaur, how to build a car with the different Legos; so like pre-engineering and he just loved it and he could make people. . . . He was into Pokémon and he built this real cute Poke ball using red and white beads that you put on an angle and iron them; . . . he loved dinosaurs so we would get toy dinosaurs and go over the different names, and then his aunt was amazed when he was a little boy and would tell her all the different types of dinosaurs. . . . We bought computer games; it's a series called the Freddie Fish series, and it appeals to young kids and you have to solve problems and use logic; . . . As a family we

did a lot of trips to museums, children's museums, . . . go the zoo, outdoor activities, a forest walk, "What kind of tree is this? What kind of leaf is this? . . . Another thing I think is important is music education; when he was like 5 years old we enrolled him in the Sazucki school of guitar; he learned classical guitar and a lot of studies show that music helps to develop the brain and mathematical skills and so we were aware of that and luckily in our school district we had an orchestra and so he was a member from a very young age. He makes his own music; he can play the keyboard, and he figured that out on his own.

He got a lot of positive feedback probably in third grade from the first male teacher that he had who happened to be African American, and I think as a result of that relationship, he began to take academics more seriously. Mr. Witt was his name and he encouraged [my son] to read a lot more . . . he was the first one to give him the Harry Potter books, and it was the first time that I can remember that he read so much and so into the series of books and it just continued from there. By fourth grade, he was reading novels regularly and enjoying them; and around fifth grade, he started to excel in math; and even then, going into middle school, we had to fight to get him into the higher math class because he did not score high enough they said to be in the higher rated math class; so we ended up having him take the test with the district over the summer again, and this time he scored higher or at least that's what they said, and he was raised into a higher math class going into middle school; and from that point on that's when he started to excel, but even then STEM was not necessarily his focus, it was basically math. STEM didn't really become a major focus until during his Freshman year at his home high school where he again excelled, but I can't really say STEM specifically was on his mind. When he got to IMSA is really when he started to lean towards or pay more attention to STEM.

One parent (5%) discussed that her son's primary motivation to engage in STEM was success. She discussed the values she instilled in him, including education as pivotal in her son's development, as suggested below:

I think that his motivation is because he wants more out of life and our goal with him has always been to be better than us and not like us. We both graduated from college, but we wanted him to go further, so we always motivated him to be the best that he can be and there is no excuse to why he can't do anything. We always taught him honesty, commitment; if he starts something he has to finish it, and I don't care what it is, whether it be school work, sports, volunteer work, you don't start it and say in the middle "I'm quitting." There's no quitting.

Perception of Extrinsic Motivation

The parents were asked to discuss their perceptions regarding the factors that extrinsically motivate gifted and talented Black males to engage in STEM of which six themes emerged: (a) obligation to/push from Black community, (b) teachers, (c) STEM exposure, (d) IMSA, (e) challenge, and (f) competition. The most agreed-upon theme that extrinsically motivated STEM engagement was obligation to/push from Black community, stated by 14 (67%) parents. Some of the gifted and talented Black males wanted to do well for their families, others viewed Black males in STEM positions and were encouraged to follow in their footsteps; whereas, some wanted to prove to society that they were intelligent in STEM, as reported in the remarks of the parents below:

He ran across a few administrators who didn't believe that he was what he was. So I think that he set off to prove them wrong. Because when he went from the program they had from the junior high, from the eighth and they are talking about the math class, and we are like "he already took that." So we pulled them to the side and said, "He's already taken this class; we want him to participate in this program but he's already taken this math. Is it possible for him to test out and take another math class?" And, of course, they blew it off, "Well maybe he took a form of it but it is probably not what we do here. So we will give him a test and we will see how he does." And, of course, he smashed! . . . Of course when his test scores came back, he loved walking by smiling at that man who thought that he took a form of the math. He blew that test out; it was to the point they just stopped: "Like you don't even need to finish this test; he needs to go up there with these sophomores." So it's intrinsic and extrinsic; he liked that people doubted him because I think on some level he knows that because he is a young Black boy and he is younger he likes to show them.

He was a boy scout, and I remember one time they asked him to write about role models and he was—at that time he was applying for IMSA. He was applying for another boarding school. It is not gifted and talented. It is a boarding school, a very good boarding school out in Indiana, and they asked him to write about role models and he picked two people. The first one is his dad and about everything the dad does, and the second person was Ben Carson, . . . he is the pediatric neurosurgeon from Hopkins University and he is well renowned. [My son] . . . read one of his books, . . . maybe a couple of other things too.

I think me being an engineer has a factor. I wouldn't say it's the only big factor . . . he seems to identify more with his mother because she was at home when he was young . . . I do talk about the importance of STEM-type careers and the importance of using your full potential so if you have an aptitude for math and an aptitude for science and you're doing well in it, then you owe it to yourself to look at those careers that utilizes those skills; so to some extent my imparting that type of advice probably had an impact on him. . . . I did discuss those things with both my boys; so there is some advantage of having a parent or a role model that emphasizes STEM.

I would say both his parents, the fact that he is the product of a teenage mom and dad and there's always that stereotypical thing where people say you won't go anywhere . . . I think he has something to prove, as well as we did and also his grandmother. He comes from a family that doesn't have many graduates outside of me and his dad, you know high school graduates, college graduates, on my side. I was the first; so those are his motivations to keep going. You know, I always take him back to my old neighborhood and show him that this can be you if you don't do what you need to do right now in school. So, I would teach him that you're always a paycheck away from being homeless. So, he gets speeches all the time.

I think that he really wants to set a good example for his siblings, so I think younger siblings are absolutely an extrinsic motivator for him and he's—well, our experience as a family; we lost a major part of our family. His father, my husband, and I think that he is also motivated by that experience, just to do the best that he can do, as far as his legacy, to really carry that out, so I say his family for sure.

The next most agreed-upon theme was teachers, stated by seven (33%) parents.

Below is a scenario that one family experienced while trying to ensure their gifted and talented Black male was challenged, had access to quality STEM education, and how teachers played a pivotal role in not only their student's development but also maneuvering through the school system:

I will add that he has had excellent teachers around him. . . . We also lobbied like hell to make sure that he has gotten the right teachers. . . . First of all we had to skip him, he skipped third grade. They wanted to skip him out of first grade to third grade. We were like I don't know about skipping so we held back. . . . We got into his third grade year and it was too slow for him. . . . When he gets to third grade we are doing fifth grade math already. . . . "All right, let's skip third grade." It was a hard decision for us. The principal had to almost really convince us saying, "He needs to skip." . . . She kept saying, "We are going to be honest; he

is smarter than the third graders, the fourth graders and probably the fifth graders . . . so we skipped to fourth. Then we met Ms. Franzee, which was his fourth grade teacher who went to the next level to make sure he was properly challenged in the STEM areas. She really bent over backwards, it was awesome. There's another external motivator, the teacher. She was so good we lobbied the principal to ask her to come to fifth grade as his teacher, and it worked. She moved up to become the fifth grade teacher. . . . You see the environment that he was in; the external environment was amazing.

The third theme that emerged was STEM exposure, expressed by five (24%) parents. These parents perceived their students' early STEM involvement, inside and outside the classroom, motivated gifted and talented Black males to engage in STEM, as suggested in their comments below:

Much to the dismay of my wife, I engaged him a lot in video-gaming, and I made sure that the video-gaming was cooperative because his brother is five years older, wanted to play competitive things, and it was a part of us keeping them both focused and out of each other's hair, and he's engaged quite a bit in video gaming rather than athletics. I would have to make him go outside and play or make him go play basketball or do other things besides the computer.

I think about it probably since he was 7 years old, and I'm sure folks at IMSA have heard the story, but he was flying with his mom and aunt to Atlanta, and I think the flight was delayed, . . . the Captain put his jacket and hat on Michael, . . . during the delay and showed him the cockpit, and he was so amazed by that. . . . I think at that point, it was a turning point for him. He started to become fascinated by flight and subsequent to that; that was at 7. So along about 11, we sent him to Aerospace Camp at Northwestern for three weeks and that really kind of turned it around for him. . . . He was just really fascinated by that whole experience and he's been on that path since.

I think my undergraduate degree is in engineering and so is his mom, so he grew up in a household where tech talk was kind of natural and my friends were associates; they have given a more objective side, so he had exposure to those conversations and those individuals at universities and in the field and labs at an early age, so that type of exposure gave him opportunities to work on weekends and summer camps.

I think the exposure at being at the academic center which was the seventh and eighth grader program at the Lindblom Math and Science Academy might have been an external motivator as well as learning about the existence of a school like IMSA.

