An Exploration of the Factors that Motivate Black and Latino Students to Engage in STEM (science, technology, engineering and mathematics)

Adrienne Coleman, Illinois Math and Science Academy
An Exploration of the Factors that Motivate Gifted and Talented Black and Latino Students to Engage in Science, Technology, Engineering and Mathematics (STEM)

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Chapter 1 - Introduction
Introduction

• Black and Latino students are academically underachieving.

• Black and Latino students typically are not exposed to gifted classrooms.

• Black and Latino students have limited exposure to Science, Technology, Engineering, and Mathematics (STEM) experiences.
**Introduction**

This leads to a STEM gap in which Black and Latino students are rarely involved in STEM education and STEM careers.

These studies examined why certain Black and Latino students have the motivation to engage in gifted and talented education, and how that motivation is defined and manifested in Black and Latino students as well as why the Black and Latino students decide to pursue STEM.
The Problem

Academic Underachievement

Lack of Gifted and Talented Programs

Lack of Exposure to STEM
The Problem

The specific problem that was addressed is the lack of motivation among Black and Latino students to engage in STEM.
Research Question

• What factors do gifted and talented Black and Latino students 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

Gifted and Talented
Black and Latino Students
Midwest
Residential Academy
STEM
Definition of Terms

• *Black or African American*: These terms refer to a person having origins in any of the Black racial groups of Africa. (U.S Census Bureau, 2013, para. 2).

• *Hispanic or Latino*: People who classified themselves as “Mexican," "Puerto Rican", or "Cuban"-as well as those who indicate that they are "another Hispanic, Latino, or Spanish origin." (U.S Census Bureau, 2013, para. 3).
Definition of Terms

• *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 (National Association for Gifted Children [NAGC], 2013, para. 4).
Definition of Terms

- **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)**: “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).
Significance of the Study

These studies contributed to positive literature on gifted and talented Black and Latino students and may help to inform STEM curriculum (Dixon et al., 2010; McGee, & Martin, 2011a).

These studies served as the authentic voice of gifted and talented Black and Latino students regarding their motivation to engage in STEM.

These studies may be utilized as a foundation to minimize the STEM achievement/excellence gap by developing a framework that motivates Black and Latino students to be engaged in STEM.
Chapter 2 – Literature Review
The Black/Latino Achievement Gap

ISSUE
• The five D’s
  – Dumb, Deprived,
    Dangerous, Deviant, and
    Disturbed
• Unintelligent
  ○ Lower grades
  ○ Less successful on
    standardized tests
  ○ Graduate less often
  ○ Drop-out more often
• Lazy
• Criminally Inclined
  – (Nasir & Shah, 2011;
    Parson & Kritsonis, 2006).

WHY???
• Racism
• Socioeconomic
  Disadvantages
• Oppression are at the root of
  the problem
• Racial Identity Conflict
  • Acting White
  • Cool Pose
The Black and Latino STEM Education Gap

ISSUE

• Black and Latino students are academically four years behind their White counterparts and score below approximately 75% of White America in mathematics (McGee & Martin, 2011a).

• Fewer than 10% of Black and Latino students complete the high school mathematics sequence, which includes algebra, geometry, trigonometry, and pre-calculus (McGee & Martin, 2011a).

WHY???

• 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

• Watching too much television (Dumais, 2008; QEMN, 2010; Toldson & Brown, 2009).
Minimizing the Black and Latino Academic Achievement and STEM Education Gaps

• Researchers who endeavor to improve Black and Latino 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).
Chapter 3 - Methodology
Research Question

• What factors do gifted and talented Black and Latino students 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?
Participants

• Focus Groups with 20 Black male students, 11 Black Females, 5 Latino Males, 9 Latino Females currently attending the Illinois Mathematics and Science Academy and their parent(s)
Data Collection Instrument

• 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?

• Describe your motivation to pursue/engage in STEM education…

• 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…

• 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…

• How has your enrollment in a gifted, residential high school contributed to your motivation to engage in STEM?

