

## ABSTRACT

Title of Dissertation: EFFECTIVE INSTRUCTIONAL PRACTICES  
THAT ENGAGE THE AFRICAN AMERICAN  
MALE IN MIDDLE SCHOOL SCIENCE

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Culturally-relevant instruction in middle school science engages and inspires the African American male to consider careers in science, technology, engineering, and/or mathematics (STEM). With the exponential value and growth of STEM career options, African American males benefit from the integration of and exposure to cultural language and customs within their science learning.

The purpose of the study was to explore the instructional strategies teachers use in middle science classes to engage students, particularly African American males. The study pursued teachers' perspectives about best instructional practices facilitated in middle school that primarily address culturally-relevant science content. Data for this study was collected and analyzed via responses from an online survey using Qualtrics.

The results of the study confirm that the values and needs of African American males are marginally considered during middle school science instructional planning. The teachers report weekly student-teacher discussion techniques as the most commonly implemented practice for student engagement. Whereas, the survey participants also reported that the reading strategy was more infrequently implemented. With respect to the culturally relevant instruction, the survey participants postulate that the introduction of cultural elements proffer more interesting, valuable, and relatable lessons in middle school science. However, the teacher responses demonstrate minimal to no inclusion of culturally relevant instruction. Lastly, teachers can benefit from learning about culturally relevant practices and the multicultural framework.

EFFECTIVE INSTRUCTIONAL PRACTICES THAT ENGAGE THE AFRICAN  
AMERICAN MALE IN MIDDLE SCHOOL SCIENCE

by

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## **Dedication**

First of all, I am MOST grateful to my loving and faithful God for the opportunity to participate in the doctoral program/research process and for blessing me with the most prayerful, supportive and encouraging village, MY VILLAGE: Dominique (my thoughtful husband), Aaliyah Christina (my creative, talented daughter), my loving parents/grandparents (Mama-Kathy, Daddy-Chris, Grandma Tressia, the late “Hahmine”-Iva, Daddy Wilbur, the late “Big Daddy”-Arthur, & Mama Eloise), Monique (my one and only little loyal sister), Ada (caring mother-in-law), my wonderful great-aunts/aunts (Aunt B.B., Aunt Shirley, Aunt Verl, Aunt Gail, Dottie, and Marlene), considerate uncles (Uncle G. and Uncle Bobby Ray), my sweet nieces/nephew (Asia, Taylor, Janiah, Austin, Maddie, and Blair) and most enjoyable cousins (Funsha, Shanda, Etoya, Crystal, Gena) who continuously called or texted to check on me, cheer me on and forever believe in me. Dominique & Aaliyah, thanks for listening and responding when I needed you most.

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## **Section 1: Introduction**

This study examines the instructional strategies teachers use in middle school science classes to engage students, particularly African American males. More specifically, this study focuses on the instructional practices of middle school science teachers in a public school district in Maryland. In this school district, African American males have consistently earned lower scores on the science section of the Maryland School Assessment (MSA) since 2011. These students scored below males in all other racial/ethnic groups and even African American female students. During a time when the knowledge of science and mathematics seems to be of increasing importance in terms of careers, the overall academic achievement of African American students continues to decline in comparison to Caucasian, Asian, and Hispanic American students (Ladson-Billings, 2006).

### **Background of the Study**

Historically, the academic achievement gap of African American students dates back to slavery when laws prohibited blacks from learning to read (Mutegi, 2011). With the differences in educational experiences from their Caucasian peers, researchers have proposed various reasons for the relatively low academic achievement of African American students. Ladson-Billings (2006) cites an argument from the 1966 Coleman Report, *Equality of Educational Opportunity*, that the academic performance of African American students is related to their enrollment and attendance at school, their confidence in the school environment and their own futures, the teacher's linguistic capacity, and the student's home life. Noguera

(2008) indicates that federal policy suggests that “the obstacle to higher achievement for children of color is rooted in educational practices and beliefs that limit student performance, rather than innate ability” (p. 94). More recent researchers assert that class size, lack of parental involvement, hunger and nutrition, and stress and sleep deprivation also contribute to the decline in academic achievement of African American students (Barton & Coley, 2009; Heissel, Levy & Adam, 2017). Regardless of the cause of the decline, the result is that African American students manifest high drop-out, suspension, and expulsion rates that overshadow the low academic achievement (Noguera, 2008).

In contrast to most other ethnic groups, where males commonly perform at higher levels in math- and science-related courses, African American males often struggle to achieve academically, particularly in science subjects (Pollard, 1993). The study of science remains a critical component of college and career preparedness (Brown, 2015; Vilorio, 2014). Science knowledge is essential for admission to college as well as basic entry into the modern-day workforce (Vilorio, 2014). The lack of academic achievement in science for African American males eventually yields underrepresentation in science-related careers (Jackson & Moore, 2006). For example, the National Center for Education Statistics (NCES, 2015) states that the number of science-related degrees and certificates conferred to U.S. citizens and nonresident aliens from 2008-2009 totaled 157,319. Of that total, only 9,105 (6.1%) of the STEM degrees were awarded to African American males (NCES, 2015). Although there has been some increase in STEM degrees awarded to African American males over the years, they continue to lag behind their male cohorts in

absolute numbers and percentages of degrees awarded. For instance, from 2008 to 2013, the distribution of STEM degrees to African American males slightly increased by 6.5% (2,940 African American males), compared to 74.5% in 2008-2009 and 70.1% in 2012-2013 for Caucasian American males (NCES, 2015). To address these disparities, educators can develop instructional strategies to encourage African American male students to engage in science subjects as early as possible.

Decades of data indicate that African American males perform worse than Caucasian males in science classes, and are more likely to be underrepresented in courses and programs that can promote early interest in science careers, such as gifted and talented programs (Jackson & Moore, 2006). To reverse this trend, researchers suggest that teachers should use culturally relevant instructional strategies and practices to support African American male students and help them overcome the challenges brought on by a lack of exposure to and insufficient experiences with the STEM-related courses and careers (Mutegi, 2011). Culturally relevant instructional strategies are critical given that, traditionally, science education highlights the customs and heroic contributions of Caucasian/European role models (Dunac-Morgan, 2015). As such, traditional science education demands reform that engages the African American student populations, particularly African American male students who consistently rank lowest in science-related courses and careers. Culturally relevant instructional strategies are discussed in more detail later in this section, but literature suggests that teachers who implement culturally relevant instructional practices place value on the student's culture and abilities and use those strategies to facilitate learning (Parsons, 2007).

## **Calls for improvement in science education.**

Recent calls for improvements in K-12 science education have focused on the growing need for science and engineering professionals to keep the United States competitive in the international arena (National Research Council [NRC], 2012). To address this need, the NRC, the National Science Teachers Association (NSTA), the American Association for the Advancement of Science (AAAS), and Achieve (a nonprofit, nonpartisan independent education reform organization that works with states to raise academic standards and graduation requirements) collaborated with practicing scientists and policy experts to develop the Next Generation Science Standards (NGSS) (Achieve, 2013). NGSS provides an internationally benchmarked science education curriculum that is content- and practice-rich across grade levels and science disciplines (i.e., physical science and earth science). These organizations came together to address lagging data on science achievement for American students both internationally and nationally (Aceves & Orosco, 2014).

This particular study focuses on middle school science instructional strategies since over one third of eighth graders scored below basic on the 2011 National Assessment of Education Progress (NAEP) Science Assessment, and the 2012 Program for International Student Assessment (PISA) ranks the U.S. as 23<sup>rd</sup> in the world in science. From these rankings, it is clear that all U.S. students would benefit from high quality science education, particularly middle school African American male students. Research shows children with early exposure and engagement with science perform better in science and express interests in pursuing further studies and careers in STEM (NRC, 2012).

## **Problem Statement in One School System**

For the purposes of this study, the researcher has identified the public school district in Maryland as the Southern Maryland Independent School District (SMDISD). The SMDISD had a student enrollment total of 26,307 during the 2016-17 school year (SMDISD, 2016). The District employs 2,079 teachers and 227 administrators and has 21 elementary schools, eight middle schools, seven high schools, and four special centers (i.e. educational and environmental centers serving disabled, non-traditional, and adult learners (SMDISD, 2016).

Similar to all school districts in Maryland, SMDISD has annually administered the Maryland School Assessment (MSA). In SMDISD, Grade 8 African American male students have consistently earned lower scores on the Maryland School Assessment (MSA) in science since 2011. These students scored below males in all other racial/ethnic groups and even African American female students. In 2015, for example, 62.7% of all students in the school district scored at or above proficient on the Grade 8 sciences while only 51% of all male students did. Within the subset, only 43.8% of African American male students received proficient and/or advanced proficient scores (Maryland State Department of Education [MSDE], 2015).

As indicated in Table 1, the overall African American enrollment in SMDISD middle schools was 21.7% in 2016. Table 1 also indicates that in six of the eight middle schools, the African American population constitutes the majority, and the Free and Reduced Meals (FARMS) population remains below 35% in each middle school. With the exception of one school, the data show that there are only four to

seven teachers assigned to teach middle school science in school enrollments that range from 415 to 999 students SMDISD (n.d.).

Table 1

*SMISD Demographics*

Middle school	Student enrollment	# of science teachers	African American	Asian	Caucasian	Hispanic	FARMS
MS1	839	6	67.2%	3.9%	12.5%	8.2%	27.4%
MS2	809	6	53.5%	1.6%	27.9%	8.9%	25.7%
MS3	716	4	66.8%	1.8%	16.6%	5.9%	25.9%
MS4	942	6	73.4%	5.4%	7.2%	8.0%	29.7%
MS5	415	4	10.1%	1.9%	77.4%	3.1%	26.6%
MS6	546	4	46.7%	2.6%	39.5%	3.0%	22.5%
MS7	999	7	35.6%	3.2%	48.8%	4.7%	34.9%
MS8	692	5	72.0%	2.6%	10.3%	8.9%	27.3%
MS9	47	1	42.5%	0.0%	36.2%	6.4%	*
SMISD	26,307	43	21.7%	12.1%	10.8%	21.0%	29.7%

Source: Southern Maryland Independent School District. (2016). *It's all about teaching and learning*. Retrieved from <http://www.ccboe.com> (Note: "\*" indicates no students or fewer than 10 students or the percentage for the category <=5 or >=95).