The next themes to emerge were challenge and the Illinois Mathematics and Science Academy, each stated by four (19%) parents as extrinsic factors that motivated gifted and talented Black males to engage in STEM, as evident in comments below:

I think a couple of things: my background is in engineering, I have an electrical engineering degree as a Bachelor's and I work in a field for automotive. I've worked at General Motors and now I work for Navistar and we do truck engines, and so he sees and understands what I do. His mom is a very science-related person as well. She has a physics degree and Kyle has a brother and uncle who have a Master's degree in physics and a doctorate in physics; so I think he was always challenged with problems. . . . He's also just gifted and he was born with that type of ability to be very strong in that science field and has just gravitated to it.

I think the other thing that I didn't mention earlier, it's a matter of fit and I can't say it's all math and science, but for IMSA in particular, it became more of a fit, a social fit, a personality fit for my son versus another kid at another math and science academy. I think it's the cultural fit in addition to the academic fit because he . . . didn't feel as much a part of the school at his prior school like he does now.

These parents believed that IMSA gave their students the challenge they desired in their pursuit of STEM. The final theme to emerge was competition, reported by two (10%) parents and evident in the statement of one parent below:

I don't think he had much choice so the expectation he clearly had to go to school, had to do well in school, but in terms of STEM, the early stages, I wouldn't give myself any credit. . . . I didn't hear about IMSA until you did the program in Chicago at Apostolic Church of God; so I'll give big credit to his teachers, who identified he was good with competition, ability, and interested in science. Now by the time I came to realize that he had to compete at such a high level to be accepted into a school like IMSA, frankly it was almost getting too late and that's a lesson that I learned for his younger brother now whom I'm starting with much, much earlier; so I'm sure the interaction in school and one other classmate of his who was also on his math team and going around the city for competition . . . the impetus early on, I would say lies with his teachers and maybe his one classmate.

Perception of IMSA's Contribution to STEM Motivation

The parents of the gifted and talented Black males were asked about their perspectives of IMSA's contribution to motivating their students to engage in STEM.

The parents believed that IMSA both enhanced motivation, stated by 21 (100%) interviewees, and hindered motivation, stated by four (19%) interviewees. Regarding IMSA's enhancement of motivation, the following themes emerged: (a) diverse environment, (b) challenge, (c) independence/responsibility, (d) STEM immersion, (e) opportunity, (f) competition, and (g) collaborative support groups. The most agreed-upon theme was diverse environment, reported by 16 (76%) of the IMSA parents. They perceived that IMSA's ethnic-based diversity and being around inquisitive minds helped prepare them for the global world, which served as a positive motivator for gifted and talented Black males to engage in STEM, as depicted in the comments below:

The fact that he was able to adapt fairly well, I think, with a diversity of cultures and kids with different cultures and they appreciate the values and I can see that in his attitude, as taken to the behavior, the foods that he eats, his communications with people with other culture to the community, the languages that he can speak. He speaks Japanese fairly well, Spanish, and his tolerance for people who are different is good. And the fact he has some very good teachers and they'll call him.

I think for him this is what he's wanted because he wants to be surrounded by people who will think like him, who are excited about math and science. So we were just having a meeting downstairs; he was saying that he likes that he is around other children who are gifted because he is learning from them. . . . When he was in kindergarten he wrote a book and it was hilarious . . . when he first started school he was the only kid who could read, write, and all of that. There was this other little boy who could so they worked together to write the book but it was his competition. . . . So I think with him being in this gifted environment, other children like him, he is like, "This is what I needed because now it's not me being stagnant and helping everybody else." . . . But I think being in this environment he likes it because he respects the children here . . . He honestly didn't respect his old group members at his old schools. . . . IMSA opened his eyes. He said these kids are like me, I can respect them and I can trust them.

For one he's around other students that are interested in achieving. One thing that I did hear him complain about in the regular high school, . . . about other students, didn't seem to try as hard, or have that much interest for those student that were outside his honors classes. So for him I think it's really important to have other peers who are interested in those subjects. The teachers from what I can tell are very dedicated and this actually is an advantage for them because they're teaching

students that want to be there and want to achieve, so I think it's very important his attending IMSA and be able to pursue an education with a strong base for whatever he wants to do in life.

I think it's encouraging him because he's around . . . kids who are even more advanced because where he was, he was considered the brain at the school and a lot of kids looked up to him and he was a genius, and I used to tell him that "Yes, you're smart, but there are other kids who are out there that are smart and even smarter than you" . . . now he's actually seeing it all around him; whereas, before he didn't have all that around him from the school he came from; but he needed to be in this environment so he could see how far he's come, but how much further he has to go; there's still a lot learning he has to do to get to where he wants to be in life.

I can't imagine him going anywhere else [IMSA] but . . . then after that first year particularly, knowing there was more out there for gifted and talented students, it became more important for him to do better in some of the things that he did, like when he would come home he would talk to middle schools about IMSA to encourage others that they can do it also, here in our community, My son is looked at in high regard just because of the things he's done, going to IMSA, going to Princeton and the things he's done since he got there and I think that IMSA was the platform, just by the way they teach the students to be thinkers, the group projects that they do and their diversity. . . . our area is like 95% African American and you try to teach them to be diverse and understanding of different cultures and languages; but to go to IMSA and be in it, I think it really brought it home for him. . . . It's something that he would not have gotten otherwise.

Sometimes when you go to a school that has all types of students and their learning experiences, sometimes gifted students can get lost in the shuffle, . . . but when you have all gifted students, they learn how to be humble, they learn they're not the only one that's gifted, that they're not the most talented in the world, that there are other kids just as good or better, which I think is great. But going to IMSA, it provided them with a vehicle to grow and mature and to just reach their own and especially with the component of living away from home, living amongst their students; it's so much that they gain, so I think that's what has made college so easy for Jordan and I'm sure for all of the IMSA students.

First of all I love that its multicultural being around people from different cultures, gives you a lot of appreciation of the world, and he does like to have Indian friends, Chinese friends, all who are about learning; so it's just natural if everybody is learning and sharing ideas you're just going to fall in line and do the same thing. He fits perfectly at IMSA; my other daughter went to IMSA too and he fits in better than her.

He went to a high school in which he was in the gifted program and he was smart, he was very smart. He was one of the top students at that school and then he gets to IMSA and the whole entire student body is just as gifted, just as intelligent just

as smart as he is, and I think that motivated him. He found people that thought like him and pushed him. They pushed him because he didn't know a lot of things he thought he knew being at the other high school, but when he got to IMSA he was like, "Whoa, I need to step up my because these kids are actually smart," so I think being around kids that were as smart as he was, smarter than he was, gave him the drive and the motivation to do better.

The second most agreed-upon theme was challenge, stated by seven (33%) parents. They perceived IMSA to provide an environment that academically challenged their student in STEM, like no other educational institution, as expressed in their comments below:

My son got in biology class at first Walter Payton and he was showing the other kids how to do that work and the volunteers told me, "Yes, SIR [Student Inquiry and Research], he's gonna be a leader. . . He said, "I don't think I'm being challenged enough." He was the one that wanted to go to IMSA only because he was invited that summer, and he was in the science fair, and he took like second or third place with the kid . . . He's the third place and this kid who was a year ahead of him, he said he was going to IMSA and we said, "I've already heard of this. I mean I don't anything about it," and there was . . . that's a residential school. I don't have a problem with that. Just like that. So, well, we trust it. We didn't think he's gonna get in but he got in. Now, he got in, there was a whole another dynamic.

A couple of things, one, he's surrounded by students who all have gifts when it comes to the sciences and so it's a comfortable environment for him; it's one where he never has to worry about the mindset of sticking out by being seen as different and also, two, it's challenging because he's not the only one who can do these things; and it's people who can do these things; and . . . they challenge each other in a positive way, in a competitive way, but with good spirits. . . . It's not a let me show you up; it's "I'll show you what I can do," and those who gravitate towards it make you want to do it even more.

He just loves that environment where they challenge him and he's social to, so living with the people, that's like the perfect school for him because he can be social and be learning. It's not like where no one else is trying to learn and question the universe. IF you listen to their conversations, it's about the problems of the world and physics problems. So, it's a community that treasures learning and values learning, and it's an energy that he just picks up on and contributes to, and I think that's been good for him.

I think the surroundings . . . there has pushed him because he comes from being number one here in Plano, where it was fairly easy, and then he gets there and he really has to push; the work is harder, the motivation is surrounding him. He has

kids that are on different levels than where he's at so he has to be motivated by trying to stay grounded, focused, keeping up with everybody else, because here in Plano there was no challenge and he is very challenged there.