• The literature suggests that there is gap in STEM majors/careers in which Black and Latino students 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 and Latino students to engage in STEM?
Chapter 4: Findings
Findings – Black Male IMSA Students

• Background
  – 20 Black Male IMSA Students
  • 11 identified as only Black/African American, 9 identified as Bi/Multiracial
  • 10 seniors, 7 Juniors, 3 Sophomores
  • 15 Middle Class, 5 Lower Class
  • 12 from two-parent households, 6 from single-parent households, 2 from other household situations

• STEM Support System
  • Family
  • Teachers
  • School System
  • Friends
Findings – Black Male IMSA Students

- Why is there a STEM Gap? n = 15
  - Themes
    - Lack of STEM Vision for Blacks, n = 6 (40%)
    - Lack of STEM Parental Support, n = 6 (40%)
    - Negative Stigma of/Misperceptions about Black Males, n = 3 (20%)
      - 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.
Findings – Black Male IMSA Students

• Why are you Engaged in STEM? n = 15
  – Themes
    • Enjoy STEM, n = 5 (40%)
    • Good at STEM, n = 4 (27%)
    • STEM is a Progressive Field, n = 3 (20%)
    • To Solve Problems and Advance Humanity, n = 2 (13%)
    • Pursuit of Scientific Knowledge, n = 1 (7%)

  – 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.
Findings – Black Male IMSA Students

- Motivation to Pursue/Engage in STEM Education, n = 9
  - Themes
    - Passion for STEM, n = 4 (44%)
    - Money, n = 4 (44%)
    - Solve Problems/Advance Humanity, n = 4 (44%)
    - Learning/Discovery of Knowledge, n = 3 (38%)

  - 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.
Findings – Black Male IMSA Students

• Intrinsic Motivation to Engage in STEM, n = 11
  – Themes
  • Competitive nature of STEM, n = 6 (55%)
  • Solve Problems/Advance Humanity, n = 5 (45%)
  • Learning/Discovery of Knowledge, n = 4 (36%)
  • Obligation to Black Community, n = 2 (18%)

  – 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.
Findings – Black Male IMSA Students

• Extrinsic Motivation to Engage in STEM, n = 11
  – Themes
    • Future Success, n = 6 (55%)
    • STEM Enjoyment/Advance Humanity, n = 4 (36%)
    • Money, n = 3 (27%)
    • Obligation to Black Community, n = 2 (18%)
  
  – *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.*
Findings – Black Male IMSA Students

- IMSA’s Contribution to STEM Motivation, n = 12
  - Themes
    - Enhanced Motivation, n = 11 (92%)
    - Challenge/Better Education, n = 5 (42%)
    - Immersion in STEM, n = 4 (33%)
    - Diverse Environment, n = 3 (25%)
    - Hindered Motivation, n = 2 (17%)
    - Self-awareness, n = 1 (8%)

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… 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.
Findings – Black Male IMSA Students

• How to Minimize the STEM Gap?  n = 8
  – Themes
    • Black Male Mentors/Role Models, n = 5 (63%)
    • Early STEM Exposure, n = 1 (13%)
    • Nation-Wide STEM Intervention, n = 1 (13%)
    • Educate Parents, n = 1 (13%)
Findings – Black Male IMSA Students

- What factors do gifted and talented Black and Latino Students 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?
  - Learning: Discovery of Knowledge
  - Desire to Solve Problems to Advance Humanity
  - Money
  - STEM is a Progressive Field that Leads to Success
  - Competitive Nature of STEM
  - Passion for STEM/STEM Enjoyment
  - Obligation to Black Community/Break Negative Stigmas about Black Males
Findings – Black Male IMSA Students

What factors do gifted and talented Black and Latino students 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?

- 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.

- 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...
Findings – Black Female IMSA Students

Background

– 11 Black Female IMSA Students
  • 7 identified as only Black/African American, 4 identified as Bi/Multiracial
  • 4 seniors. 7 Juniors
  • 2 Middle Class, 2 Lower Class
  • 10 from two-parent households, 1 from other household situations

– STEM Support System
  • Parents
  • Family
  • Teachers
  • School System
  • Friends
  • Mentors
  • Self
Findings – Black Female IMSA Students

• Why is there a STEM Gap? n = 9
  – Themes
    • Negative stigma of/Misperception about Black people in media and society, Racism by school administration, Racial Intimidation/Thinks other races do better than them, n = 4 (44%)
    • Lack of parent knowledge, support, influence, monetary resources, n= 3 (33%)
    • Lack of STEM vision for themselves/exposure to STEM, n= 3 (33%)
    • Ignorant or unaware of future STEM benefits , n= 3 (33%)
    • There is no gap, n = 1 (11%)
Findings – Black Female IMSA Students