**Significance of the Study**

As noted above, science education remains important to both the US and to an individual's career opportunities. While science education contributes to one-fourth of STEM (science, technology, engineering and mathematics), frequently science and STEM are mentioned interchangeably. Most recently, STEM education has been a focus of federal education policy, as well as a global and economic focus since STEM fields offer high income career opportunities (NRC, 2007). For the integrated STEM

movement to be successful, STEM educators will need to receive vital support and professional development (NRC, 2012). While 100% of the STEM components are important, with the recent onset of the NGSS, it is clear that science education will require unique shifts in instructional practices for student engagement (Woodruff, 2013). Research indicates that middle school is an ideal time to interest adolescents in science (National Science Teachers Association (NSTA), 2003). Fostering this interest is particularly important among African American male students when considering their substantial, sustained underrepresentation in STEM careers. Considering that MSDE has adopted NGSS and the new assessment, Maryland Integrated Science Assessment (MISA), reflecting these standards, has been administered, it is an ideal time to explore science education (MSDE, n.d.).

This study specifically examines the teacher instructional practices that contribute to middle school science performance. Because middle school science teachers in SMDISD prepare eighth grade students for the MISA and since teacher performance is easily accessible and influenced by the school district leadership, extant teaching practices in middle school science will serve as a key variable in this inquiry. Additionally, for this study, the science MSA scores will serve as the indicator of student performance and a rationale for the need for the study.

### **National Laws and Policies Related to STEM**

This exploration of middle school science education is embedded within the complex context of national laws and policies. Nationally, the No Child Left Behind Act (NCLB) of 2001 made middle school science more relevant, especially in states and school districts that did not place an emphasis on science education. NCLB

(2002) required that states assess students' mastery of science courses in elementary, middle, and high school. In response to this mandate, state departments of education developed high-stakes assessments to measure such achievement (Mastropieri, et. al, 2006). Additionally, state education agencies (SEAs) and school districts developed graduation requirements that included passing an end-of-year course assessment in science. Because of NCLB's high-stakes assessment requirements, district- and school-level administrators began to acknowledge science instruction during public school-wide data reviews and collaborative planning with teachers (Hursh, 2005).

On April 16, 2015, as a part of the reauthorization of the Elementary and Secondary Education Act (ESEA), the U.S. Senate Education Committee passed the Franken-Kirk and Murray STEM Amendment, which restored STEM programs to the federal education bill (ESEA, 2015). The Franken-Kirk and Murray STEM Amendment supports improving STEM instruction and student achievement by calling for (1) improving science instruction through Grade 12; (2) improving student engagement in, and increasing student access to, science courses; (3) improving the quality and effectiveness of classroom instruction by recruiting, training, and supporting highly-rated teachers and providing robust tools and supports for students and teachers in science courses; and (4) closing achievement gaps and preparing more students to be college and career ready for STEM majors and careers (Brown, 2015). Overall, the reauthorization confirmed federal support for STEM education.

Over the past several years, a number of other national policies and initiatives have addressed and promoted STEM education for students. For example, the NGSS, noted previously, are national standards developed by Achieve for all students

engaged in a science and engineering curriculum between kindergarten and high school graduation. NGSS provides detailed guidance to classroom teachers that will afford students in the U.S. the opportunity to compete with peers across the globe (Achieve, 2013). NGSS presents three dimensions (e.g. practices, crosscutting concepts, and disciplinary core ideas) that identify key scientific behaviors and practices that scientists and engineers actually use (NRC, 2012). The intention of the scientific and engineering practices of NGSS was to encourage K-12 student mastery of the science concepts across the main fields of science (Achieve, 2013).

In 2010, Achieve hired experts to complete a study of science standards originating from 10 countries. Researchers selected these science standards based upon successful student results from international assessments (i.e., the PISA, and Trends in International Mathematics and Science Study [TIMSS]) to develop the National Research Council (NRC) Framework. For 15 years, states relied on the National Science Education Standards from the NRC and Benchmarks for Science Literacy from the AAAS to guide the development of science standards, although major advances in science standards had taken place. With a nation-wide agenda to align science instruction, Achieve (2013) developed the NGSS to clarify the types of knowledge that all American students need to learn to excel in STEM related courses and careers.

As Achieve developed the NGSS, similarly, the National Science Teachers Association (NSTA) was established to raise standards and strengthen accountability in science education. The NSTA's position statement proposes recommendations for teachers, curriculums, curriculum offerings, assessment strategies, and administrative

oversight at the middle school level. Although the NSTA refers to Grades 5 through 9 as the middle level, its recommendations remain relevant in SMDISD, where middle school encompasses grades 6 through 8. The NSTA (2016) asserted that middle-level science education is most effective when (a) schools have qualified and trained teachers who are dedicated to working with adolescents and who remain current in instructional technology and (b) the curriculum is aligned with science content and process skills and includes “hands-on, minds-on” inquiry-based instruction (NSTA, 2003). The NSTA also recommended place-based education; where, educators link science to the real world by connecting the classroom to student experiences via the use of field trips, guest speakers, and local partnerships. Finally, NSTA recommends that administrators support their science programs by providing opportunities for professional development and collaborative planning time for teachers, funding appropriate materials and resources, and cultivating a dedicated team of teachers with expertise and interest in serving young adolescent students (NSTA, 2016).

### **Maryland and Southern Maryland Independent School District (SMDISD)**

On June 25, 2013, the Maryland State Board of Education became the fourth of 26 leading states to adopt the NGSS (MSDE, 2016). According to Maryland’s vision for NGSS, Maryland will maintain international leadership in science literacy and STEM education. Thus, according to Mary Thurlow, the Maryland State Science Supervisor, the Maryland science curriculum “reflects a vision of science education in the twenty-first century” (MSDE, 2016). As Maryland has accepted the NGSS, the standards will inspire an instructional shift from merely teaching to learning problem-solving skills for teachers and students, respectively. Moreover, the implementation

of MISA will allow students to demonstrate problem-solving through an interactive online assessment MSDE (n.d.).

Locally, SMDISD used the Maryland State Assessment or MSA to monitor student performance in science in Grades 5 and 8. The MSA was a requirement of MSDE, as mandated by NCLB. The science MSA was one of three high-stakes assessments administered to middle school students. The exam evaluated the degree to which schools and students scored proficient on established curriculum benchmarks for Grades 6-8 related to Skills and Processes, Earth/Space Science, Life Science, Chemistry, Physics, and Environmental Science. Although the MSA was replaced by the MISA in the 2016-2017 year, performance data reported in this section uses only that generated by the MSA.

As noted earlier in this section, there are eight middle schools (Grades 6 through 8) within the SMDISD. The average eighth grade student enrollment within a middle school in the SMDISD is 749.25 students. Table 2 displays the longitudinal scores on the MSA for each middle school located in SMDISD from 2008 to 2015. Table 3 compares the performance between SMDISD eighth graders and the overall performance of all Maryland eighth graders on the science MSA from 2008 to 2015. Although there was a consistent 3-year increase in science scores from 2010 to 2012, the most recent 2015 report shows a decrease of 1.7% from 2014. Lastly, Table 4 denotes the performance of eighth grade African American males within the SMDISD to the overall performance of all male eighth graders in SMDISD on the science MSA. Over a four-year span, the data also confirm that African American

males consistently scored lower than did their male cohorts on the Grade 8 Science MSA.

The data also revealed that at two (i.e., MS5 and MS7) of eight middle schools, 70% or more of students have consistently earned proficient or advanced proficient scores over the past eight years. Although the two schools have consistently scored higher than the other SMDISD middle schools, their increase in MSA science scores is less than the greatest increase of 13.5 percentage points earned by students at one of the lower performing middle schools. Additionally, even though the overall performance of the African American males on the Grade 8 science MSA shows an increase, their performance data consistently lags behind associated sub-groups.

Table 2

*8th Grade Science Maryland School Assessment Scores*

SMDISD Middle Schools	Percentage of students achieving passing, proficient, and/or advanced scores						
	2015	2014	2013	2012	2011	2010	2009
MS1	66.2	62.0	65.5	73.9	63.8	65.8	64.8
MS2	57.4	69.5	70.4	66.4	64.3	68.5	57.0
MS3	60.2	65.8	65.2	62.1	63.7	58.1	51.4
MS4	57.6	61.6	66.6	62.1	65.9	68.2	54.8
MS5	72.8	78.0	80.7	84.2	79.1	80.0	73.8
MS6	53.7	59.4	61.9	67.1	55.8	58.8	65.2
MS7	72.0	78.3	77.5	79.4	81.0	78.2	80.9
MS8	55.9	51.1	55.0	54.5	61.1	57.4	56.1

Source: Maryland State Department of Education (2015). Maryland School Assessment Data. Retrieved from <http://www.mdreportcard.org>

Table 3

*Comparison of Maryland vs. SMDISD 8<sup>th</sup> Grade Science MSA Scores*

	Percentage of students achieving passing, proficient, and/or advanced scores							
	2015	2014	2013	2012	2011	2010	2009	2008
SMDISD	62.7	64.4	59.7	64.4	63	62.9	59.5	61.4
Maryland	65.0	68.1	69.4	71.4	70.7	69.5	67.7	65.3
SMDISD increase	-1.7	4.7	-4.7	1.4	0.1	3.4	-1.9	n/a
Maryland increase	-3.1	-2	-1.3	0.7	1.2	1.8	2.4	n/a

Source: Maryland State Department of Education (2015). Maryland School Assessment Data. Retrieved from <http://www.mdreportcard.org>

Table 4

*Comparison of SMDISD 8<sup>th</sup> Grade Science MSA Scores (All Males vs. AA Males)*

	Percentage of students achieving passing, proficient, and/or advanced scores							
	2015	2014	2013	2012	2011	2010	2009	2008
All males	58.8	64.7	66.7	66.3	63.3	n/a	n/a	n/a
AA males	43.8	52.8	54.4	50.9	52.6	n/a	n/a	n/a
Increase for all males	-5.9	-2	0.4	3.0	n/a	n/a	n/a	n/a
Increase for AA males	-3.7	3.3	1.4	-3.2	n/a	n/a	n/a	n/a

Source: Maryland State Department of Education (2015). Maryland School Assessment Data. Retrieved from <http://www.mdreportcard.org>.

Although a variety of complex factors might contribute to the achievement gap in science noted in these tables, such as lack of exposure to science in elementary school, student learning disabilities or basic reading and comprehension deficiencies, this study specifically examines the teacher instructional practices that contribute to

middle school science performance. Because middle school science teachers in SMDISD prepare eighth grade students for the MISA and since teacher performance is easily accessible and influenced by the school district leadership, extant teaching practices in middle school science will serve as a key variable in this inquiry. Additionally, for this study, the science MSA scores will serve as the indicator of student performance and a rationale for the need for the study. The pervasive disparity between African American males and other males indicates a need for research into strategies that might improve academic achievement in science for African American male students and ensure their opportunity to prepare and compete globally and/or outperform students in other countries (NRC, 2007).