I think it's encouraging him because he's around . . . kids who are even more advanced because where he was, he was considered the brain at the school and a lot of kids looked up to him and he was a genius, and I used to tell him that "yes, you're smart, but there are other kids who are out there that are smart and even smarter than you," . . . Now he's actually seeing it all around him; whereas, before he didn't have all that around him from the school he came from; but he needed to be in this environment so he could see how far he's come, but how much further he has to go; there still a lot learning he has to do to get to where he wants to be in life. I think going to IMSA, he's more challenged. On the social aspect, he's been able to hang out and socialize more. . . . I think being at IMSA has developed his social aspect as well as STEM.

I think that he's used to an environment where he was at the top of his class, looked up to as having the most information, the smartest person; and since he's been at IMSA, it's been challenging in that there's information out there that he's not familiar with, or that he's not seen before; and his peers, they have. A lot of them have more of a background and a foundation, in various subjects in science and math, even language and grammar, so that's motivating for him in that I think a student who is not gifted and talented, it would be almost an insurmountable obstacle in that situation for that person, but for him it just pushed him further so that he could be the best that he could be.

To assist in this challenging IMSA environment, the gifted and talented Black males had a collaborative support group of peers in which information could be shared and exchanged, stated by three (14%) parents:

So, he's got this IMSA community of kids that he really has good friends, that he had a network of friends, a support; and that is critical because when you look at people who do better under stressful conditions, if you have to identify one underlying denominator that allows them to do better than those who fall by the way side, because all of them are going with some challenges, and stress is those who have friends, those who have psychosocial support system.

The spirit of the teaming, the way they work on projects together, the way that the school does things internally as well as externally have been real good from that standpoint.

I think by having individuals of interest together they tend to collaborate and feed off each other, engage with each other in a similar manner, so if your neighbor is taking some advanced math or science class you tend to have that as your topic of conversation.

An additional three (14%) parents focused on how IMSA developed their students' independence and heightened their sense of responsibility, as indicated in their statements below:

What I think it did for him today, he's better prepared for college as far as the whole roommate, and living independently is a another dynamic that other students haven't experienced, and I think even though he was independent to begin with, and I never really had to check to make sure he was doing what he was supposed to do, I think this just reinforced it and he had a jump on a lot of the kids that are just out of the house for the first time . . . being away from home. He knows what has to be done, he knows what's required, and I think him being away from home those three years kind of helped him conform that that's what he needs to do.

I think it makes him very responsible so that motivates him, like he's out there—almost like he's on his own, he's getting prepared for college. It's preparing him for college and he probably won't have any trouble going to college. It keeps him on his toes and makes sure he does what he needs to do for his homework. . . . I don't have to stay on him for homework, he does what's he's supposed to do, when he's supposed to do it, how much time he needs to do it in.

Now the residential aspect, that's something else altogether as well, the residential part of it, that freedom, and I can see that even when he's home. He just keeps all sorts of hours. At this stage of the game, what do you say? I can't say anything to him. He looks at me like I'm crazy, like "this is what I do, and who are you to tell me I'm going to sleep?" . . . He would just sleep all day and I understand that the environment is challenging, and I know that he can't sleep all day at school, so I don't really bother him too much when he does that here because I know what the pressures are. . . . In this situation, being in a residential environment at a younger age, it taught him more responsibility. The residential aspect is also motivating because he is able to control his own schedule and do it in a responsible way.

The final themes to emerge, each reported by two (10%) parents, were STEM immersion, opportunity, and competition, as evident in the following remarks:

Prior to coming to IMSA, he really didn't have any competition. I don't think the majority of students around him were motivated to do as well as he does; and now I think he's in an environment where people are more motivated than he so he's trying to keep up with them; so it's pushing him more than he was pushed in the past.

I know for the fact that he is competitive, so being in a community with other bright students who are also driven and competition forces him to be on top of his game. . . . He gets down on himself if he doesn't compete with others that he

thinks he should be competing with, and so I think the whole idea of IMSA with a small community, but talented and bright students, is the kind of environment that he excels in because everyone is basically on the same page as far as academics are concerned and that's where his head is.

Well, it doesn't get more focused than IMSA for science and math and that talent and the rigor and the advancement. My son is motivated to take the most difficult science and the most difficult math, and he's with students that care about education. He's challenged.

I think being around, since that's the focus and it's repeated day after day, hour after hour and everyone's kind of on the same focus, I think that helps to instill the importance of it. I think that helps to reinforce the importance of sticking with STEM . . . if it was a business school, then you would get a different light, but since it's focused on STEM I think it helps to reinforce it. The faculty has done it in the positive way as well as the other students.

Although all of the parents believed that IMSA enhanced their students'

motivation, there were four (19%) that felt IMSA also hindered their students' motivation to engage in STEM, as humbly expressed by one parent below:

That's a two-edged sword kind of question because on one hand, I think being in the mist of the crème de crème or the best of the best at IMSA, I want to say has given him a deeper insight than he probably would have gained at any other school, where he's living away from home. And the fact that IMSA faculty and staff are also top notch, I think has positively influenced his thinking, his general outlook. The flip side of that is . . . but I don't know if he doesn't feel intimidated sometimes; that's just my own opinion. . . . The level at which academics standards are held at IMSA is clearly as high as you could get at a high school in the world, . . . He says, "The first term I didn't do as well as I expected. . . . I got a B instead of an A." . . . but sometimes . . . he says, "I tried. I didn't get an A, so maybe B's are just what I have to shoot for," so that's the most candid opinion I have of this question.

The STEM Gap

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:

A lot of them don't even see what they can do with math and science as a profession. When you think about the counselors who meet with these students, they push the typical majors, business, and they push all these different business, psychology. A lot of times the children don't know the options that are there for them. I think if they had more information on what they could do with math and science, that it would be different.

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."

I think the gap is there mainly because students don't believe they can pursue those types of careers, or they haven't had exposure to what those careers entail. They want to be what they see, I guess is a way of putting it, so if they don't see a lot of African American males in those kinds of roles, the sciences, the engineers. then they might not aspire to do that.

People in these positions don't look like them; they probably don't see it in their normal schools, whether it be inner city schools or whether it be in some of the suburban schools. They don't necessarily see people that look like them that come talk to them; they don't see people in those roles. What they see is the things we see on TV, so it sets their interests around the sports, the music, and not understanding the sciences in terms of what it can offer you; and it may not seem as glamorous as some of those other things they aspire to be. . . . I've been a recruiter for companies that I've worked for, so I've always been very proactive in going out to look for minority candidates so that they can see that people that look like them are in these fields, and introducing to my son to those types of things as well.

I think it's probably a cultural thing because in the Black community, you may not have as many doctors to look up to or to mentor you or to show you what that

field is about so you can be interested in it. . . . I think we in the Black community we don't have those examples as often as we could, as they do in other cultures. The difference with my son is we're in a community with a lot of different cultures so they're a lot of different examples that he can see outside of Black people, but I think that's why he may have an interest in being a doctor . . . and he volunteered at the hospital so his goal right now is to be a doctor.

I think the most difficult part about that is having that person in their life to say "you can do it." A lot of Black males get this stigma on them already that they're not going to be successful, they're just another statistic, they're just a gang banger or, you know, just going to be worthless. And I think if they just had that support behind him, that person that motivates them and says, "You can go anything that you put your mind to, anything that you dream of you can do it." I think that would be a great stepping stone for them. All they need is motivation; they need somebody behind them to let them know they are capable of succeeding in whatever they do. Black males don't have that because . . . majority of them either have single parents, or they don't have that male role model . . . that support. I think support is very important for Black males and a lot of them don't get that. So I just pray and hope that as African American males we get more African American males to help them to come up and follow their dreams.

The community that I live in now, there is always a big push for African American in athletics. When people find out that my son went to Princeton and it's four years covered, "Oh does he play football or basketball is always the question.

I have a middle son that is also in a STEM school; they're not giving those choices; they are not told they can do those types of jobs. They're not given the resources that are needed. Personally . . . with my sons, I look outside the box. I find opportunities that will give them more, you know, of a career. I have a 16-year-old that wants to be a veterinarian. I don't hear too many Black males or I've never heard any Black males say they want to be a veterinarian . . . a lot of people are like, "What do you know about animals?" and that's what they hear, a lot of negativity. . . . I hear a lot of African American children when they talk about a career, all they talk about is being a football star or basketball star. . . . They never really talk about engineering, doctors...