• Why are you Engaged in STEM?  n = 10
  – Themes
    • Enjoy it/ STEM interests, n = 6 (60%)
    • Future success, n = 2 (20%)
    • My parent pushed me towards it, n = 1 (10%)
    • Solve Problems/To Advance Humanity, n = 1 (10%)
Findings – Black Female IMSA Students

- Motivation to Pursue/Engage in STEM Education, n = 11
  - Themes
    - Future Success, n = 7 (64%)
    - To advance humanity and help people, n = 3 (28%)
    - Obligation to Others, Ancestors/Family/Black Community, n = 3 (28%)
    - Passion for STEM, n = 2 (18%)
    - Money, n = 2 (18%)
    - Challenge, n = 1 (9%)
    - Good at STEM, n = 1 (9%)
Findings – Black Female IMSA Students

• Intrinsic Motivation to Engage in STEM, n = 11
  – Themes
    • Personal Drive to learn and be successful, Acquisition of knowledge, Desire to Learn, n = 6 (55%)
    • Obligation to Others - Ancestors/Family/Black Community, n = 3 (28%)
    • Desire to solve problems/ the challenge/ help the world, n = 2 (18%)
    • Contentment, n = 2 (18%)
    • Passion for STEM, n = 2 (18%)
Findings – Black Female IMSA Students

• Extrinsic Motivation to Engage in STEM, n = 7
  – Themes
    • Future Success - pay for college, Job Security, ability to give back to family, n = 3 (43%)
    • STEM Enjoyment - Discovery, help people, n = 3 (43%)
    • Break Negative Stigmas about Black females /Be a role model, n = 2 (29%)
    • Money, n = 1 (14%)
Findings – Black Female IMSA Students

- IMSA’s Contribution to STEM Motivation, n = 11
  - Themes
    - Enhanced Motivation, n = 11 (100%)
    - Immersion in STEM, occupation discovery, n = 7 (64%)
    - Challenge, better education, n = 6 (55%)
    - Self-Awareness/ Self-realization, Independence, n = 6 (55%)
    - STEM Opportunities, n = 3 (27%)
    - Diversity of people/ Around more cultural and intellectual inquisitive students, n = 2 (18%)
Findings – Black Female IMSA Students

- How to Minimize the STEM Gap? \( n = 5 \)

  - Themes
    - More Black students involved/ Exposure to STEM, \( n = 3 \) (60%)
    - Start STEM early in life, 1\(^{st}\)/2\(^{nd}\) grade, Improve Curriculum by making it more fun and relatable, \( n = 1 \) (20%)
    - Improve racism in school system, \( n = 1 \) (20%)
    - Educate them on future STEM benefits, \( n = 1 \) (20%)
Findings – Black Female IMSA Students

- What factors do gifted and talented Black and Latino students 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?
  - Future Success
  - Solve Problems/To Advance Humanity
  - Personal Drive to learn and be successful
  - Obligation to Black Community/Break to Negative Stigmas about Black/Female students
  - Money
  - STEM Passion/Enjoyment
  - Contentment
  - Good At STEM
  - Challenge
  - Instilled Values
Findings – Black Female IMSA Students

What factors do gifted and talented Black and Latino Students 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?

- I feel like our education system isn’t leveled like it should be. A lot of what you get in school is based on your zip code. Unfortunately a lot of black and Latino students are in schools that don’t provide them with enough resources or they don’t have the budget or they are just living in not the best environments. Going along with us being minorities, it also hinders how many of us are in these fields. I feel like if kids were exposed to everything as their Caucasian and Asian peers then, you would see an increase in STEM. Because a lot of kids love science because there are no boundaries to it, you know. You can blow up something and you can just be yourself. So that is why I feel like, it’s not that many of us in STEM field.

- I have developed a passion for biology specifically and for the medical field and microbiology both. So what my motivation at this point is just getting through whatever else will get me to a place where I can really pursue that passion and develop it and eventually, I’ve always had that childish dream of "I want to save the world with learning" so just kind of see what the abilities I’ve been given what I can do to help out with them so just being able to pursue that passion and being able to see where I can take it.
Findings – Latino Male IMSA Students

• Background
  – 5 Latino Male IMSA Students
    • 3 identified as only Latino, 2 identified as Bi/Multiracial
    • 2 seniors, 2 Juniors, 1 Sophomore
    • 5 Middle Class
    • 5 from two-parent households
  – STEM Support System
    • Parents
    • Family
    • Teacher
    • Friends
    • Self
Findings – Latino Male IMSA Students