### **The Value of Science Education**

Tan (2011) explained, “Science education is perceived as a means for economic growth for the country and hence, it is typical for science curriculum to be standardized (not just within the country but also globally)” (p. 563). As the expanding global job market necessitates more STEM-based skills in employees, U.S. grade schools must work to increase students’ exposure to science education in the earlier grades, particularly at the elementary and middle school levels (NRC, 2012).

Nichols and Berliner (2007) asserted that high stakes assessment has driven national instruction since 1965. Historically, when SEAs do not include science in standardized tests, school leaders will completely remove science from the instructional schedule to dedicate more instructional and classroom time to reading/English language arts and mathematics, especially at the elementary level (Hursh, 2005). This lack of exposure to science can have a lasting impact on students’

engagement with the subject. According to the NSTA (2003), if educators do not capture students' interest and enthusiasm in science by Grade 7, students may never develop a true interest in the field of study.

Researchers have argued that, with “the proliferation of technology, adequate preparation in science and mathematics is rapidly becoming a requirement for workplace entry and mobility in today’s information, knowledge-based society” (Flowers & Moore, 2003b; Maton, Hrabowski, & Schmidt, 2000 as cited by Moore, 2006, p. 246). As our society changes, middle school teachers and students will need more sophisticated content knowledge in science (Walsh & Snyder, 2004). Moore (2006) concluded that there is also a particular, and “growing need in the United States to funnel resources into initiatives that attract and retain nontraditional populations, such as African American males, in science and engineering fields” (p. 246). The recruitment of African American males is ultimately necessary for career preparation and placement in STEM fields.

As students consider their career options and future opportunities, it is clear that science teachers should become more serious about professional development, lesson planning, and student preparation. Although it is important for middle school science teachers to earn or maintain their certification in science content, principals can hire and assign teachers with merely a general Maryland Certification in Grades 1-8 (Walsh & Snyder, 2004). These teachers prepare middle school students for high-stakes assessments in science without the appropriate background and expertise in the field (Mastropieri, et. al, 2006). Ultimately, the professional development of middle

school science teachers is imperative for student success in learning science (Shaha, Glassett, & Copas, 2015).

### **Prior Attempts to Address the Science Achievement Gap in SMDISD**

According to the “2015 SMDISD Bridge to Excellence Annual Update,” SMDISD has implemented several district-wide strategies aimed at improving middle school science teaching and learning (SMDISD, 2015). For example, SMDISD offered systemic and differentiated teacher professional development to increase teacher capacity and to reduce achievement gaps between African American student performance and that of their Caucasian counterparts. The initiatives primarily focused on implementing reading strategies that highlighted informational text. The report stated that from 2015 to 2020, the district will establish a systemic goal of making close reading of informational text as a priority. Close reading involves student use of annotation of text and claim/evidence/reasoning approaches to defend arguments based solely upon evidence (Dalton, 2013).

Other instructional strategies designed to address the achievement gap between African American students and Caucasian students included differentiated stations and flexible groupings (Tomlinson, 2017). The flexible groupings include small group, collaborative, or independent work based upon interests, readiness, learning styles or a combination that allows students to work with and learn from a variety of peers. During the summer of 2015, the SMDISD science department coordinated curriculum writing to integrate Universal Design for Learning (UDL) principles. These principles provide a scientifically valid framework for guiding educational practice that:

- provides flexibility in the ways that teachers present information, the ways that students respond or demonstrate knowledge and skills, and the ways that teachers engage students;
- reduces barriers in instruction;
- provides appropriate accommodations, supports, and challenges; and
- maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient (The Higher Education Opportunity Act, 2008).

The SMDISD (2015) “Bridge to Excellence Master Plan” also noted that professional development had occurred and that the district would continue to integrate UDL strategies into the middle school science curriculum (SMDISD, 2015). The plan also noted the district’s intention to implement local formative assessments to inform instructional decisions at the classroom and school levels. Through this effort, teachers would facilitate review stations, differentiated close reading content strategies, and student feedback as components of the local formative assessments. In addition, the district designated a K-8 science resource teacher and content specialists as decision makers for curriculum and professional development (SMDISD, 2015).

In support of the MSDE’s vision to prepare all students for college and career readiness, SMDISD also offers all students a variety of academic opportunities in STEM, including preparatory strategies for students in STEM-related careers. For instance, in 2013, SMDISD launched STEM curricular and extracurricular activities that provided equitable student access to technology and equipment along with mentoring, internships, conferences, and extended learning programs (SMDISD,

2015). These opportunities increased the participation of African American, Hispanic, and female student populations in STEM activities, including mentoring, internships, conferences, and extended learning programs. In fact, SMDISD demonstrated significant growth in the participation of underrepresented minorities in STEM—from 31% in 2012-13 to 89.5% in 2014-15, merely based upon STEM activities funded by and presented in a MSDE STEM funded grant initiative. (SMDISD, 2015).

A review of previous attempts to address the SMDISD middle school science program revealed that most of the initiatives were recent and seemed to exclude sustained, systemic teacher professional development specific to science content. The recent initiatives also included equity training for incoming staff and teachers that address the district-wide diversity (e.g. academic levels, ethnicity, gender, culture, stereotypes, etc.) of students and teachers, but not specific subgroups such as African American males. In addition, while the master plan does allude to strategies that target all underrepresented minority populations, few of the prior solutions specifically focused on improving the science learning of African American males in 8<sup>th</sup> grade. Furthermore, the plan does not specify how the district leadership used the Grade 8 Science MSA data to develop classroom intervention strategies, particularly for subgroups of the student population like African American males. Finally, even the high priority systemic initiative, close reading, did not indicate the specific effects the initiative will have on the performance of African American students, or more specifically, the African American males that are the focus of this study.

Although the prior attempts failed to specifically address the performance of African American males in middle school science, they do represent efforts that focus

on middle school science teachers and students. The attempts were also district-wide strategies that were accessible to all middle schools and students within SMDISD.

### **Review of Literature**

This section will present the reoccurring themes found in the extant body of knowledge related to middle school science education accompanied by known productive strategies for instructing the African American male. Specifically, this review will focus, first, on the researched-based strategies that educators use to deliver middle school science instruction. Overall, this research presents common themes associated with middle school science instruction, such as effective teaching strategies, technology-based instruction, and hands-on instruction. Then, the review will focus on the strategies that are directly relevant to the engagement of the African American male, such as culturally-relevant instruction, teacher-student relationships, and inquiry-based instruction, that also enhance student achievement in middle school science.

**Strategies for effective science instruction.** While few studies examined strategies for science instruction that specifically targeted African American males, several studies have examined effective approaches for general student populations. These strategies include technology-based and hands-on instruction. Additionally, the NGSS provides a number of recommendations and resources to support the instructional practices of middle school science teachers. Most recently, the NGSS advocated the use of technology and collaborative inquiry in the classroom and the implementation of science and engineering practices to improve student enthusiasm about science (Achieve, 2013). Beyond NGSS advocacy, several researchers found

that the integration of technology motivated students and led to increased on-task behaviors and improvements in student engagement (White & Frederiksen, 1998; Mistler-Jackson & Songer, 2000; Chauvot & Lee, 2015; Xin & Johnson, 2015).

Aside from technology, hands-on activities are presented through cooperative learning and place-based education. First, in cooperative learning, teachers facilitate student-led small group learning through peer assistance, discussions, and evaluations. The findings of a recent study concluded that cooperative learning led to a better understanding of science concepts (Eymer & Geban, 2016). Furthermore, the NSTA (2016) recommends place-based education, a process which involves the teacher extending cooperative learning opportunities for student interaction and engagement with the local citizens, community organizations, and environmental resources to enhance student learning (Linnemanstons & Jordan, (2017). Place-based education can involve student field trips, guest speakers, and local partnerships or sponsorships.

Additionally, the Council of State Science Supervisors (CCSSS) (n.d.) recommended the following good science teaching strategies in K-12 classrooms via a website post:

- Enjoy and believe in young people;
- Facilitate learning and know students' learning styles;
- Provide hands-on, inquiry-based activities;
- Maintain high expectations for all students;
- Use authentic assessment techniques (e.g., evaluate students' application of concepts in tasks related to the real world);

- Encourage students to use and evaluate research materials;
- Listen to and encourage students to refine and extend their own thinking; and realize that true learning happens when students can connect new and prior knowledge and allow students to integrate the learned information.

While the main effective science instructional approaches (e.g. technology-integration, hands-on activities) appeal to the general student population, there are other approaches (e.g. student-teacher relationships and inquiry-based instruction), as mentioned by the CCSSS, that overlap with student cultures and values.

**Culturally-relevant instruction.** For over 35 years, researchers have explored approaches to link education and instruction to students' home culture (Ladson-Billings, 1995a). The approaches have been variously renamed including “culturally appropriate” (Au, 1981), “culturally responsive” (Cazden & Leggett, 1981; Thomas & Warren, 2015), “culturally compatible” (Yamauchi, 1998), and “culturally congruent” (Day-Vines & Day-Hairston, 2005). The culturally-relevant instruction may include other approaches, such as the integration of student cultural practices, promotion of prosocial behavior, or establishing a classroom environment that captivates the student cultures and values. Ladson-Billings also suggests that if teachers use student colloquialisms during instruction, then student academic achievement would improve.

According to Lee and Buxton, (2010), teachers should present a culturally-relevant curriculum that offers “diverse cultural perspectives and contributions [in science] so that through example and instruction, the contributions of all groups to science will be understood and valued” (p. 29). Ladson-Billings (1995b) explained

that culturally relevant science instruction included instructional strategies that appealed to the home and community cultures of students of color and effectively engaged them in learning science content. Ladson-Billings (1995a) also urged teachers to use culturally relevant pedagogy (CRP) that advocated critical thinking, valued student culture, and established high expectations for young African American students, although CRP had no specific suggestions for science education.

Teel and DeBruin-Parecki (2001) offer four alternative strategies which included (1) a non-competitive classroom with effort-based grading, (2) multiple opportunities to complete assignments and assessment, (3) increased student responsibility and choice, and (4) validation of heritage that develop a classroom environment that promotes student confidence and comfort. They also suggested that student motivation is encouraged through student-teacher relationships. Teel and DeBruin-Parecki also found that the motivation of the African American male was developed through self-confidence in their academic abilities, which was inspired by high expectations established by the classroom teacher. Similarly, according to Toch and Headden (2014), David Yeager, a psychology professor of the University of Texas at Austin, reported that students of color took more frequent steps to improve their performance when they trusted their teachers' commitment to helping them. Generally, the teacher has effectively applied CRP when students voluntarily connect their learning to their personal thinking and home lives.