Well, I think the reasons that the gap exists is multifold for one. It's going to be a miracle for a child . . . to find his way through STEM careers when there are so many other easy opportunities that students can go in. . . . I'm probably speaking from the point of view from a professor who teaches in a predominately minority school. I see students coming to my lab and my classroom who are just amazingly intelligent, but the discipline of receiving challenges and rolling up your sleeves and saying, "Okay, after this class is over, I'm going to the library and I'm not leaving the library until I find the answer to this question. . . . It's not there, that drive, . . . it's not there because nobody ever enforced those kind of disciplines. I keep referring to them as disciplines because any child who has an

option to go into . . . an easier social science area versus dealing with physics and mathematics and chemistry—if you see one path giving you . . . much hassle and the other path is a “walk through the park,” it’s understandable that the child would say, . . . “I don’t want to deal with all this headache, but if you have the guiding of parents who . . . says, “You can’t give up, just because you didn’t do well this time, you have to stick with it.” . . . “Remember you said you want to be an engineer, right, remember you said you want to make planes, you want to be a doctor,” those kinds of things, “You have to take your chemistry, you have to take your physics, you have to take your math, and you stick with it.” . . . to see that commitment from the parental figure is bound to make a lot difference.

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:

The reason . . . African American males are not accessing STEM education . . . because they're not educationally socialized into the institutions at that early age. That's the only difference . . . Lack of exposure. Point in case, if I had not . . . there were certain things we saw at IMSA. Okay, space camp, okay how you'll get there? We'll take you there? Well, how would you do that? I'm gonna take off of work, take my vacation to the time make sure you get there. That's commitment.

I think it's a fear for some of it and just a lack of exposure to a lot of things that maybe Asians and other children are exposed to, like Kumon Math. I had actually found out about that through one of my Indian co-workers, . . . no one had ever told mentioned it to me, so I think if you see, just the lack of people paying attention to what maybe their kids' strengths are or focusing on something that maybe they need help in and getting them the help that they need. I think it's natural for us to be afraid of science and math if you don't really have a lot of exposure to it other than just the basics, and I think a lot of it is just the failure of our public school system and not giving kids exposure.

I work in a school in an inner city school that is considered a turn-around school and the school I work in was going to be closed just because of very low scores. . . . They are not using a lot of technology, they're not using a lot of labs, hands-on experiments at the elementary level, and those are the things that tend to be very interesting. A lot of children want to touch, feel, move around, use technology and use their hands, and the resources are just not there; and especially

in my school . . . we do have some resources, but we don't have any live specimens to experiment on, they're not using chemicals, they're not being taught—they're being taught the scientific method on paper in a book, but everyone has a tablet, everyone has a lab top, everyone has a smart phone, so I think that the fact that we are still trying to put a paper book in front of a student and say look at this, look at that, they're not interested; so I think we need to meet them where they are as far as interest and really figure out what's motivating our young men and then build off of that because STEM is everywhere. So if we could get down to . . . what it means to them. . . . what is it that they like because whatever they like, there is some science, some technology, some math and absolutely some engineering involved with that, and I think that if our young Black men can see how that affects them, then they'd be more interested.

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.

I think it's the lack of exposure . . . in the public schools it's lack of knowledge, in the home it's lack of exposure . . . so it's the exposure and lack of knowledge . . . Some of the Black males come from certain areas where the schools may be inferior academically and the kids are at a distinct disadvantage. . . . They're not exposed to the STEM subjects in as great as depth or quality, if at all, in those areas and this doesn't just deal in STEM subjects, but literature, socially as well, so there has to be the early exposure but they have to be able to be exposed.

The reason it exists is due to lack of exposure. I am currently on a committee working with the Federal Reserve Bank. The investment company I work for and a few other organizations—hasn't been released yet, but it'll be a huge press release, and it is focused on creating a pipeline for African American and Hispanic students, men and woman. I know we're talking about the man now, but the numbers for females are even smaller; so part of is the role models in the community don't exist and an unawareness of the opportunities that exist and the

careers that exist in the areas of math and science. So there's engineering, but there's also financial intuitions as well. What could be done? We are looking into having research done. The group that I'm participating in from a corporate perspective is to identify why the gaps exists. I think a huge thing is exposure.

Second, it is true that most of the elementary schools and middle school, that most Black males attend, in large cities, we don't have the level of commitment from teachers to see them through to the end because the issues, external academics, you know issues that some of these kids face is such that they can go through areas where they have to see things can be very, very difficult. And if the teacher says, "Well, I tried and John is not showing effort," maybe John is not good in math instead, that's a lot easier than sticking with it and saying, "You know what, we're going to work with John, we're going to do extra-tutorial work, we're going to do things, other difficult things that are perhaps easier to avoid."

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:

The reason that we see so many of our Asian and White counterparts doing more is because at a younger age, they're told or they think they can and the fact that they think that they can may not be because they're parents tell them they can, but I think that privilege has a lot to do with it. So if you grow up in privilege already, the sky is the limit: this is what I do, this is what is expected of me, nonverbally this is what is expected of me, so I can do this. But in underrepresented populations and in our young Black men in what they see and what they hear, what they're told, the way that they are treated, they don't even realize they are being treated differently because we have an African American president . . . well that means that everything is okay now; but right away the expectation is low, and no one, even in schools, people are not holding them to a higher expectation.

What the Asians do, they're not any different. I told my kids from the beginning that when you see kids—you know people have a stereotype that Asians are very smart. No. Asians are very dedicated and their parents are very dedicated and they push them and do whatever they can, and that's what I did with my kids too. You know that kids, they're malleable. You can push them and you know they're not going to—I mean look at all those kids and that's what you get what you get from the Asian whether they're from far east Asia, Indians, or you know whatever. We need to push the kids to wherever they can do but when, you know, like I said it's multi-factorial. You don't want to be insensitive to what people are going through so they need—the parents need help.

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.

Parents have not been exposed . . . don't know what resources are available . . . lack knowledge, especially down state . . . it's not pushed as much . . . it's not a priority because parents have not been exposed and passed down to kids . . . Parents might say, "You can't do that, you're not smart enough," and it keeps getting repeated . . . why do you want to go embarrass yourself . . . we push towards what we know . . . other culture are in STEM environments, doctors . . . academics is not a priority in many Black families . . . spend money on material items instead of academic help.

I think it exists, because sometimes as parents we don't know and I think it has a lot to do with where they go to school at, and I guess I see both sides of it because I have a student who's a senior now in high school, and . . . the information that is filtered down, and it's not a lot of technology. Sometimes, it's not even a huge focus on the academic side of it, so I think as a parent it's our responsibility and job to ask those questions.

We need some sort of mentoring or training system for the parents so when they . . . like imagine if your parents who might have saw you as interesting in petri dishes, could join this organization that would mentor them—like when you find that spark in your child, here are the steps that you need to do. I don't know if it's a mentoring program or a package you can give him. But here are the things that could work, encourage them, buy them this, do this, sit down, listen. . . . And let them explain, talk it out; and when they get stuck don't feel like you gotta tell them, just listen. Let them talk through it and be encouraging.

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:

I think the gap exists because African American males aren't exposed to a STEM curriculum as early as their White and Asian counterparts, and I think to combat that gap is to address that specific issue. You really have to get kids involved early on in elementary school, you have to expose them to engineering and math and sciences and an abundance of things . . . that's the only way they'll ever bridge that gap.

I like the program that IMSA has where they go to different schools that for children that show an interest or that they are capable of or interested in math and science to develop those interests and educate them on what the opportunities are, so I like programs like that. I think that they are costly, but I don't know how many kids in the inner city could actually be reached and how many kids it would make a difference in, but I think it's investing in our youth.

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.

They need to see the different ways that science can be fun. If they see that early on, they will keep finding ways to implement science into everything that they do, and then they start having these different exposures, these different workshops, meeting these people and hearing about their job titles. "Like you do what, where? That sounds cool, maybe I will look into it." If they have this exposure, then they could more likely pick a different major outside of just engineering just because that's what they hear, or business. They will look into more of some of the sciences. Like when you get to medicine, some of them will go into that. That's only if they are going into medicine. They don't even realize that there is so much you can do with sciences that aren't medicine. You don't have to be a doctor to be involved in sciences. They don't get that information early on. . . . I

think I chose miniature golf or something like that, try to show that science and math is still part of all your sports. If you understand science and math, you do better in sports because it's all calculations.

I think that you definitely have to fund STEM at very early ages, maybe even in nursery school. . . . You never know when the light bulb is going to go off on a child working with the beakers. . . . So you got some 2, 3, 4 or 5-year-olds doing little experiments, and the child is like "Oh MY GOD I love this!" If they never got that exposure, how can they get that chance to get into it at that early age. How would the parent even now that "Oh my God, my baby loves chemistry. Let me start buying chemistry sets and beakers and all of the stuff. I think that's a major thing. I think bringing in . . . people from these various fields to talk to them at a younger age. . . . It is great that Dr. P is doing it in junior high but we really need to roll that down into the elementary so that they are not behind by the time they get into junior high. . . . You have to make it real to the kids and show them what that type of money could, just to get them. . . . There's a rapper . . . It's one of the guys from WuTang. He goes around the science classes and motivates the kids. . . . His program is he goes into schools, he raps. Everybody knows WuTang, even the kids; he is educating them with lyrics about molecular structure. It's mind blowing and it's a hot rap; it's not like it's bubble gum, eight ball. It's the real deal. He is giving you old school, WuTang talking molecular structure and breaking it down on the white board. It's amazing! And then he encourages them to create their own raps about science so now they have to learn about it and have to explain it in a rap. That's hot, right!