• Why is there a STEM Gap? n = 5
  – Themes
    • Lack of parent knowledge, support, influence, monetary resources, n = 3 (60%)
    • Negative Environment / lack of community support, focus is on supporting family not education, n = 3 (60%)
    • Negative stigma of and Misperception about Latino students in media and society, Racism, n = 2 (40%)
    • Lack of STEM vision for Latinos, exposure to STEM…more sports and entertainment, n = 1 (20%)
    • Parents do not emphasize a specific field of study for their children, n = 1 (20%)
Findings – Latino Male IMSA Students

• Why are you Engaged in STEM?  n = 5
  – Themes
    • Solve Problems/To Advance Humanity, n = 3 (60%)
    • Future success, n = 2 (40%)
    • STEM is fundamental for everything, n = 2 (40%)
    • STEM is constantly evolving / Always something new to study/
      STEM is a Prominent, Progressive Field, n = 2 (40%)
    • Enjoy it/ STEM interests, n = 1 (20%)
    • Constant STEM Application, n = 1 (20%)
Findings – Latino Male IMSA Students

- Motivation to Pursue/Engage in STEM Education, n = 5
  - Themes
    - Obligation to Others, Ancestors/Family/Latino Community, n = 3 (60%)
    - To advance humanity and help people, n = 2 (40%)
    - Want to be like role models / wants to be a role model, n = 2 (40%)
Findings – Latino Male IMSA Students

- Intrinsic Motivation to Engage in STEM, n = 5
  - Themes
    - Obligation to Others, Ancestors/Family/Latino Community, n = 2 (40%)
    - Personal Drive to learn and be successful, Acquisition of knowledge, Desire to Learn, Curiosity/Skepticism, n = 2 (40%)
    - Desire to solve problems/help the world, n = 1 (20%)
    - Competitive Nature of STEM, n = 1 (20%)
Findings – Latino Male IMSA Students

• Extrinsic Motivation to Engage in STEM, n = 5
  – Themes
    • Seeks Parental / Familial Approval, Parental / Familial Support, n = 3 (60%)
    • STEM Enjoyment, Discovery, help suffering people, n = 2 (40%)
    • Break Negative Stigmas about Latino males/Be a role model, n = 1 (20%)
    • Immersion in STEM/comprehensive perspective of other fields, n = 1 (20%)
Findings – Latino Male IMSA Students

• IMSA’s Contribution to STEM Motivation, n = 5

- Themes
  • Enhanced Motivation, n = 5 (100%)
  • Diversity of people/ Around more intellectual inquisitive students, n = 2 (40%)
  • Challenge, better education/ research opportunities, n = 2 (40%)
  • Immersion in STEM, n = 2 (40%)
  • Balance the uneven playing field for minorities, n = 1 (20%)
Findings – Latino Male IMSA Students

• How to Minimize the STEM Gap?  n = 5
  – Themes
    • Use popular organizations to get into communities / public program to help families, n = 2 (40%)
    • More Black and Latinos males involved / Role models / professionals to talk to the younger generation, n = 1 (20%)
    • Start STEM early in life, 1st/2nd grade, elementary/junior high, n = 1 (20%)
    • Encourage Them to Never give up no matter what, n = 1 (20%)
    • Showing that no matter what your occupation STEM is always going to be necessary, n = 1 (20%)
Findings – Latino Male IMSA Students

- What factors do gifted and talented Black and Latino students 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?
  - Obligation to Latino Community/Break to Negative Stigmas about Latinos,
  - Seeks Parental / Familial Approval, Parental / Familial Support
  - Solve Problems/To Advance Humanity
  - Want to be like role models / wants to be a role model
  - Personal Drive to learn and be successful, Curiosity/Skepticism
  - Help suffering people
  - Competitive Nature of STEM
Findings – Latino Male IMSA Students

What factors do gifted and talented Black and Latino Students 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?

- I think one of the big things, definitely, I think we also touched on is the environment in which these Hispanics and African American students live in. There are no resources in the communities that Hispanics and African Americans that aren’t necessarily affluent or rather more poor. I think that definitely contributes to it just because they can’t pursue STEM because it’s just not a possibility. And if it is, it’s not easily accessible. And another thing is historically, I feel like African Americans and Hispanics have been affiliated with things that aren’t academic, like gang affiliations and different stereotypes of that variety which makes it easy to go along with the stereotypes because I’m not expected to do anything else. So that’s definitely one thing that I think is a big contributor because historically they aren’t expected to do anything.