Culturally-relevant instruction is necessary to generate the interest of African American males in learning science. Research shows that, when interacting with African American students, teachers should consider the language and actions

necessary to present the science content in a way that is familiar to student culture (Parsons, 2007; Ladson-Billings, 1995b). In an earlier study, Atwater (1994) also suggested that teachers include discussions of ethnically and culturally specific contributions, heroes, celebrations, and people in their science curriculum on special days. As the teacher uses the students' cultural knowledge, skills, and interests to make the science curriculum relevant to their lives, students can begin to develop (a) a better understanding of the material and (b) the ability to use the scientific process to think critically and make evidence-based decisions (Parsons, 2007; Achieve, 2013).

Thomas and Warren (2015) explained that “culturally relevant teachers view themselves and their work as deeply interconnected with and within the communities where they teach. They facilitate collaborative learning in the classroom, and they understand that knowledge is co-constructed between students and teachers” (p.2). One example of this was provided by Ridgeway (2016) who stressed that “encouraging inquiry and listening to student voice is a powerful way to utilize CRP” (p. 11). The author described a middle school science hands-on experience that allowed students to directly interact with digital and triple beam balances to weigh cans of coke and diet coke. The hands-on experience was initiated in response to student comments about previous science teachers measuring everything for them. Ridgeway noted that the teacher's effort to create a classroom culture that embraced student voices resulted in a comfortable, safe environment that facilitated learning and encouraged students to engage in scientific inquiry. Studies have also shown that inquiry-based instruction via culturally-based analogies (e.g. observation

skills/inferences used during social card games) and inquiries had significant, positive influences on minority student achievement, particularly in urban classrooms and among populations of young African American men (Schademan, 2008). Lastly, the practices of Ridgeway (2016), not only demonstrate inquiry-based instruction, but also increased student responsibility and choice as recommended by Teel and DeBruin-Parecki (2001).

For the purposes of studying effective instructional practices, particularly for the African American male in middle school science, the multicultural framework is an approach of focus. According to Banks (2007), a multicultural framework approach to instruction includes teachers embracing diversity within the classroom, reading about and engaging with diversity and understanding that futures, fate and journeys (of all people) are connected. As teachers set high expectations, the expectations tend to overshadow the basic needs of students, particularly the African American male, who academically underperform compared to their male co-horts (Banks). While teachers primarily focus on their expectations, the African American male struggles with minimal support; hence, the academic achievement in science suffers. Therefore, the multicultural framework serves as a teacher resource to address the learning needs of the African American male.

Christine Sleeter (2015) suggests that teachers interview students to discover the prior experiences and questions that students bring to the classroom, along with dispelling inaccurate assumptions that teachers may have about students. Additionally, teachers should facilitate students' learning through an informal assessment of their own learning needs. In other words, students should choose the

method of assessment to demonstrate their learning, (Debruin-Parecki, 2001). Sleeter also suggests that teachers visit the home community of the students to learn about important resources (e.g. community or religious organizations) that are relatable to African American students, and that can be used in classroom instruction. In addition, Sleeter encourages, teachers to engage in discussions with colleagues about sensitive issues, such as implicit racism. In the end, the one linchpin for multicultural education that Banks (2007) emphasizes is that the teachers start with the process of self-transformation. Ultimately, Banks says that teachers need to know, care, and act enough to teach students to know, care and act, accordingly.

### **Summary**

As indicated earlier, effective teaching in science is being transformed by standards and expectations elicited through the NGSS and NSTA (2016), respectively. Hence, best practices in science instruction relevant to all students have been described and supported based upon the research reviewed earlier in this section. However, the focus of this study is specific to African American males, because of the manifestation of the gap in their science achievement scores which, as the literature suggests, might be related to culturally effective instructional practices delivered by culturally competent instructors (Mutegi, 2011). These practices overlap general best practices, but include additional, more unique practices. This study is designed to explore the extent to which science educators in one local education agency in Maryland implement best practices in science instruction as defined by NGSS or NSTA, and then specifically, to what extent they incorporate culturally relevant practices in their instruction.

## **Section 2: Purpose and Research Questions**

The purpose of the study was to explore the instructional factors that contribute to improvements in the performance of African American males in middle school science. Specifically, the study explored teachers' reported use and knowledge of effective science instructional strategies including culturally relevant instructional practices to engage middle school African American males in learning science. The following research questions guided the study, data collection, and analysis:

1. To what extent do middle school science teachers in one school district in Maryland report implementing selected best practices in science instruction with African American male students?
2. To what extent do middle school science teachers in one school district in Maryland report implementing culturally relevant instructional practices with African American male students?

### **Design**

The researcher selected a descriptive and online survey approach for several reasons. First, the survey approach has proven less complex, efficient, less expensive, and more exact during data collection (Cowles & Nelson, 2015). Second, the use of a survey captures data on the frequency of use of various instructional practices in middle school science as described in the literature review. Third, in order to explore the topic more in-depth and derive some richer feedback, the survey included two open-ended questions that focused on the research questions on culturally relevant instructional practices.

## **Instrument**

An online anonymous survey based on the work of Supovitz and Turner (2000) was facilitated using Qualtrics 360 (see Appendix A). Qualtrics 360 is a web-based survey tool that offers sophisticated question options (Qualtrics, 2017). The use of Qualtrics reduced expenses and time in developing a survey tool, and aided in arraying data to facilitate the analysis of participant responses (Wright, 2005).

The survey consisted of 24 questions with a Likert scale (1-6) and two open-ended questions. The six-point scale provided an opportunity for the survey participants to select a definitive position for each statement instead of remaining indifferent or not applicable; whereas, the two-open ended questions directly referred to the focal point of the research questions, the integration of culturally-relevant instruction. The introduction to the survey stated the purpose of the research and a brief synopsis for the proposed use of the teacher responses. The first page of the survey was the Informed Consent explaining that the survey is anonymous and voluntary. No reports or other dissemination of the findings identified any individual teacher or assigned school.

The survey began with the first category of questions that probed the teacher about student engagement in instructional practices using a six-point likert scale: Never, Once a Semester, Once a Month, 2-3 Times a Week, Once a Week or Daily. Table 5 shows the survey questions focused on instructional practices that teachers used to engage students in middle school science.

Table 5 presents the sources and rationale for survey items. The majority of the items come from NSTA (2016) recommendation, with the exception of the close

reading strategy, which originated with the SMDISD (2015) “Bridge to Excellence Master Plan.” Additionally, the structure of the questions drew from the Supovitz (2000) survey attached in Appendix A. The first ten questions of the survey addressed the first research question about the extent to which middle school science teachers implement or use best practices (e.g. computer use, close reading strategy, discussions/sharing/open-ended questions, hands-on, evidence-based claims, using models, written reflections) in science education.

Table 5  
*Survey Items for Student Engagement and Research Question 1*

<b>Survey Item</b>	<b>Derivation of Question</b>	<b>Reference of Research Question (RQ)</b>
How frequently do students engage in computer use?	NSTA (2016) recommends certain teacher practices for the middle level grades	RQ1
How frequently do students engage in close reading strategy?	SMDISD (2015) has designated priorities for middle school as outlined in the Bridge to Excellence Master Plan	RQ1
How frequently do students engage in discussions with the teacher to further science understanding?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in explaining concepts to one another?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in hands-on science activities?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in supplying evidence to support their claims?	Adapted from the Likert survey used by Supovitz (2000)	RQ1

How frequently do students engage in sharing ideas or solving problems with each other in small groups?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in using models?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in using open-ended questions?	Adapted from the Likert survey used by Supovitz (2000)	RQ1
How frequently do students engage in written reflections in a notebook or journal?	Adapted from the Likert survey used by Supovitz (2000)	RQ1

Table 6 shows the survey questions focused on the unique teacher practices recommended by the NSTA (2016). The response categories for the survey items also used the same six-point Likert scale.

Table 6  
*Survey Items for Unique Teacher Practices and Research Question 1*

<b>Survey Item</b>	<b>Derivation of Question</b>	<b>Reference of Research Question (RQ)</b>
How frequently do I plan for middle school science relevant field trips?	NSTA (2016) recommends certain teacher practices for the middle level grades	RQ1
... middle school science relevant guest speakers?	NSTA (2016) recommends certain teacher practices for the middle level grades	RQ1
... middle school science relevant local partnerships?	NSTA (2016) recommends certain teacher practices for the middle level grades	RQ1
... NGSS 3-D Dimensional Learning?	Derived from the Next Generations Science Standards (NGSS) developed by Achieve (2013)	RQ1

The third category of questions collected data about respondents' experiences with classroom supports. As shown in Table 7, the researcher used a six-point Likert scale that ranged from Strongly Agree to Strongly Disagree for these questions.

Table 7  
*Survey Items for Teacher Access and Research Question 1*

<b>Survey Item</b>	<b>Derivation of Question</b>	<b>Reference of Research Question (RQ)</b>
As a teacher I have access to computers for science instruction.	Adapted and originated directly from the Likert survey used by Supovitz (2000)	RQ1
I have appropriate funding for materials and resources	NSTA (2016) recommends certain teacher practices for the middle level grades	RQ1
I have availability of quality instructional materials	Adapted and originated directly from the Likert survey used by Supovitz (2000)	RQ1
I have experienced challenges with science content	Derived from NSTA (2003)	RQ1
I have participated in opportunities for teacher professional development in science.	Adapted and originated from SMDISD (2015) as outlined in the Bridge to Excellence Master Plan	RQ1
I have used student feedback to plan science instruction.	Adapted and originated from SMDISD (2015) as outlined in the Bridge to Excellence Master Plan; Also noted in NSTA (2003) and Teel and DeBruin-Parecki (2001)	RQ1

In Table 8, the final category of Likert survey items and the two open-ended questions collected information for the second research question, which addresses

current teacher practices and culturally relevant teacher practices that engage African American males in science instruction. The four Likert-type questions used a six-point scale and were based upon the four alternative teaching strategies proposed by Teel and DeBruin-Parecki (2001) that are specifically relevant to incorporating culturally relevant practices in instruction, such as effort-based grading, culturally relevant discussion examples, and small-group activities. The open-ended questions examined the respondents' knowledge of African American contributions (Atwater, 1994) and require the subjects to identify culturally relevant strategies, people, or events used during science instruction. The last open-ended question afforded the survey participants an opportunity to express their thoughts and beliefs about the integration of cultural aspects into their science instruction.