To motivate others . . . I think it's something that you have to start with very early on, like almost what we did with my son when he started at age 2. I mean he has not thought of anything else; he's always thought about college; he never thought about stopping after high school because we've always talked to him about that. . . . I mean early on, that's when you have to get them, daycare and kindergarten, start talking about those kinds of goals.

If we were to bring STEM to our pre-schools, to our elementary schools in the Black neighborhood, I think we would get a much higher number, but we have to give them that support and exposure.

Having role models/mentors as part of that STEM exposure was suggested by 10

(48%) parents, as expressed below:

We need exposure, exposure, exposure, find other people of color that are involved in STEM . . . need to see more people that look like them . . . need to study them in school . . . make it part of the curriculum . . . need to know about ancestors beyond sports . . . so many images of Black males on TV . . . need more successful Blacks in media, in literature . . . should be a positive web-site about Black males

I think one way to combat that, and in some ways I've done that through my affiliation with the National Society of Black Engineers, is just getting out and touching the students and telling them about what they can do in STEM, so I think workshops, exposure to individuals who are already in careers is a great way to get students interested. If they already have an aptitude for math and science, then maybe all it takes is giving them some possibilities about what they can do with that. And students who don't think they can do well in math and science and haven't really applied themselves will need a little bit more encouraging for them to try to achieve that. I think from day one, the elementary teachers letting the students know and pushing them to do well. I think often that teachers assume that little Black boys are not going to do well and don't give them that opportunity or that encouragement to do well; then it falls back on the parents to really push and encourage their students.

I think that gap exists because Black males don't think they are capable of achieving those jobs, and I think to motivate them there needs to be a Black male figure from the outside coming in showing them that you can do this because I did it.

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.

I think as parents we have to change our thinking and stay involved with them so they know it's more out there, to get them in those fields that are careers and are long-lasting. And once you develop a mentorship, like the guy that works at Exelon, I still talk to him; like he called to see if Shawon needed an intern; so I think mentoring is really important. If you can find an African American that is in one of those fields, and connect your child, it is really important also.

The third thing I would say, I would point at is, we need more of us that are in the field—Blacks to be mentors to those who are in high schools and even middle schools so that we can at least show them that it is possible. Many successful persons have said the only reason I kept going is because I saw such and such

person at my school or such and such person on the television. . . . It's a combination I think of parental responsibility, guardianship, the school system, and mentorship. I think from wherever that comes, whatever sources we can get that, whether it's through successful Blacks in STEM, or it's from teachers who are willing to go the extra mile, but I totally reject the notion that Black males have less intellectual capacity to embrace the rigors of STEM fields. . . . The fact is that by the time we wake up to say, "Why is this not happening? they've already lost interest, they're no more willing to sit down there and work on algebra, they think it's a waste of time. If we actually put in the necessary measures in third grade, fourth grade, we can turn this ship around. . . . If we wait until they get to high school, it's almost too late.

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.

STEM Motivation

The research question asked, *"What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?"* The answer to this from IMSA parents yielded

interview responses to questions regarding their perceptions of gifted and talented Black males' motivation to engage in STEM, both intrinsically and extrinsically. The study found that IMSA parents perceived the following motivational factors of gifted and talented Black males to engage in STEM:

1. Obligation to Black community
2. Good at STEM/STEM interest
3. Teachers
4. Curious/inquisitive nature
5. STEM exposure
6. Determination/self-motivated
7. Challenge
8. IMSA
9. Competition
10. Learning/discovery of new knowledge
11. Success

This study also provided IMSA parents' perspective about the literature's suggestion that there was a Black male STEM gap and ways to minimize that gap. Table 5 shows a comprehensive snapshot of IMSA parents' thoughts of the STEM gap, their perceptions of gifted and talented Black male STEM motivation, how IMSA contributed to that motivation, and how to motivate Black males to engage in STEM ($n = 21$):

Table 5

Parent Perspective: Gifted and Talented Black Male Motivation (n = 21)

Why a Black Male STEM Gap	Perception of Black males engaged in STEM	Gifted and Talented Black Male Student STEM Motivation	IMSA's contribution to STEM motivation	Motivate Black males to engage in STEM
Lack of STEM vision for Blacks, <i>n</i> = 14	Curious/Inquisitive, <i>n</i> = 5	Obligation to/push from Black community, <i>n</i> = 14	<i>Enhances Motivation</i> , <i>n</i> = 21 –Diverse environment –Challenge	STEM Exposure, <i>n</i> = 13
Lack of Quality STEM education, <i>n</i> = 11	STEM encouragement, <i>n</i> = 5	Good at STEM/STEM Interest, <i>n</i> = 9	–Independence /Responsibility –STEM Immersion –Opportunity	Black male mentors/Role models, <i>n</i> = 10
Lack of parent support, <i>n</i> = 6	Self-motivated/independent, <i>n</i> = 4	Teachers, <i>n</i> = 7	–Collaborative support group competition	Government intervention, <i>n</i> = 1
	Few Black males in STEM, <i>n</i> = 4	Curious/Inquisitive nature, <i>n</i> = 6		
	STEM interest, <i>n</i> = 3	STEM exposure, <i>n</i> = 5		
	Early STEM exposure, <i>n</i> = 3	Challenge, <i>n</i> = 4		
	Lack STEM vision, <i>n</i> = 3	Competition, <i>n</i> = 3	<i>Hinders Motivation</i> , <i>n</i> = 4	
	Stereotyped/breaks negative stigma of Black males, <i>n</i> = 2	IMSA, <i>n</i> = 4	–Rigorous STEM curriculum	
	No different than any other student, <i>n</i> = 1	Determination/Self-motivated, <i>n</i> = 4		
		Learning/Discovery of new knowledge, <i>n</i> = 2		
		Success, <i>n</i> = 1		

**Gifted and Talented Black Males' STEM Motivation:
A Vested Interest Perspective from IMSA Faculty/Staff and Parents**

The previous two sections provides perspectives of the motivation of gifted and talented Black males engaged in STEM from IMSA faculty/staff and IMSA parents. This section takes an intricate look at the collective thoughts of these 48 adults who have supported/influenced and have a vested interest in the gifted and talented Black males' pursuit of STEM. This chapter also looks at patterns that exist between the groups as

well as differences regarding perceptions of Black males engaged in STEM, STEM motivation, IMSA's contribution to STEM motivation, STEM achievement gap, and minimizing the STEM achievement gap.

Perception of Black Males Engaged in STEM

The IMSA faculty/staff and parents were asked to discuss their perceptions of gifted and talented Black males engaged in STEM. There were a variety of perspectives regarding the perception of Black males, but the following patterns did arise between IMSA faculty/staff and parents:

1. STEM encouragement, $n = 7$
2. Black males are victimized, $n = 5$
3. Black males are no different than any other student, $n = 5$

In terms of differences, the IMSA faculty/staff also discussed that gifted and talented Black males struggled with STEM rigor, lacked STEM encouragement, and struggled from an identity conflict. They also viewed them as having a range of giftedness and were hard working and passionate about STEM. Although the IMSA parents discussed that Black males lacked a STEM vision and that there were few Black males in STEM, those who were engaged in STEM were curious/inquisitive, self-motivated/independent, and had a strong interest in STEM.

Perception of Intrinsic Motivation

The IMSA faculty/staff and parents were asked their perceptions as to the factors that intrinsically motivate gifted and talented Black males to engage in STEM. Five patterns arose that included good at STEM/STEM interest reported by 22 (46%) respondents; success, reported by 14 (29%) respondents; competition, reported by seven

(15%) respondents; learning, reported by six (13%) respondents; and challenge, reported by five (10%) respondents. In terms of the patterns, all of them were equally agreed upon by the two groups (faculty/staff and parents), with the exception of success. Although success was stated as an intrinsic motivator by both groups, 13 of the 14 respondents who reported this were IMSA faculty/staff.

In terms of differences, the IMSA faculty staff also reported gifted and talented Black males were intrinsically motivated by their obligation to the Black community, being enrolled at IMSA, their responsibility to break negative stigmas of Black males, and from being a leader inside and outside the classroom. In addition, the IMSA parents also suggested that gifted and talented Black males were intrinsically motivated to engage in STEM as a result of their curious/inquisitive nature and determination, suggesting they were self-motivated.