- I think that STEM still has the most unknown attached to it. We know a lot of basic math, we know a lot of basic scientific concepts but it’s always evolving. And I think with a lot of other fields we kind of hit our peak or at least it’s not as evident when you make a change. With reading and writing and things like that, that’s kind of set in stone. You’re going to learn new techniques as you grow older but if you look at the past fifty years even a hundred years some of the basic strategies with that stuff, it hasn’t changed. But STEM has evolved so dramatically and it has the potential to evolve so dramatically and ….it is fundamental in just about everything we’re doing because it’s so unknown. You know if you’re going into STEM you’re going to find some area of importance, you’re going to find some way to apply it to your life because there’s so much that is available to you. Whereas other fields are kind of closed off.
Findings – Latino Male IMSA Students

What factors do gifted and talented Black and Latino Students 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?

– A big thing for me is I want to be able to give back to my community and give back to the people who gave to me. Specifically, my parents, I want to be able to support them when they can no longer support themselves because they’re old or whatever. I want to be able to give my children, not only the same but better opportunities. And I want to be someone who, not only kids but anyone can look up to. I guess going back to the role model thing. Not only do I strive to be like my role models but I want to be a role model, one day. I want to be somebody that people can look up to so they can say, “I could do that.”

– I think that STEM education is kind of, not necessarily the content, but the way you have to learn when you study like science, math, technology and all that good stuff the way you learn the connections you make, sets you up to solve problems which is what you’re eventually going to have to do. That’s the goal, that’s what you do when you’re older, you solve problems. Regardless of what those problems may be that’s what you’re doing, you’re solving problems. Studying STEM sets you up to solve those problems. It teaches you how to solve those problems. It teaches you how to think about things at a lot of different angles. That’s why studying STEM it prepares me with what I want to do with my life even if what I want to do doesn’t have to with STEM.
Findings – Latino Female IMSA Students

• Background
  – 9 Latino Female IMSA Students
    • 8 identified as only Latino/Hispanic, 1 identified as Bi/Multiracial
    • 4 seniors, 5 Juniors
    • 7 Middle Class, 1 Lower Class, 1 Upper Class
    • 9 from two-parent households
  – STEM Support System
    • Parents
    • Family
    • Teacher
    • School System
    • Friends
Findings – Latino Female IMSA Students

• Why is there a STEM Gap? n = 9

  – Themes
    • Lack of parent knowledge/lack of parent encouragement, support, influence, monetary resources, n = 4 (44%)
    • Negative stigma of and Misperception about Hispanic people in media and society, Racism by school administration, Racial Intimidation/Thinks other races do better than them, n = 3 (33%)
    • Black and Latino History is not taught thus there are fewer Role models in successful in STEM, n = 3 (33%)
    • Lives in negative Environment, n = 2 (22%)
    • Language Barrier in Schools for Immigrants, n = 2 (22%)
    • Lack of STEM vision for themselves, exposure to STEM…more sports and entertainment/make fast money, n = 1 (11%)
    • Ignorant or unaware of future STEM benefits, n = 1 (11%)

  – So I think the common thing throughout what we are going to be discussing is in terms of information and how knowledgeable the student is in terms of if you're Latina you are given, since you were young, a stereotype based off of which race you were. I feel like that’s a really big thing because studies have shown that kind of changes your sense of motivation, your priorities, so say they, “Oh Hispanics don’t do that well in STEM education,” well if you’re badgered with that stereotype, that start to feel like “Oh well what if they are right,” what if you don’t really feel comfortable in this situation because people keep on putting you down. So I feel like a very big component and especially in this institution, it’s kind of the knowledge and de-establishing the hype of stereotypes.
Findings – Latino Female IMSA Students

- Why are you Engaged in STEM?  n = 5
  - Themes
    - STEM is a growing field, n = 3 (60%)
    - My parent pushed me towards it, n = 2 (40%)
    - Solve Problems/To Advance Humanity, n = 2 (40%)
    - Future success, n = 2 (40%)
    - Challenge / Solving Problems, n = 2 (40%)
Findings – Latino Female IMSA Students