Table 8  
*Survey Items for Classroom Climate Strategies and Research Question 2*

<b>Survey Item</b>	<b>Derivation of Question</b>	<b>Reference of Research Question (RQ)</b>
How frequently do I create the following classroom climate strategies? (Allows students to resubmit classwork or homework assignments for a better grade/average)	Derived from one of the 4 alternative strategies of Teel and DeBruin-Parecki (2001);	RQ2
(Allows students to retake on summative tests for a better grade/average)	Derived from one of the 4 alternative strategies of Teel and DeBruin-Parecki (2001);	RQ2
(Allows students to discuss science topics relevant to their individual lives)	Derived from one of the 4 alternative strategies of Teel and DeBruin-Parecki (2001)	RQ2
(Students choose their partner(s) for small group assignments)	Derived from one of the 4 alternative strategies of Teel and DeBruin-Parecki (2001)	RQ2

Identify two or three African American heroes, contributions, historical or current events that you have used during a middle school science lesson to spark the interest of African American males.	Derived from one of the 4 alternative strategies of Teel and DeBruin-Parecki (2001); specifically, validation of cultural heritage. Yet the statement is adapted from Atwater (1994).	RQ2
What insights or beliefs have you had about incorporating cultural aspects or diverse perspectives into your science lesson planning and instruction.	Barton (2007) supports the need for continued research on effective instructional practices merged with teacher perception of students with culturally responsive teaching	RQ2

The final section of the survey including items related to the respondent’s professional characteristics and student diversity, such as amount of years teaching in SMDISD, the status of their Maryland teacher certification, whether or not they are a National Board Certified teacher or certified in science content, as well as the percentage of diversity and African American males enrolled in their classes.

**Procedures**

The proposed participants consisted of middle school science teachers within the eight middle schools in SMDISD that prepared students for the Grade 8 Science MSA. There were a total of 43 designated middle school science teachers teaching different science courses. The rationale for the selection of middle school science teachers was based upon the researchers’ own experience within SMDISD and the expertise in instructional strategies and preparation required for the high stakes assessment in middle school science.

After approval for the study was secured from the UMD Institutional Review Board, and the SMDSD Coordinator, all 43 middle school science teachers received an introductory email, explaining the study and describing its benefits to the respondent. The researcher had the endorsement of the SMDISD Science Office, and a link to the online survey was included in the introductory email. The survey was designed and hosted on the Qualtrics website.

As an incentive, participants submitted a separate survey via Qualtrics with their names and emails for consideration for a paid one-year membership to the NSTA. The cost of that membership was \$79. To increase the response rate, the researcher sent a follow up email as well as presented to department chairs and sought assistance from district and building administrators, friends, current and/or former colleagues of middle school science teachers to remind teachers about the survey.

### **Analyses**

Upon collection of the data, the Qualtrics software provided reports of the percentage of responses for each Likert scale question. Survey data were exported to Microsoft Excel and entered into SPSS Statistics to analyze the frequencies, means, and standard deviations of each item. Regarding the two open-ended questions, the researcher reviewed, analyzed, and coded the responses to determine similarities, differences, and other patterns pertinent. Using reports from Qualtrics and analysis features of Microsoft Excel, the researcher compared survey responses of the teachers to highlight any similarities and differences in middle school science instructional practices and to, determine teacher attitudes, beliefs, and strategies for culturally relevant instruction. Also, the researcher analyzed the teachers' use and

implementation of the district-wide priority, the Close Reading strategy, into middle school science instruction.

Throughout the analyses, the researcher observed patterns in participant responses to the open-ended questions to contrast findings with the Likert questions that addressed the strategies to engage African American male students during science instruction.

### **Section 3: Results and Conclusion**

The most recent literature relevant to science and culturally-relevant instruction recommends that middle school science teachers have access to funding, quality materials, and technology. This study attempted to capture the teacher perspective on the implementation of best practices in science instruction, as well as culturally relevant instructional practices focused on the African American male in middle school science.

This section presents the results of the study, as well as a discussion and implications of the results for the District.

#### **Description of Participants**

A total of 23 (53.5%) out of 43 middle school science teachers in the school district completed the online survey. Respondent and student characteristics are described in Table 9. Nearly half (47.8%) of the sample indicated teaching experience of ten or more years and over half (65.2%) held Advanced Professional Certificates. A majority (73.9%) of the participants were not Nationally Board Certified; and a majority (87.0%) of the participants were certified in science content. With reference to the enrollment of student diversity within the middle school science classes, 69.6% of the participants reported that more than 50% of the student population in their classrooms was culturally diverse. In addition, 56.5% of the survey participants reported that less than 50% of their classroom enrollment was comprised of African American males.

Table 9  
*Professional characteristics and student diversity*

	Frequency	Percent
Years of teaching experience in SMDISD		
1-3	9	39.1
4-6	2	8.7
7-9	1	4.3
10+	11	47.8
Teacher Certification		
Conditional Certificate	1	4.3
Standard Professional I	5	21.7
Standard Professional II	2	8.7
Advanced Professional Certificate	15	65.2
National Board Certified		
Yes	6	26.1
No	17	73.9
Certification in Science Content		
Yes	20	87.0
No	3	13.0
Completed SMDISD Equity Training		
Yes	17	73.9
Maybe	6	26.1
Percentage of culturally diverse students enrolled in your science classes		
Less than 50%	7	30.4
More than 50%	16	69.6
Percentage of African American male students enrolled in your science classes		
Less than 50%	13	56.5
More than 50%	10	43.5

### **Analysis of Research Question 1**

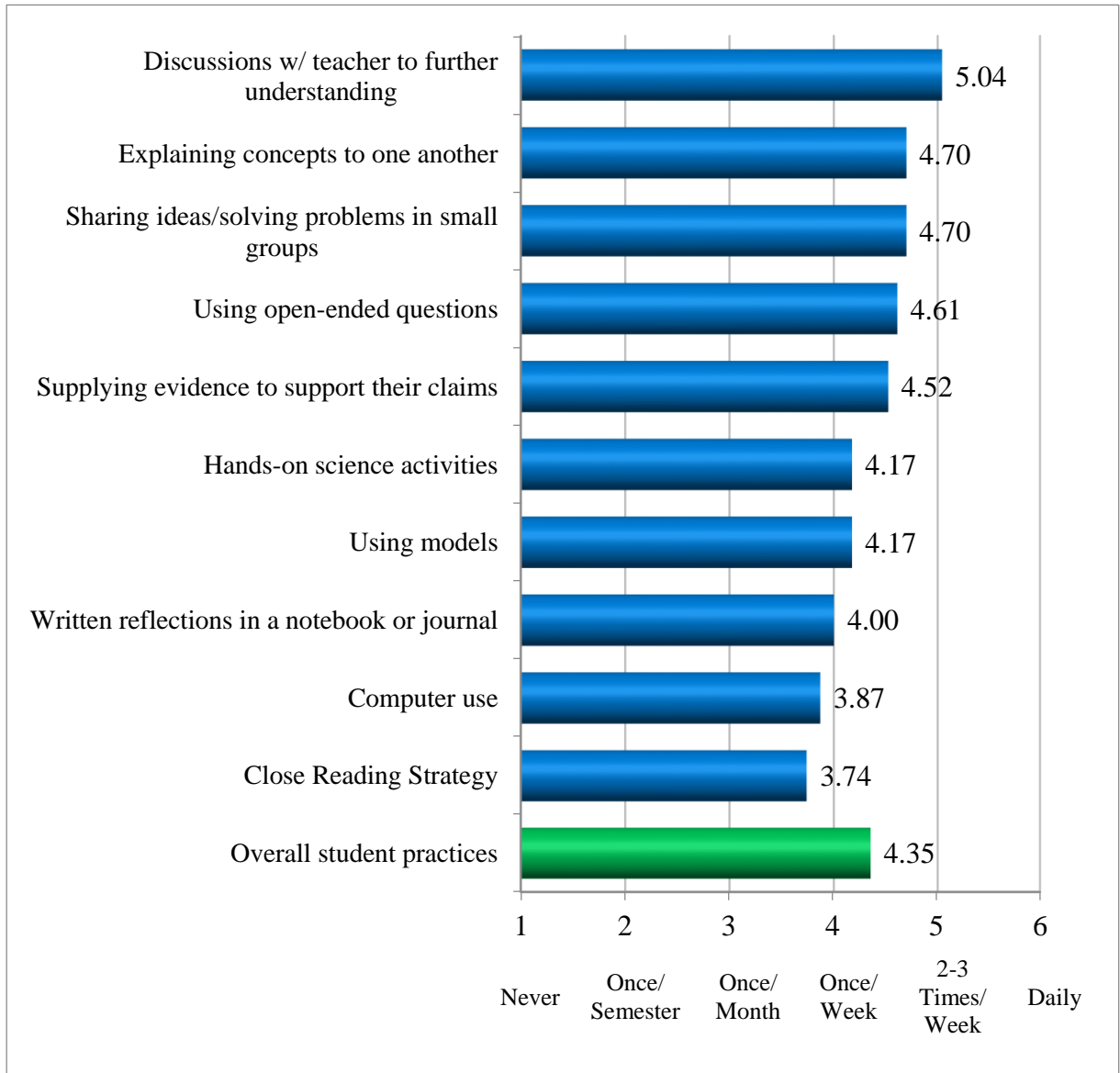
Research Question 1 was addressed in three sections of the online survey involving aspects of student classroom activities, teacher planning for special activities, and resources available to teachers. The ten questions in section one, relevant to student classroom activities, were scored using a 6-point system, 1 (never) to 6 (daily). The mean of the Likert-type responses and an overall average are presented in Table 10, sorted from the highest to the lowest reported frequency while

Figure 1 displays the results in graphic form. The highest reported mean of 5.04 demonstrated that students frequently engage in discussions with the teacher to further science understanding from two to three times per week. The lowest reported mean of 3.74 indicates that the Close Reading Strategy was the least frequently used practice of the ten. The second and third most frequently used strategies by mean score were both 4.70, for students being frequently engaged in explaining concepts to one another and sharing ideas/solving problems in small groups. Overall, the frequency of student engagement in classroom activities resulted in a mean of 4.35, meaning more than once per week, but not quite daily.