Perception of Extrinsic Motivation

The IMSA faculty/staff and parents were also asked about the extrinsic motivators of gifted and talented Black males engaged in STEM. When grouped, the following patterns arose: obligation to/push from Black community reported by 26 (54%) respondents; IMSA reported by 13 (27%) respondents; and competition, reported by five (10%) respondents. Regarding differences between the two groups, the IMSA faculty/staff also suggested success, STEM being a progressive field, and leadership opportunities as extrinsic motivators. The IMSA parents mentioned teachers, challenge, and STEM exposure as factors that extrinsically motivated gifted and talented Black males to engage in STEM.

Perception of IMSA's Contribution to STEM Motivation

The IMSA faculty/staff and parents were asked their perceptions of how IMSA contributed to the motivation of gifted and talented Black males to engage in STEM. The majority of the participants agreed that IMSA enhanced their STEM motivation, stated by 46 (96%) participants; whereas, 13 (27%) reported that IMSA hindered their STEM motivation. Only two (4%) participants believed that IMSA did not enhance motivation at all; IMSA only hindered the motivation of gifted and talented Black males. For the participants who reported IMSA enhanced the STEM motivation of gifted and talented Black males, the following patterns arose:

1. Diverse Environment, $n = 34$ (71%)
2. Collaborative support groups, $n = 13$ (27%)
3. Opportunity, $n = 10$ (21%)
4. Challenge, $n = 8$ (17%)
5. Competition, $n = 7$ (15%)
6. Independence/leadership, $n = 7$ (15%)

The only difference was that the IMSA parents also discussed STEM immersion that occurred at IMSA as a factor that enhanced gifted and talented Black males STEM engagement. The pattern that arose for faculty/staff and parents who stated IMSA hindered gifted and talented Black male STEM motivation was a rigorous STEM curriculum, reported by 11 (85%) of the 13 respondents. The IMSA faculty/staff also suggested that sometimes gifted and talented Black males have a perception of not belonging, which hindered their motivation.

The STEM Gap

The IMSA faculty/staff and parents were asked why there was a Black male STEM gap and how to minimize that gap. Their responses paralleled one another with the following patterns emerging for why a STEM gap:

1. Lack of STEM vision, $n = 29$ (60%)
2. Lack of STEM exposure, $n = 25$ (52%)
3. Lack of parental support, $n = 11$ (23%)

In terms of how to minimize the Black male STEM gap and motivate Black males to engage in STEM, the following patterns arose: STEM exposure, stated by 23 (53%) of the 43 respondents; and Black male mentors/role models, stated by 19 (44%) of the 23 respondents. The only difference was that IMSA parents also discussed the need for government intervention to motivate gifted and talented Black males to engage in STEM.

STEM Motivation

The research question asked, “*What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?*” Responses to questions regarding motivation to engage in STEM, both intrinsically and extrinsically, yielded from their interviews patterns to engage in that developed as factors that motivate gifted and talented Black males:

1. Obligation to Black community, $n = 28$ (58%)
2. Good at STEM/STEM interest, $n = 22$ (46%)
3. IMSA, $n = 13$ (27%)

4. Challenge, $n = 8$ (17%)
5. Competition, $n = 6$ (13%)
6. Learning, $n = 6$ (13%)

This study also provided a gifted and talented Black male perspective about the literature's suggestion that there was a Black male STEM gap and ways to minimize that gap. Table 6 shows a comprehensive, collective snapshot of IMSA faculty, staff, and parental perspectives of the Black male STEM gap, perceptions of gifted and talented Black males, the STEM motivation of gifted and talented Black males, how IMSA contributed to their motivation, and opinions about motivating Black males to engage in STEM ($n = 48$):

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 were that the Black male STEM gap was a result of a lack of a STEM vision and a lack of parental support. The differences were that Black males discussed a negative stigma/misperception of Black males contributing to the Black male STEM gap. Although the IMSA faculty, staff, and parents discussed a lack of STEM exposure/quality, STEM education was a major contributor to the Black Male STEM gap. In terms of how to motivate Black males to engage in STEM, the trends that emerged were STEM exposure and Black male mentors/role models.

The research question asked, *“What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?”* The primary trend that emerged in response to this research question was the Illinois Mathematics and Science Academy. The participants agreed that the diverse environment, challenge and sense of independence were positive attributes of IMSA that enhanced motivation of gifted and talented Black males to engage in STEM. Below are the complete list of trends that emerged regarding the factors that motivated gifted and talented Black males to engage in STEM:

1. IMSA, $n = 45$ (48%)
2. Obligation to Black community, $n = 44$ (47%)
3. Success, $n = 42$ (45%)
4. Good at STEM, $n = 32$ (34%)
5. Learning, $n = 31$ (33%)

6. Competition, $n = 15$ (16%)

Table 7 shows a comprehensive, collective snapshot of gifted and talented Black males currently enrolled at or alumni of IMSA; along with IMSA faculty, staff and parents perspectives of the Black male STEM gap, the STEM motivation of gifted and talented Black Males, how IMSA contributed to their motivation and opinions about motivating Black males to engage in STEM ($n = 93$):

Table 7

Collective Perspective: Gifted and Talented Black Male Motivation ($n = 93$)

Why a Black Male STEM Gap	Gifted and Talented Black Male Student STEM Motivation	IMSA's contribution to STEM motivation	Motivate Black males to engage in STEM
Lack of STEM vision for Black males, $n = 47$	IMSA, $n = 45$	Enhances Motivation, $n = 78$ –Diverse environment –Challenge –Independence	Black Male Role Models/Mentors, $n = 38$ STEM exposure, $n = 24$
Lack of parent support, $n = 19$	Obligation to Black community, $n = 44$ Success, $n = 42$ Good at STEM, $n = 32$ Learning, $n = 31$ Competition, $n = 15$	<i>Hinders Motivation</i> , $n = 18$ –Rigorous STEM curriculum	

CHAPTER FIVE: SUMMARY, CONCLUSION, and RECOMMENDATIONS

Summary

This study is an exploration of the factors that motivate gifted and talented Black males to engage in science, technology, engineering, and mathematics (STEM). The specific problem that is addressed is the lack of motivation among Black males to become gifted and talented learners engaged in STEM. The literature indicates that a racially based STEM achievement gap exists that disproportionately impacts Black males. This gap is evident in STEM majors and careers, in which the Black male has been underrepresented. The literature suggests this is a result of a lack of exposure to STEM in K through 12 education, mathematics phobias, students' misperceptions of what science is, no real-life application of science, no motivation to succeed, and peer pressure that devalues high achievement (QEMN, 2010). Although this gap exists, there are Black males who are engaged in STEM and have entered STEM fields. Thus, the purpose of this study was to examine the factors that motivate gifted and talented Black males to engage in STEM at the Illinois Mathematics and Science Academy (IMSA), a residential academy for gifted/talented students.

The research question asked, *“What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?”* To address this question, a qualitative methodology was used that included focus groups with gifted and talented Black males that currently attended IMSA as well as interviews with gifted and talented Black male IMSA alumni, and IMSA faculty, staff, and parents. There were a total of 93 participants

in the study, including 20 gifted and talented Black males who currently attended IMSA, 25 gifted and talented Black male IMSA alumni, 21 parents of IMSA gifted and talented Black male students/alumni, and 27 IMSA faculty/staff who worked with gifted and talented Black males. The information yielded from these participants was transcribed, utilizing a software transcription program and using a word analysis program in conjunction with a qualitative management system. A triangulation analysis approach was conducted to look for cross-case themes, patterns, and trends.

The only limitation was in regard to the geographic diversity of the participants. The researcher focused only on gifted and talented Black males in the state of Illinois who were enrolled at the Illinois Mathematics and Science Academy. The delimitations included the non-applicability to Black females or Latino males/females who may have a shared experience. It was also not applicable to other academic areas in which Black males may be talented and gifted. Thus, this study was only applicable to understanding motivation in gifted and talented Black males from the state of Illinois, engaged in STEM who enrolled at IMSA.

Discussion of Findings

Gifted and Talented Black Males

The gifted and talented Black male students were asked about the factors that motivated them to engage in STEM. They identified eight themes that motivated them to engage in STEM:

1. IMSA
2. Learning: Discovery of knowledge
3. Solve problems/to advance humanity

4. Money
5. STEM is a progressive field that leads to future success
6. Competitive nature of STEM
7. STEM passion/enjoyment
8. Obligation to Black community/break negative stigmas about Black males

Being students at IMSA vastly contributed to their motivation to engage in STEM. The aspects of IMSA that enhanced this motivation were the culturally and intellectually diverse environment, the immersion in STEM, and the challenge of IMSA. This suggests that creating environments for Black males in which they are around a variety of peers from different backgrounds, with a heavy focus on STEM that is challenging, will motivate them to engage in STEM.