- Motivation to Pursue/Engage in STEM Education, n = 9
  - Themes
    - Obligation to Others, Ancestors/Family/Latino Black Community, n = 6 (67%)
    - Passion for STEM, n = 2 (22%)
    - To advance humanity and help people /making a difference, n = 2 (22%)
    - Instilled Values, n = 2 (22%)
    - Future Success, n = 1 (11%)
Findings – Latino Female IMSA Students

• Intrinsic Motivation to Engage in STEM, n = 9
  – Themes
    • Desire to solve problems/ the challenge/ help the world, n = 3 (33%)
    • Obligation to Others, Ancestors/Family/Hispanic Community, n = 2 (22%)
    • Personal Drive to learn and be successful, Acquisition of knowledge, Desire to Learn/Independence, n = 2 (22%)
    • Open to new things, n = 2 (22%)
    • Desire to be the best, n = 1 (11%)
    • Contentment, n = 1 (11%)
Findings – Latino Female IMSA Students

- Extrinsic Motivation to Engage in STEM, n = 9
  - Themes
    - Parents / Family / Teachers, n = 8 (89%)
    - Future Success - pay for college, job security, ability to give back to family, n = 3 (33%)
    - STEM Enjoyment, n = 3 (33%)
    - Money, n = 1 (11%)
    - Break Negative Stigmas about females/Be a role model, n = 1 (11%)
Findings – Latino Female IMSA Students

- IMSA’s Contribution to STEM Motivation, n = 9
  - Themes
    - Enhanced Motivation, n = 8 (92%)
    - Diversity of people/ Around more intellectual inquisitive faculty staff and students/competition awareness, n = 7 (78%)
    - Challenge, better education, course variety, n = 3 (33%)
    - Immersion in STEM / quality teaching, occupation discovery/confirmation, n = 3 (33%)
    - Provide Opportunities. N = 2 (22%)
    - Hindered Motivation, n = 1 (17%)
      - Discouraged when competing with other races, n = 1 (11%)
    - Self-Awareness/ Self-realization, Independence, n = 1 (11%)
    - Maturity, space to make mistakes and fix them, n = 1 (11%)
Findings – Latino Female IMSA Students

How to Minimize the STEM Gap?  n = 8

– Themes
  • Organizational & Community support to change negative mindset toward education and self, n = 3 (38%)
  • More Latina students involved/ Exposure to STEM, role models, n = 3 (38%)
  • Start STEM early in life, 1\textsuperscript{st}/2\textsuperscript{nd} grade, Improve Curriculum by making it more fun and relatable, n = 2 (25%)
  • Educate them on future STEM benefits, n = 2 (25%)
  • Parents/Caretakers, n = 2 (25%)
Findings – Latino Female IMSA Students

- What factors do gifted and talented Black and Latino Students 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?
  - Parents / Family / Teachers, any authoritative figure
  - Obligation to Latino Community/Break to Negative Stigmas about Latinos
  - Solve Problems/To advance humanity
  - Future Success
  - Challenge
  - STEM Passion/Enjoyment
  - Instilled Values
  - Personal Drive to learn and be successful
  - Open to new things
  - Contentment
  - Competitive Nature
  - Money
Findings – Latino Female IMSA Students

What factors do gifted and talented Black and Latino Students 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?

– I think something that has helped me throughout my entire education, ever since I was a little girl. I think what has helped me is that I am very energetic. As in I can’t sit still. Whenever I do not do anything I feel like I am worth nothing. I feel like I always have to be doing things, I would say I am antsy. That has driven me to be involved in activities and when it comes to school, learning. I can’t just sit there and waste time so essentially what I do is get the most I can with the time that I do have do not like to bored I like to do things and school I like to learn things and seek more out of it so very curious along with antsy. So that has helped me when I am in school to make sure I am focused and I am doing worthy of my time and do things right and I am learning the subjects that I should be learning and then the curiosity has driven me further more as a high schooler now to make sure that I have understand what I need to understand and learning what I need to learn, that has helped me.

– I say that my drive would be the, like whenever I was in middle school my mom would be like "si se puede" which is "yes you can" "yes I can" stuff like that and that’s always been in my head since that time because she would be like "oh, look at how hard your dad worked for all five of you even me" even her, because my mom has like carpal tunnel so she can’t really work right now in the moment. She has I believe seven years without working and my dad has been working ever since they both got married. I feel like I can do anything I set my mind to. And my dad says the same thing. "si se puede" "you can do that, you can see how hard I’ve worked" and like him telling me that he doesn’t care as much as like how hard he works or how much his back hurts, cause he has back issues stuff, if his back goes out or anything or that sort of stuff, he doesn’t care for it, because he says that he knows we will take care of him, that what I like, To have them rest and know that we did well. They worked so hard to get us to get to the right path, to get us like, more out there to have that opportunity as they did growing up.
Findings – Latino Female IMSA Students

What factors do gifted and talented Black and Latino Students 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?