Table 10  
*Frequency of student engagement in classroom activities*

	Mean	SD
Discussions w/ teacher to further science understanding	5.04	1.07
Explaining concepts to one another	4.70	1.02
Sharing ideas/solving problems in small groups	4.70	0.82
Using open-ended questions	4.61	0.89
Supplying evidence to support their claims	4.52	1.04
Hands-on science activities	4.17	0.78
Using models	4.17	0.98
Written reflections in a notebook or journal	4.00	1.00
Computer use	3.87	0.97
Close Reading Strategy	3.74	0.75
<b>Overall student practices</b>	<b>4.35</b>	<b>0.64</b>

Figure 1. Frequency of student engagement in classroom activities



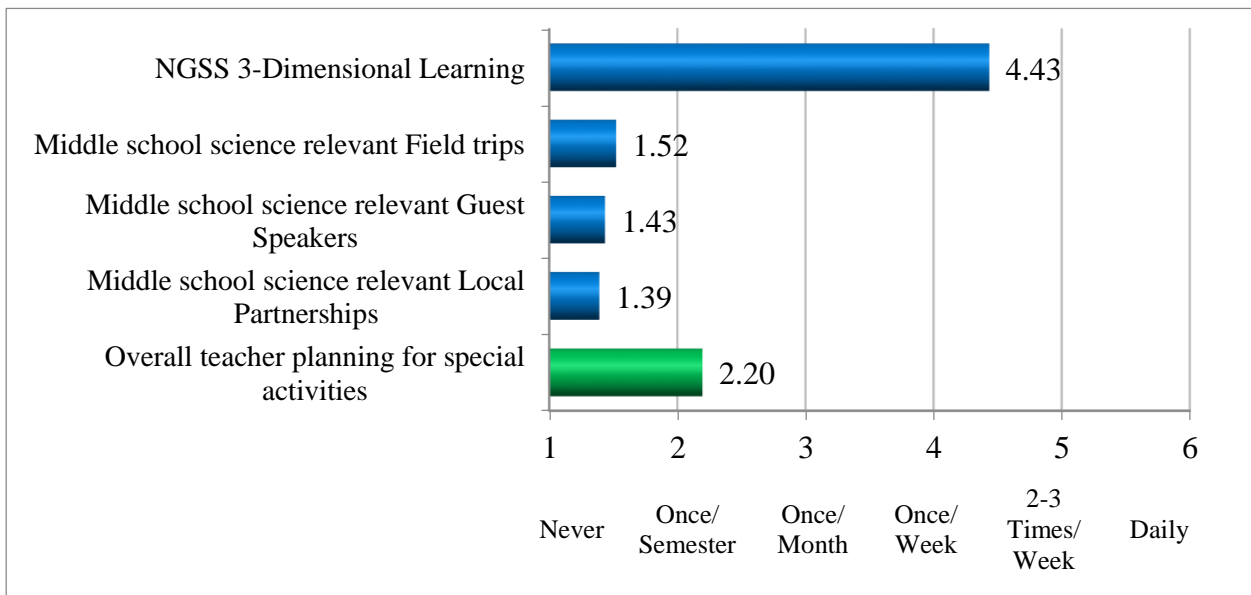
The next section addressing Research Question 1 involved the frequency with which teachers planned for the four special teaching practices. Again, frequency was scored from 1 (never) to 6 (daily). Mean responses and an overall average are presented in Table 11 and Figure 2, sorted from highest to lowest reported mean

frequency. The most frequently used practice was NGSS 3-Dimensional Learning yielded a mean of 4.43. With a mean less than two, middle school science teachers infrequently planned for field trips, guest speakers, and local partnerships.

Table 11  
*Frequency of teacher planning for special activities*

	Mean	SD
NGSS 3-Dimensional Learning	4.43	1.38
Middle school science relevant Field trips	1.52	0.51
Middle school science relevant Guest Speakers	1.43	0.66
Middle school science relevant Local Partnerships	1.39	0.66
<b>Overall teacher planning for special activities</b>	<b>2.20</b>	<b>0.57</b>

Figure 2. Frequency of teacher planning for special activities



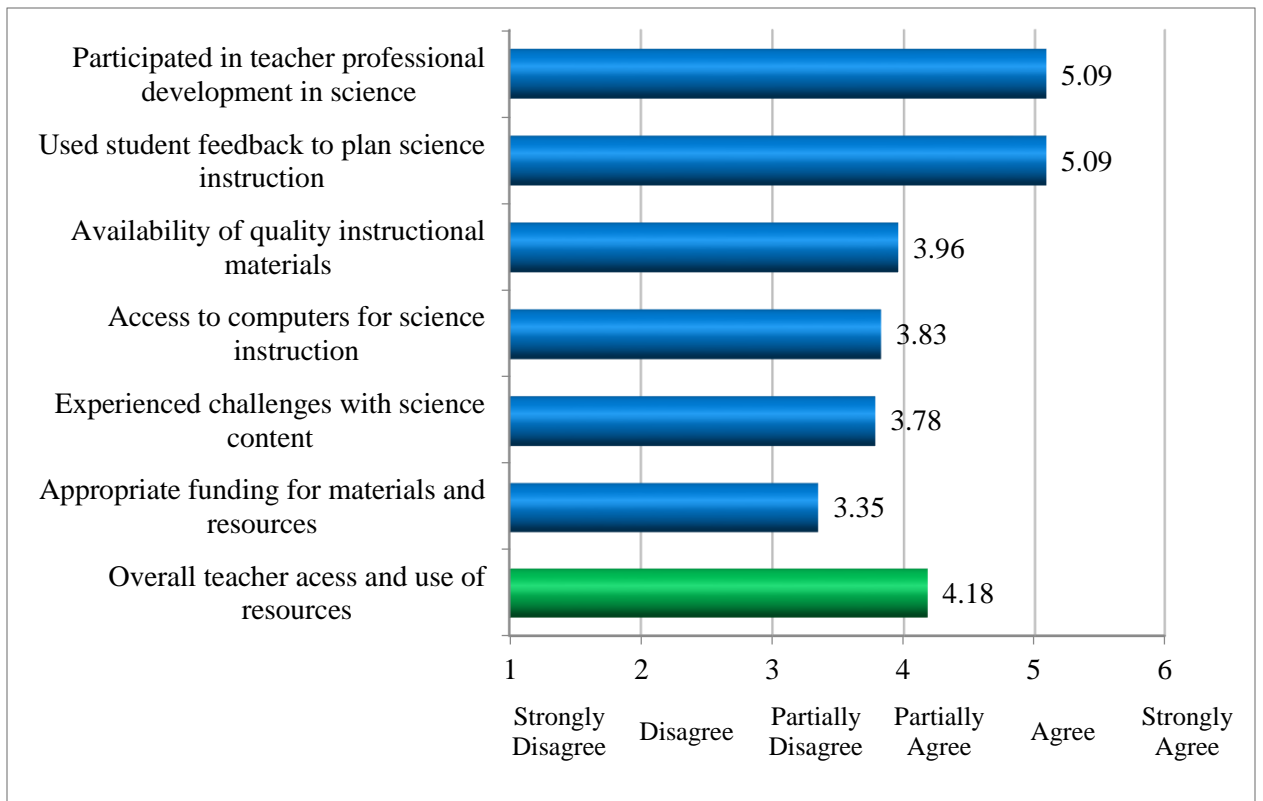
The final section addressing Research Question 1 involved how much teachers agreed with having access to and making use of various resources. Agreement was

scored from 1 (strongly disagree) to 6 (strongly agree). One item, “Experienced challenges with science content” was reverse-scored. Unlike all the other survey questions, the aforementioned item required a lower scored rating for a positive outcome since the structure of the question was written with a negative subtext. Mean responses and an overall average are presented in Table 12 and Figure 3, sorted from highest to lowest. With a mean of 5.09, the participants equally agreed that they participated in teacher professional development in science and used student feedback to plan science instruction, respectively. Although the teachers agree about the participation in the professional development opportunities in science, a majority of the teachers disagree that appropriate funding for materials and resources is available with a mean of 3.35. Then, the majority also disagreed with the availability of quality instructional materials and access to computers for science instruction with a mean of 3.96 and 3.83, respectively.

Table 12  
*Teacher access and use of resources*

	Mean	SD
Participated in teacher professional development in science	5.09	1.16
Used student feedback to plan science instruction	5.09	0.90
Availability of quality instructional materials	3.96	1.11
Access to computers for science instruction	3.83	1.53
Experienced challenges with science content	3.78	1.31
Appropriate funding for materials and resources	3.35	1.56
<b>Overall teacher access and use of resources</b>	<b>4.18</b>	<b>0.64</b>

Figure 3. Teacher access and use of resources



### Analysis of Research Question 2

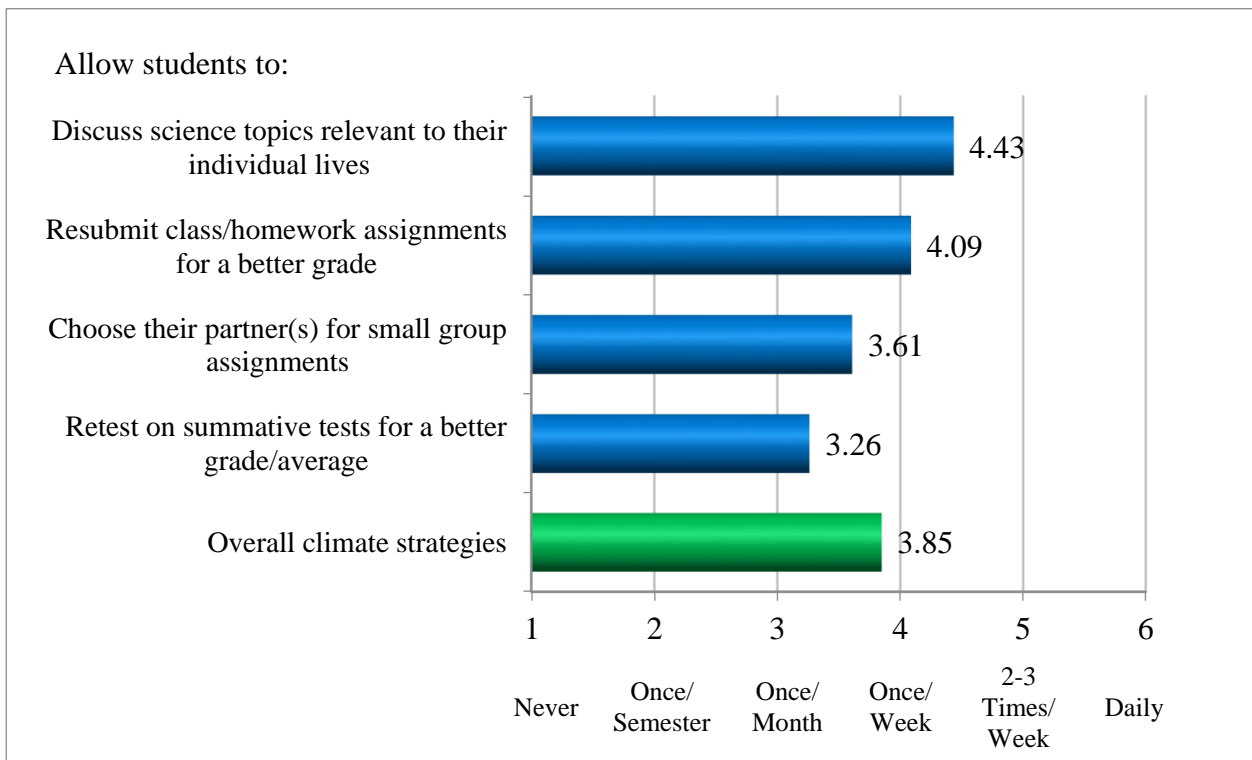
The second research question was addressed in a set of four questions involving climate strategies and using two open-ended questions concerning the introduction of African American heroes and incorporating cultural aspects or diverse perspectives in lesson plans. The frequencies that teachers used climate strategies were scored from 1 (never) to 6 (daily). Mean responses and an overall average are presented in Table 13 and Figure 4, sorted from highest to lowest reported frequency. The teachers reported that including topics relevant to individual lifestyles as the most frequently used climate strategy. Then, teachers were least likely to retest on summative assessments for better grades.