Learning also served as a great motivator for Black males to engage in STEM. They want to learn, for learning's sake and enjoy discovering new information, ideas, and concepts. This suggests that Black males need to be engaged in experiences that will allow them to acquire and seek knowledge.

The Black males also discussed that being able to solve problems to advance humanity was a motivator to engage in STEM. These students enjoyed the analytical and deep thinking that is a part of STEM teaching and learning. They wanted to utilize this thinking to save lives and make the world a better place. This suggested that engaging Black male students in problem-solving curriculums with real-life application will motivate Black males to engage in STEM.

Some of the gifted and talented Black males discussed money as a motivation to engage in STEM. It was discussed that many Black males lacked a STEM vision; instead

their vision of success and Black males that made money were entertainers and athletes. However, the Black male student participants had a STEM vision that had monetary value. This suggested that if Black males are shown a vision of STEM in terms of monetary value, more of them will be motivated to engage in STEM.

Others saw STEM as a progressive, prominent field that could lead to success. They believed going down a STEM path would lead to college scholarships, which would lead to career stability, and ultimately lead them to being able to give back to their parents and take care of their future families. Thus, if Black males were shown how STEM was a stable field that would ensure future success, they would be motivated to engage in STEM.

The competitive nature of STEM was also identified as a motivational factor. STEM was an area seen as more challenging than other academic areas, which Black males react to and like the perception that they are smarter than the average person and also like competing with their peers on this higher level. If Black males are engaged in competition that is challenging and developmental with their peers, they will be motivated to engage in STEM.

For some of the Black males, they developed a passion/interest for STEM. This is a result of early and consistent exposure to STEM. Also, their mentors/role models were those who were engaged in STEM. This suggested that Black males need to not only be exposed to STEM, but they also need mentors/role models who are engaged in STEM to motivate their STEM engagement.

An obligation to the Black community was also discussed as a factor of motivation to engage in STEM. They felt obligated to achieve and attain a higher

education because they valued their ancestors and the sacrifices of their families. They wanted to break that stereotype that Black males were viewed as negative in society. They wanted to prove society wrong and serve as a positive example to other Black males. This suggests that when Black males have a social responsibility to their community, they are motivated to engage in STEM.

Gifted and Talented Black Male Alumni

The gifted and talented Black male alumni were asked about the factors that motivated them to engage in STEM. They identified 11 themes that motivated them to engage in STEM:

1. IMSA
2. Learning, discovery of knowledge
3. Obligation to Black community/break negative stigmas about Black males
4. Solve problems/to advance humanity
5. Success
6. STEM passion/enjoyment
7. STEM is a progressive field
8. Competitive nature of STEM
9. STEM exposure
10. Self
11. Money

IMSA was a strong factor that motivated gifted and talented Black male alumni to engage in STEM. They enjoyed being immersed in STEM, being exposed to higher quality education, the culturally and intellectually diverse environment, and the problem-

solving/inquiry-based approach to teaching and learning. They also felt that IMSA enhanced their confidence, made them more independent, and gave them life skills. This suggested that creating diverse environments in which Black males are immersed in STEM from an inquiry-based teaching and learning approach, they would be motivated to engage in STEM.

Some of the alumni stated that learning motivated them, especially STEM learning. They wanted to learn more, understand how things work, and explore STEM areas. This suggested that Black males need to be placed in competitive environments that are conducive to their learning, exploring, and seeking knowledge.

Other Black male alumni believed their obligation to the Black community to be successful and break negative stereotypes motivated them to engage in STEM. They felt as if society had low expectations of them and they wanted to change that perception. They also felt obligated to pay it forward for their family and community who believed in them and pushed them to be successful in STEM. This suggests having a positive support community and understanding societal perspectives of Black males to create change may motivate Black males to engage in STEM.

Success was also a key motivational factor for Black males to engage in STEM. They wanted career stability so that they could take care of their children and families. This suggests that demonstrating to Black males that STEM is a prominent, progressive field in which they can be successful and financially stable will motivate them to engage in STEM.

STEM passion developed as a result of STEM exposure was also a factor of motivation for Black males to engage in STEM. As this STEM passion developed, so did

their sense of self and confidence. This suggests that STEM exposure that includes aspects of building self-esteem would motivate Black males to STEM.

IMSA Faculty/Staff

The IMSA faculty/staff were asked about their perceptions of factors that motivate gifted and talented Black males to engage in STEM. There were eight emergent themes:

1. Obligation to Black community
2. Success
3. Good at STEM/STEM Interest
4. IMSA
5. Learning
6. Challenge
7. Competition/peer acceptance
8. Leadership

The IMSA faculty/staff perceived motivation to engage in STEM to be connected to Black males' obligation to the Black community. Because their families and Black societal role models believed in the gifted and talented Black males' ability to achieve, the IMSA faculty/staff believed the Black males felt they owed their communities and wanted to give back. One even told a story about a Black male student whose brothers had autism, and thus that motivated him to engage in STEM. This suggests that Black males need the Black community to be sources of inspiration and encouragement that could lead to STEM motivation.

Other IMSA faculty/staff suggested success in the academic classroom and in life motivated gifted and talented Black males to engage in STEM. Their experiences working with gifted and talented Black males suggested that success in the classroom demonstrated through grades, competitive activities, and collaborative activities were motivations to engage in STEM. These successes led them to believe they would be successful in the future, which motivates them even more.

Enrollment at the Illinois Mathematics and Science Academy was also perceived by the faculty/staff as a factor that motivated gifted and talented Black males to engage in STEM. Being in a diverse and competitive environment, having a collaborative support group, living in a residential community, and the experience of a challenging curriculum are aspects of IMSA that motivate STEM engagement. Learning, competition, and challenge were also components identified by IMSA that faculty/staff perceived as factors that motivated gifted and talented Black male STEM engagement. This suggested that Black males need access to learning environments that have a rigorous curriculum, are diverse and competitive, yet collaborative to motivate them to engage in STEM.

The IMSA faculty/staff also stated leadership as a factor that motivated gifted and talented Black males to engage in STEM. One faculty member discussed how students that did well inside the classroom seemed to gravitate towards leadership opportunities outside of the classroom. Another discussed a Black male who served as Student Council president who did well in the classroom, but truly had an *immeasurable* impact on the academy. This suggested that Black males need to be given opportunities to be leaders both inside and outside the classroom.

IMSA Parents

The parents of gifted and talented Black males who engaged in STEM were asked their perceptions of factors that motivate gifted and talented Black males to engage in STEM. The following themes emerged:

1. Obligation to Black community
2. Good at STEM/STEM interest
3. IMSA
4. Challenge
5. Competition
6. Learning

The parents believed the obligation their sons had to the Black community motivated them to engage in STEM. This obligation was a result of people in society not believing in them and the Black males wanting to prove them wrong. The parents shared stories of how school administrators did not believe their student was gifted in math and how people did not believe their students had gotten into certain selective enrollment schools/institutions of higher learning based on academics. They felt their Black male students fought against these stereotypical perspectives and that was what drove their motivation to do not only do well academically, but to also engage in STEM.

Some parents discussed how their child was innately good in STEM and how that was developed by exposing their students to STEM early on. Stories were shared about teaching their students to play chess at age 2, their child growing up in a household with parents engaged in STEM careers, and how their child had an opportunity to sit in an airplane cockpit. All these experiences led to their Black male children developing innate

ability in STEM, wanting to learn more about STEM, and ultimately developing a passion for STEM.

Many of the parents also discussed IMSA as a factor that motivated their gifted and talented Black male to engage in STEM. IMSA provided a diverse environment in which their child was immersed in STEM, had a collaborative support group, and was taught independence. Other aspects of IMSA, that were also mentioned as factors that motivated Black males to engage in STEM regardless of IMSA, were challenge and competition. The parents discussed how winning competitions and being in challenging environments motivated their Black male students to engage in STEM. This suggested that learning environments that are competitive, challenging, diverse, and collaborative, with a focus on STEM, may motivate gifted and talented Black males to engage in STEM.

Conclusion

This section includes a triangulation analysis that looks at patterns and trends of factors that motivated gifted and talented Black males from the perspectives of gifted and Black males, IMSA faculty/staff/parents, and the literature on motivation in Black males. These perspectives were examined in relation to the research question, “*What factors do gifted and talented Black males identify as motivating them to engage in Science, Technology, Engineering and Mathematics (STEM) at the Illinois Mathematics and Science Academy, a residential academy for gifted/talented students?*” The patterns that arose regarding gifted and talented Black male STEM motivation based on the study included obligation to Black community, success, learning, good at STEM/STEM passion, IMSA, competition, STEM exposure, self-motivation, and curiosity/inquisitive

nature. Although parents were not mentioned as a motivational factor, the majority of the Black male participants stated their parents as a pivotal source of support in their STEM endeavors.