– I think what motivates and what keeps me going, especially when I get down is my willingness to help other people and make a difference. That is the one reason I wanted to become a doctor is because I wanted to help people so it keeps me going if I understand the material and I can just accomplish at least one thing then I can help others do it too and I can make a difference by know that other people can do it just and well or even better than me. What keeps me motivated is the fact that I can help people examples will be not only in the working but also in the service trips that IMSA has even the small trips like shoveling snow you can save some from falling on the ice and dying. Something as simple as that is keeps me going knowing that I made a difference somehow. That keeps me motivated to get better grades so that I can become a doctor so that I can help people and that what I love doing and I know that’s what I want to do for the rest of my life.
Conclusion: All Participants, n = 45

- What factors do gifted and talented Black and Latino students 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?

- Trends
  - IMSA
  - Obligation to Black & Latino community/Break negative stigmas
  - Future Success
  - Learning
  - Solve problems/to advance humanity
Conclusion: Black Males/Females, Latino Males/Females & Literature

- What factors do gifted and talented Black and Latino students 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?
  - Triangulation Analysis

Obligation to Black & Latino Communities
Break Negative Stigmas
Learning
Future Success
Conclusion: Contributions to the Literature

- What factors do gifted and talented Black and Latino students 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?
Chapter 5: Implications

• Educators if you want to motivate Black and Latino students to engage in STEM, follow this 5-Step program:
Implications

1) Early STEM Exposure
   – The earlier Black and Latino students are exposed to STEM learning experiences and are consistent throughout their academic careers they will develop the necessary skills and eventually nurture their passion for STEM. In doing so, they will instill a future vision for themselves that involves STEM.
Implications

2) IMSA as a Model

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

- In addition to using the STEM immersion technique during these learning experiences, the curriculum should also include historical and current Black and Latino news and issues. This allows Black and Latino students to understand societal perspectives which would nurture their obligation to their community and the world. The state of awareness of themselves and those around them will grow which could entice their want to develop as students. Recognizing this, could increase their ability to understand themselves: who they are as a student, how they think and learn, and then discovering what is important to them. This process not only builds self-confidence but promotes resilience.
Implications

4) Personalized Assessment and Evaluation

- Black and Latino Students 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 improving their weaknesses. This demonstrates to them the importance of collaboration by showing how a diversity of strengths and weaknesses can assist in solving problems. In terms of competition, showing some success in certain areas will ultimately help build self-confidence and enhance the students’ awareness of areas that need improvement. This enhances the will to do better amongst the Black and Latino students. Furthermore, it establishes a support system for the student with the teacher because the teacher will personally know what each specific student needs to progress.
Implications

5) Leadership Opportunities

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

• Utilizing the research on gifted and talented Black and Latino students engaged in STEM, design a program to motivate Black and Latino students to engage in STEM...
Question and Answer
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### Black Male IMSA Alumni, n = 25

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## Black Female IMSA Students, n = 11

From IMSA Alumni, Kayla Ingram’s SIR (Student Inquiry and Research) Project

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- STEM Passion/Enjoyment, n = 2 (18%)
- Contentment, n = 2 (18%)
- Good At It, n = 1 (9%)
- Challenge, n = 1 (9%)
- Instilled Values, n = 1 (9%)
Latino Male IMSA students, n = 5
From IMSA Alumni, Kayla Ingram’s SIR (Student Inquiry and Research) Project