Table 13

*Frequency of teachers' use of climate strategies*

	Mean	SD
Allow students to:		
Discuss science topics relevant to their individual lives	4.43	1.27
Resubmit class/homework assignments for a better grade	4.09	1.65
Choose their partner(s) for small group assignments	3.61	1.47
Retest on summative tests for a better grade/average	3.26	1.60
<b>Overall climate strategies</b>	<b>3.85</b>	<b>1.09</b>

Figure 4. Frequency of teachers' use of climate strategies



Nine (39.1%) of the teachers responded to the open-ended question, "Identify one or two African American heroes, contributions, historical or current events that you have used during a middle school science lesson to spark the interest of African American males." George Washington Carver, Ben Carson, and Neil deGrasse Tyson were each mentioned three times. Also mentioned were James Andrew Harris, Booker T. Washington, Charles Drew, Warren Buck, and Euclid. Based upon the responses to the first open-ended question, several of the participants focused on African American heroes in lieu of addressing contributions or historical events. With "not applicable" as a response, the researcher may conclude that the participants were either uncomfortable, in a hurry to finish the survey, did not use or never considered using African American cultural references during science instruction.

Thirteen (56.5%) of the teachers responded to the open-ended question, "What insights or beliefs have you had about incorporating cultural aspects or diverse perspectives into your science lesson planning and instruction?" Six reported that introducing cultural elements into the instruction helped make the lessons more interesting, understandable and personally relevant. One of these six mentioned the importance of introducing other cultural perspectives outside of what the students are most familiar, in order to prepare them for later life. One teacher mentioned explaining why rich white men made most of the early scientific discoveries. The remaining six teachers explained that they introduce anything that would make the lessons more relevant to the students, and two of the survey participants mentioned that they treat all students equally regardless of diversity.

## Conclusions and Discussion

One of the clearest findings from this study is that science teachers primarily relied on discussion to engage students in the middle school science classroom. Discussions included interactions with the teacher, conceptual explanations to peers, and sharing ideas in small groups. Specifically, the frequency of the use of these types of strategies included: (1) Discussions with teacher to further science understanding (almost daily); (2) Explaining concepts to one another (two-three times/week; and (3) Sharing ideas/solving problems in small groups (two-three times/week). This finding is consistent with collaborative inquiry advocated by Achieve (2013) via NGSS. The findings indicated that interactions with the teacher exceeded the peer-to-peer conceptual explanations and idea sharing in small groups. The results shown in Table 6 and Figure 1 coincide with the findings of Eymer & Geban (2016) who confirm that cooperative learning through discussions lead to a better understanding of the science concepts.

A second strong finding was that teachers identified two barriers or obstacles to their instruction: funding and access to technology. Although the identified district policies and NGSS require funding and utilization of technology, the survey participants partially disagreed ( $m=3.4$ ) that appropriate funding for materials and resources are available. Additionally, teachers reported that they partially disagreed that access to computers for science instruction are readily accessible. These obstacles to implementing best practices are not specifically relevant to culturally defined practices, but according to researchers (White & Frederiksen, 1998; Mistler-Jackson & Songer 2000; Chauvot & Lee, 2015; Xin & Johnson, 2015), hands-on

technology motivates and improves student performance in middle school science. So, the fact that teachers perceive it not being available may inhibit learning for all students, but, especially for African American males because of the disparity in their science performance and their low entry into STEM careers (Jackson & Moore, 2006; NCES, 2015).

In terms of instructional strategies specific to African American males, a few insights were gleaned from the results. One was the lack of creativity or ideas that teachers used in the integration of African American scientists or role models, as well as culturally relevant knowledge into the classroom. Even more unanticipated was the lack of planning for field trips, and the use of mentors or guest speakers in the classroom. Again, these activities are particularly effective for all children, but specifically for the African American male based upon recommendations of the District presented earlier, and the strong recommendations of NSTA, 2016. Without the culturally relevant mentorship and exposure to role models in science, African American males are challenged to imagine themselves as scientists or any in pursuit of any job in technology, engineering or mathematics.

The results indicated that the top four classroom activities in which students are frequently engaged focus on communication, discussions, and questioning. According to Charlotte Danielson's Framework for Teaching (2007), discussion and questioning techniques are necessary for the promotion of student thinking and exploring content. On the other hand, the most rarely used classroom engagement reported by this sample includes technology and the use of the district-mandated reading strategy, the Close Reading Strategy. The Close Reading strategy affords

students an opportunity to use claim, evidence, and reasoning (Dalton, 2013). Since science is invaluable to support reading and writing comprehension of informational text, the nominal reports of the use of the district-mandated Close Reading strategy were noteworthy that middle school science teachers neglect to support Reading English Language Arts.

When science learning extends beyond the classroom and involves additional science experts as suggested by NSTA (2016), the survey data revealed extremely low participation in field trips and invitations extended to guest speakers. In Table 11 and Figure 2, the middle school science teachers reported a nominal mean of 1.52 and 1.43 for planning of field trips and guest speakers, respectively, indicating that they rarely or never engage in these activities. The survey results also reveal a lack of planning for local partnerships. Overall, a large proportion of this sample (48%) report “never” planning for field trips, guest speakers (65%) or local partnerships (70%). However, in support of planning for the Next Generation Science Standards and 3-Dimensional Learning, the teachers report using NGSS at least once per week. Therefore, the researcher may conclude that the middle school science teachers have planned and modified instruction to include the most recent content- and practice-rich national standards (Woodruff, 2013).

Generally, the data revealed that a majority of the middle school science teachers hold an Advanced Professional Certificate, as well as certifications in science content. Furthermore, it is interesting that a majority of the teachers reported more than 50% of their student enrollment is culturally diverse while less than 50% of student enrollment is composed of African American males with reference to the

SMDISD demographics. Since the student demographics of SMDISD (2015) reveal a total population of over 50% African Americans and since science is a required course for all middle school students, the teachers' reports are disproportionate to the demographics of the reported district data. Although not a specific focus of this study, it is interesting that the teachers who responded to this study under-reported this demographic characteristic.

In conclusion, the teachers report the implementation of proven instructional strategies in middle school science, but several of these practices are not used frequently in the classroom, particularly some of those that may specifically benefit African American students, such as, field trips, inviting guest speakers and using local partnerships that extend learning beyond the classroom.

Additionally, based upon the survey results, the teachers' access to instructional materials for student engagement is limited, another factor that will affect all students, but may particularly affect learning and achievement of African American students, including males that are the focus of the study. In other words, it appears that this sample of science teachers are not providing the necessary nor sufficient conditions all students require to learn science, but particularly they may be failing to specifically address the needs of these students.

The results of this study indicated that science teachers in this southern Maryland district implement several effective instructional practices, but report that they lack access to resources and technology to make the most of these practices in the classroom. In addition, their lack of use guest speakers, who might be African American scientists, as well as field trips, that may visit culturally diverse role

models, may inhibit African American males' pursuit of science careers. On the other hand, it is clear that the sample of teachers may be aware and willing to implement instructional practices that benefit all students in science instruction.

### **Limitations**

Limitations are uncontrollable circumstances of the research that may negatively affect the results of the study (Gay, Mills, & Airasian, 2008). A limitation in this study is the minimal sample size of middle school science teachers that limits the ability to make generalizations about overall student practices, teacher planning for special activities, access and use of resources, climate strategies, and culturally relevant instruction. Hence, that data collected merely gleaned 23 completed surveys out of 43 total middle school science teachers. Overall, the small sample size inhibits the variety in survey responses and imparts analytical deficiencies.

In the Likert-type question number 5, this research is also limited due to inaccuracy of the 6-point scale since the statement "Once a Week" (point 4) and "2-3 Times per Week" (point 5) were inadvertently interchanged. Furthermore, it is unknown if the respondents noticed that the 6-point scale was interchanged; therefore, affecting the final results of the survey. Another limitation was the one-sided teacher perspective. The teacher perspective may be exaggerated and/or insufficient. Student information may have provided practices that were most effective for student understanding and learning.

Another limitation was the school district's restriction on collecting teacher demographic information on the survey (e.g., gender and race). These data would have enabled comparisons within the sample regarding the extent to which sex or race

matters in terms of using effective instructional practices or integrating culturally relevant practices in the classroom.

Finally, this study did not provide specific data to whether instruction was sufficient for the achievement of African American males. However, the data does offer insight to possible contributions to the low performance in science and possible implications to address to address the performance.

### **Practice Implications**

Given teachers' perspectives on middle school science instruction and the culturally-relevant instruction specific of African American males, the school district should consider the following recommendations.

First, to enhance and reinforce science learning beyond the classroom, resources for field trips and guest speakers should be provided and encouraged. This is particularly relevant in the geographic area where the District is located, which is proximate to major governmental science-related agencies, such as NASA (National Aeronautics & Space Administration), NOAA (National Oceanic & Atmospheric Administration), NIH (National Institutes of Health), the USDA (United States Department of Agriculture), and the U.S, Geological Survey. Several of the federal agencies support and promote cultural relevance through the development of diversity committees and trainings.

Moreover, Maryland has a rich resource in Historically Black Colleges and/or Universities (HBCU), such as Bowie State University, Coppin State University and Morgan State University, that middle school teachers may contact and develop partnerships for possible mentoring or guest speakers. African American male

students would benefit from meeting role models – that are African American men and women who have succeeded in the science or STEM careers.

Additionally, science teachers should understand the significance of integrating reading and writing in science, as the SMDISD (2015) requires the close reading strategy as a priority to highlight informational text. The close reading strategy is particularly beneficial in high-stakes assessment in science, reading and mathematics, as well as important in future high stakes adult activities, such as making decisions about elections, or environmental concerns in their communities.

Another recommendation is that all teachers – not just newly hired ones – can benefit from learning about culturally relevant practices and the multicultural framework as described by Sleeter (2015). Discussions about multicultural awareness and implicit bias, while sensitive, can assist all teachers with understanding how their instructional perspectives or attitudes might affect student learning.

Finally, science teachers can be encouraged to share strategies with each other for making instruction more relevant to African American males. For example, integrating culturally relevant music, colloquialisms (e.g. slang terms, pop culture), into the classroom is an approach to engage student learners (Ladson-Billings, 1995a). From the researcher's own experience, encouraging students to learn science formulas or other material by connecting it with rhythmic sounds (hand clapping or desk tapping), increases their interest in learning by pairing it with fun activities. For a more in depth critical thinking, students should relate the formula to a scenario from their daily routines and solve a problem using the formula.