These factors of Black male STEM motivation are consistent with the literature on Black male motivation, with the exception of the Illinois Mathematics and Science Academy. However, the literature's additional suggestions that Black males are also motivated by established high expectations, caring and committed teachers, and association with a high-achieving peer group all happen to also be aspects of IMSA that enhance motivation of gifted and talented Black males. Thus, the only factor of motivation that was identified in the literature, but not from the study participants, is God. There are two participants who thanked God and mentioned God giving them gifts needed to be successful. The literature also discussed curiosity and having an inquisitive nature as a factor of motivation, which is consistent with the collective perspective of IMSA faculty, staff, and parents, but not with the perspective of the gifted and talented Black male.

There were several patterns that emerged that were not consistent with the literature. The gifted and talented Black males also mentioned solving problems/to advance humanity, break negative stigmas about Black males, and money as factors that motivated them to engage in STEM. The IMSA faculty, staff, and parents further mentioned challenge and leadership as factors that motivated gifted and talented Black males to engage in STEM.

To conclude, the trends that developed as a result of this triangulated analysis are listed as follows:

1. IMSA
2. Obligation to Black community
3. Success
4. Learning
5. Good at STEM/STEM passion
6. Competition
7. STEM exposure
8. Self-motivation

The factors that motivated gifted and talented Black males that were new that contribute to the literature on Black male STEM motivation are as listed:

1. Solve problems/to advance humanity
2. Challenge
3. Leadership

This suggests that Black males enjoy solving problems, especially when it can be applied to realistic scenarios. They are motivated to engage in STEM when they are able to solve problems that help the world's progression. Gifted and talented Black males are also motivated to engage in STEM when they are challenged. They need to be in situations that are academically challenging, yet diverse, supportive, and collaborative, which happen to also be aspects of the Illinois Mathematics and Science Academy. In addition, gifted and talented Black males are motivated by leadership. This leadership starts in the classroom and extends beyond the classroom. Thus, gifted and talented Black males need opportunities to be leaders, both in STEM and outside of STEM, in order to motivate them to engage in STEM.

Implications for IMSA and Educators

Based on the findings of this study, an exploration of the factors that motivated gifted and talented Black males to engage in STEM, several implications for professional practice are posed. This information may potentially be used by the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology and more specifically, it may inform an affiliate school, the Illinois Mathematics and Science Academy PROMISE (providing opportunities of mathematics and science enrichment) pre-enrichment programs designed to prepare underrepresented populations for a rigorous STEM curriculum. Below are the implications for educators on motivating Black males to engage in STEM:

1. Black males should be exposed to STEM learning experiences at an early age and consistently throughout their educational career to develop STEM skills and nurture STEM passion.
 - a. This will allow them to create a STEM vision for themselves;
2. The STEM learning experiences for Black males should use IMSA as a model, including these components:
 - a. The participants should be culturally and intellectually diverse,
 - b. The curriculum should have the students immersed in STEM,
 - c. The teaching and learning approach should be exploratory in nature and inquiry-based, and
 - d. The activities should include realistic problem-solving elements that promote participant collaboration and support. Possibly have

them work with mentors/Black male role models engaged in STEM to solve problems and advance humanity.

3. Although there is an immersion in STEM during these learning experiences, the curriculum should also include:
 - a. Historical and current Black news and issues,
 - b. This will allow the Black males to understand societal perspectives and their obligation to their community and to the world,
 - c. Self-awareness and student development,
 - d. This will allow the Black males to understand themselves, discover what is important to them, and build their self-confidence as well as resilience.
4. Black males should be regularly assessed to understand their strengths and weaknesses; then personalized evaluations should be created to emphasize their strengths and inform the development of their weaknesses.
 - a. This will allow the Black males to be competitive, while showing some success in certain areas, which will ultimately help build self-confidence. It will also demonstrate to them the importance of collaboration by showing how the variance of strengths and weaknesses can help to solve problems. Finally, it will make them aware of the areas in which they need to improve.
5. The STEM areas in which the Black males have demonstrated strength need to be complimented with an activity in which that student can lead. Then the

student should be provided with leadership opportunities outside of STEM and encouraged to be involved.

- a. This will allow them to develop leadership skills needed to be successful STEM leaders in a global world.

Recommendations

The findings in this study demonstrated the various factors that motivate gifted and talented Black males to engage in STEM. However, these findings did not completely address the problem of there being a lack of Black males in STEM majors and careers. Thus, there need to be more studies that not only seek to address this problem, but also it needs to look at other cultures that have underrepresentation in STEM fields. Not only that, there is a gap in literature in which the authentic male voice is rarely evident. Thus, more studies that include Black males as participants as it relates to various educational endeavors need to occur. Recommendations for further study by answering the following questions that are listed below:

1. As a Black male engaged in STEM, Why did you pursue this career? What path did you take to get you to STEM? How would you encourage Black males to engage in STEM?
2. What motivates Black females and Latino males/females to engage in STEM?
3. Why does a Black male/female and Latino male/female STEM gap exist in which there are few of them in STEM majors and careers? How should this STEM gap be addressed?

4. As a Black male who has been identified as gifted and talented, why do you think a gifted achievement gap exists in which Black males achieve below their gifted and talented counterparts? How would you address this gap?
5. What motivates Black males to achieve academically? How do you motivate low achieving Black males to become high achievers?
6. Why does a Black male achievement gap exist, in which Black males typically achieve lower grades and standardized test scores compared to other subcultures of the population? How should this achievement gap be addressed?
7. As a Black male, what is your perspective of education and its significance in your life, as well as your vision of success?

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APPENDICES

APPENDIX A**Black Male Background Questionnaire**

APPENDIX A**Black Male Background Questionnaire**

Study Title: An Exploration of the Factors that Gifted and Talented Black Males to Engage in STEM.

1) What was the geographic location of your family while in high school?

2) What is your racial/ethnic make-up?

3) Did you attend any STEM pre-enrichment program prior to enrolling in/during high school?

a. _____ Yes _____ No

i. List:

4) What will be/is/was your major in college?

5) What is your current occupation?

6) During your high school years, what was your families' socioeconomic status (please circle)?

- a. Lower Class
- b. Middle Class
- c. Upper Class

7) Which best describes your household during your high school years (please circle)?

- a. Single-Parent
- b. Two-Parent
- c. Raised by family member (i.e. grandmother, aunt)
- d. Ward of the State
- e. Other: _____

- 8) Describe the community in which you were raised (i.e. urban/suburban/rural, racial make-up, socioeconomic status, educational resources)

- 9) Describe your support system related to you being a gifted and talented Black male engaged in STEM?

- 10) Why did you choose to enroll in a gifted, residential STEM high school?

APPENDIX B**Black Male Interview and Focus Group Questions**

APPENDIX B

Black Male Interview and Focus Group Questions

- 1) Why are you engaged in STEM (science, technology, engineering and mathematics) education and whom/what do you give credit to for your initiation/interest in STEM education?
- 2) Describe your motivation to pursue/engage in STEM education...
- 3) Discuss your intrinsic motivation (“behaviors performed out of interest and enjoyment”) as it relates to you being a gifted and talented learner engaged in STEM...provide examples in which your motivation to engage in STEM was developed...
- 4) Discuss your extrinsic motivation (“behaviors carried out to attain contingent outcomes”) as it relates to you being a gifted and talented learner engaged in STEM...provide examples in which your motivation to engage in STEM was enhanced...
- 5) How has your enrollment in a gifted, residential high school contributed to your motivation to engage in STEM?
- 6) The literature suggests that there is 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, what makes you different and how would you motivate Black male students to engage in STEM?
- 7) For alumni
 - a. Did you continue a STEM academic path/career? Why or why not?
 - b. If you answered yes to the above question...How did your STEM focused high school experience prepare you for your persistence in STEM Education?

APPENDIX C
Interview Questions

APPENDIX C

Interview Questions

- 1) What is your role in working with gifted and talented Black males engaged in STEM education?
- 2) Discuss your perception of the gifted and talented Black male pursuing/engaged in STEM education...
- 3) What do you perceive to be the intrinsic motivators (“behaviors performed out of interest and enjoyment”) that have led gifted and talented Black males to engage in STEM...provide examples in which this motivation was observed?
- 4) What do you perceive to be the extrinsic motivators (“behaviors carried out to attain contingent outcomes”) that have led gifted and talented Black males to engage in STEM...provide examples in which this motivation was observed?
- 5) How does being in a gifted, residential community contribute to motivation of gifted and talented Black males engaged in STEM?
- 6) The literature suggests that there is 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 motivate Black male students to engage in STEM?