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<td>Encourage Them to Never give up no matter what, n = 1 (20%)</td>
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<tr>
<td>Lack of STEM vision for themselves, exposure to STEM, n = 1 (20%)</td>
<td>Personal Drive to learn and be successful, Curiosity/Skepticism, n = 2 (40%)</td>
<td>- Balance the &quot;uneven playing field&quot; for minorities</td>
<td>Showing that no matter what your occupation STEM is always going to be necessary, n = 1 (20%)</td>
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<tr>
<td>Lack of parent knowledge, support, influence, monetary resources n = 3 (60%)</td>
<td>Help suffering people, n = 2 (40%)</td>
<td>IMSA Hinders Motivation, n = 0 (0%)</td>
<td>Competitive Nature of STEM, n = 1 (20%)</td>
<td></td>
</tr>
<tr>
<td>Lack of parent knowledge, support, influence, monetary resources n = 3 (60%)</td>
<td></td>
<td></td>
<td>Immersion in STEM/comprehensive perspective in other fields, n = 1 (20%)</td>
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<tr>
<td>Why a Black and Latino Student STEM Gap Exists, n = 9</td>
<td>Why STEM for Gifted and Talented Black and Latino Students, n = 5</td>
<td>Gifted and Talented Black and Latino Student STEM Motivation, n = 9</td>
<td>IMSA’s Contribution to STEM motivation, n = 9</td>
<td>How to Motivate Black and Latino Student to Engage in STEM, n = 8</td>
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<tr>
<td>Lack of parent knowledge, support, influence, monetary resources, n = 4 (44%)</td>
<td>Challenge/Solve Problems, To Advance Humanity, n = 4 (80%)</td>
<td>Parents / Family / Teachers, any authoritative figure, n = 8 (89%)</td>
<td>IMSA Enhanced Motivation, n = 8 (89%)</td>
<td>More Latinas as Mentors &amp; Role Models, n = 3 (38%)</td>
</tr>
<tr>
<td>Negative stigma of and Misperception about Hispanic people in media and society, Racism by school administration, Racial Intimidation, n = 3 (33%)</td>
<td>STEM is a Prominent, Progressive Field, n = 3 (60%)</td>
<td>Obligation to Latino Community/Break to Negative Stigmas about Latinos, n = 7 (78%)</td>
<td>- Diverse Environnement</td>
<td>Organizational Support, Community support, changing negative mindset toward education/ self , n = 3 (38%)</td>
</tr>
<tr>
<td>Lack of Black and Latino History, disestablishing role models, n = 3 (33%)</td>
<td>Parent support, n = 3 (60%)</td>
<td>Solve Problems/To advance humanity n = 5 (56%)</td>
<td>- Challenge, better education</td>
<td>Parents/Caretakers, n = 2 (25%)</td>
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<tr>
<td>Lives in negative Environment, n = 2 (22%)</td>
<td>Future Success, n = 2 (40%)</td>
<td>Future Success, n = 4 (44%)</td>
<td>- Immersion in STEM</td>
<td>Early STEM exposure/ Improve Curriculum by making it more fun and relatable, n = 2 (25%)</td>
</tr>
<tr>
<td>Language Barrier in Schools for Immigrants, n = 2 (22%)</td>
<td>Challenge, n = 3 (33%)</td>
<td>- Provide Opportunities</td>
<td>Educate them on future STEM benefits, n = 2 (25%)</td>
<td></td>
</tr>
<tr>
<td>Ignorant or unaware of future STEM benefits, n = 1 (11%)</td>
<td>STEM Passion/Enjoyment, n = 2 (22%)</td>
<td>- Self-Awareness</td>
<td></td>
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<tr>
<td>Lack of STEM vision for themselves, exposure to STEM n = 1 (11%)</td>
<td>Instilled Values, n = 2 (22%)</td>
<td>- Maturity, provided space to make mistakes and fix them</td>
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<tr>
<td></td>
<td>Personal Drive to learn and be successful, n = 2 (22%)</td>
<td>IMSA Hinders Motivation, n = 1 (11%)</td>
<td></td>
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<td></td>
<td>Open to new things, n = 2 (22%)</td>
<td>- Discouraged when competing with other races</td>
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<td></td>
<td>Contentment, n = 1 (11%)</td>
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<td></td>
<td>Competitive Nature, n = 1 (11%)</td>
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<tr>
<td></td>
<td>Money, n = 1 (11%)</td>
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Prezi References

• [http://prezi.com/mptbwyiqrmr4/?utm_campaign=share&utm_medium=copy&rc=ex0share](http://prezi.com/mptbwyiqrmr4/?utm_campaign=share&utm_medium=copy&rc=ex0share)

• [http://prezi.com/x7e9sn4brlq2/?utm_campaign=share&utm_medium=copy&rc=ex0share](http://prezi.com/x7e9sn4brlq2/?utm_campaign=share&utm_medium=copy&rc=ex0share)