## **Research Implications**

Recommendations for future research include understanding which instructional strategies are correlated with students' successful performance on the MISA. Teachers report they use the research-based strategies, yet there is no indication of strategies that actually produce the best student outcome. With forthcoming student results from MISA, comparisons of student reports by teacher and frequency of instructional strategies used may reveal the science instructional strategy that yields the most effective student outcome.

Another recommendation for further investigation is administering the survey to elementary and high school science teachers to gain their perspective on culturally relevant instruction that influences the African American male learning in science. A larger sample size would allow for a greater variety of responses to analyze. As the global market offers STEM career options and seeks to recruit and employ underrepresented minorities, through science instruction, elementary and high school science teachers may also peak interest in the African American male to engage in and pursue STEM careers, respectively (NRC, 2007; Tan, 2011).

## **Summary**

In summary, the researcher deduces that there are not one or more instructional practices that solely engage the African American male in science education, although this exploratory study demonstrates that discussions techniques were used two to three times per week during classroom instruction, as well as basic cultural references to African American scientists. Otherwise, ineffective instruction or instruction inconsistent with best practices is unfavorable for all students,

particularly the African American male, who underperforms in science. However, all teachers should consider acknowledging the talents, gifts, and culture of African American males and use cultural analogies, music, and colloquialism to engage them in the classroom (Schademan, 2008). As the teacher challenges the African American male to think critically, discuss meaningful scientific concepts, asks questions about the “unknown” language used during the discussion (Ladson-Billings, 1995a; Mutegi, 2011), the teacher may actually motivate the African American male to relate his interests to middle school science. Most importantly, the teacher must believe that the African American male is capable of critical thinking and using evidence-based claims and rationales. Then, the teacher must exert effort to understand the values and beliefs of the African American male in order to connect the culture with the middle school science concepts.

## Appendix A

### Consent Form & Online Survey

# EFFECTIVE INSTRUCTIONAL PRACTICES THAT ENGAGE THE AFRICAN AMERICAN MALE IN MIDDLE SCHOOL SCIENCE

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Start of Block: VOLUNTARY CONSENT FORM

#### Q1 Consent to Participate

Project Title: Effective instructional practices that engage the African American male in middle school science

You are being asked to take part in a research study conducted by Treesa Elam-Respass for a dissertation project under the supervision of Dr. Ellen Fabian at the University of Maryland College Park.

You are being asked to participate, because you currently serve as a middle school science teacher in Sothern Maryland Independent School District. Please read this form carefully and ask questions of the researcher before agreeing to participate. You may contact the researcher at XXX.XXX.XXXX or te.respass@gmail.com.

Purpose The purpose of this research is to explore the instructional factors that contribute to improvements in the performance of African American males in middle school science.

Procedure You are being asked to complete a 24-item survey about your instructional practices in science education. The survey is completed on-line via a link to Qualtrics, the survey hosting site. The survey should take about 10 minutes to

complete. The survey does not ask you for any identifying information. Sample survey questions are below:

1. How frequently do students engage in...hands-on activities?
2. How frequently do I plan for...middle school science field trips?
3. As a teacher I have...appropriate funding for materials and resources?
4. Identify one or two African American heroes, contributions, historical or current events that you have used during a middle school science lesson to spark the interest of African American males.

As a token of appreciation for completing the survey, you will receive a chance to win one \$79 one-year membership to the National Science Teachers Association. All respondents that complete the survey within the first five days of dissemination will have their names entered into the raffle twice. The drawing will be held directly after the survey window closes and the prizes will be disseminated to the winner.

Risks The researcher does not anticipate that you will face any known risks by participating in this research project. The researcher will be the sole person with access to the collected survey data to prevent any breach of confidentiality. You do not have to respond to any question that make you feel uncomfortable.

Benefits This research is not designed to help you personally, but the results may help the investigator learn more about support for middle school science instruction, as well as instructional practices that engage the African American male in middle school science.

Confidentiality You are not required to provide your name or school on the web-hosted survey, thus protecting your confidentiality. The researcher will be the sole person with access to the collected survey data to prevent any breach of confidentiality. Participant responses will be reported on by variable used in the survey only. All survey results will be maintained on pass-word protected computer. Only the researcher will have access to the password-protected data. Any reports written about the results of the study will present data in aggregated form, thus protecting any individual identity. If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law. After the study is done, all survey data will be retained on a secure computer system for three years, per University of Maryland guidelines, after which the data will be destroyed.

Voluntary Participation & Right to Withdraw: Please understand that your participation in this research is completely voluntary. There is no penalty for deciding not to participate. In addition, you have a right to withdraw from participation at any time, for any reason, with no penalties whatsoever. If you decide not to take part, or change your mind about taking part in this survey, there will be no positive or negative effect on your employability with Southern Maryland Independent School

District.

Participant Rights: If you have any questions, please contact me at XXX.XXX.XXXX or telam-respass@ccboe.com. You may also contact Dr. Ellen Fabian at efabian@umd.edu or XXX.XXX.XXXX. If you have questions regarding your participant rights, you may contact the University of Maryland Institutional Review Board at 301.405.4212 or irb@umd.edu.

Statement of Consent By clicking on the “next” button, you are indicating your right to consent electronically and that: You are at least 18 years of age. You have read the consent form or have had it read to you. Your questions have been answered to your satisfaction. You voluntarily agree to participate in this research study. You may print/download a copy of the consent form for your records.

By clicking "I agree/Consent" below, the "I agree/Consent" option indicates that you are at least 18 years of age; you have read the emailed consent form; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You may print a copy of the consent form for your records.

- I agree/Consent (1)
- I disagree/decline (2)

*Skip To: End of Survey If Consent to Participate Project Title: Effective instructional practices that engage the African... = I disagree/decline*

End of Block: VOLUNTARY CONSENT FORM

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Start of Block: SURVEY: SCIENCE INSTRUCTIONAL PRACTICES

**Q2 How frequently do students engage in...?**

	Never Scale point 1 (1)	Once a Semester Scale point 2 (2)	Once a Month Scale point 3 (3)	Once a Week Scale point 4 (4)	2-3 Times per Week Scale point 5 (5)	Daily Scale point 6 (6)
Computer Use (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Close Reading Strategy (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussions with the teacher to further science understanding (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Explaining concepts to one another (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hands-On science activities (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplying evidence to support their claims (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sharing ideas or solving problems with each other in small groups (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using Models (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Using open-  
ended  
questions (9)

Written  
reflections in  
a notebook or  
journal (10)



**Q3 How frequently do I plan for...?**

	Never Scale point 1 (1)	Once a Semester Scale point 2 (2)	Once a Month Scale point 3 (3)	Once a Week Scale point 4 (4)	2-3 Times per Week Scale point 5 (5)	Daily Scale point 6 (6)
Middle school science relevant Field trips (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Middle school science relevant Guest Speakers (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Middle school science relevant Local Partnerships (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Next Generation Science Standards (NGSS) – 3 Dimensional Learning (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q4 As a teacher I have....**

	Strongly Disagree Scale point 1 (1)	Disagree Scale point 2 (2)	Partially Disagree Scale point 3 (3)	Partially Agree Scale point 4 (4)	Agree Scale point 5 (5)	Strongly Agree Scale point 6 (6)
Access to computers for science instruction (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appropriate funding for materials and resources (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability of quality instructional materials (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experienced challenges with science content (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participated in opportunities for teacher professional development in science (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used student feedback to plan science instruction (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q5 How frequently do I create the following climate strategies?**

	Never Scale point 1 (1)	Once a Semester Scale point 2 (2)	Once a Month Scale point 3 (3)	2-3 Times per Week Scale point 4 (4)	Once a Week Scale point 5 (5)	Daily Scale point 6 (6)
Allows students to resubmit classwork or homework assignments for a better grade/average (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allows students to retest on summative tests for a better grade/average (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allows students to discuss science topics relevant to their individual lives (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students choose their partner(s) for small group assignments (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Q6 Identify one or two African American heroes, contributions, historical or current events that you have used during a middle school science lesson to spark the interest of African American males.**

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**Q7 What insights or beliefs have you had about incorporating cultural aspects or diverse perspectives into your science lesson planning and instruction?**

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End of Block: SURVEY: SCIENCE INSTRUCTIONAL PRACTICES

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Start of Block: SURVEY PARTICIPANT DEMOGRAPHICS

**Q9 Years of Teaching experience in SMDISD:**

- 1-3 (1)
  - 4-6 (2)
  - 7-9 (3)
  - 10 or more (4)
- 

**Q10 Teacher Certification:**

- Conditional Certificate (CDC) (1)
  - Standard Professional I (SPI) (2)
  - Standard Professional II (SPII) (3)
  - Advanced Professional Certificate (APC) (4)
- 

**Q11 National Board Certified**

- Yes (1)
  - No (2)
- 

**Q12 Certification in Science Content (e.g. biology, chemistry, physics, earth/space):**

- Yes (1)
  - No (2)
-

Q17 Completed SMDISD Equity Training:

- Yes (1)
  - Maybe (2)
  - No (3)
- 

Q14 Among the students enrolled in your science classes, approximately what percentage are culturally diverse?

- 0% (1)
  - Less than 50% (2)
  - More than 50% (3)
- 

Q15 Among the students enrolled in your science classes, approximately what percentage are African American males?

- 0% (1)
  - Less than 50% (2)
  - More than 50% (3)
- 

Q16 END OF SURVEY MESSAGE

(PLEASE TAKE A SCREENSHOT OF THE FOLLOWING STATEMENT FOR YOUR TEACHER PORTFOLIO)

Thank you for your participation and support!

You have successfully REFLECTED on your best science instructional practices, completed and submitted the online survey to report about your implementation of best practices in middle school science instruction, as well as your perspective on culturally relevant instruction.

- YES (1)

## Appendix B

### Email to Prospective Survey Participants

Dear Middle School Science Teachers,

I am conducting a dissertation research study for my Ed.D. in Educational Leadership and Policy at the University of Maryland College Park. My dissertation is entitled: Effective Instructional Practices that Engage the African American Male in Middle School Science.

You are being requested to participate in a 10 minute or less online survey to report about your implementation of best practices in science instruction, as well as your perspective on culturally relevant instruction.

For completing the survey, you will receive a chance to win a \$79 one-year membership to the National Science Teachers Association. More importantly, you are afforded an opportunity to reflect on your instructional practices and include a screen shot of the final survey statement in the Domain 4- Professional Responsibilities section of your observation/evaluation portfolio.

Please click on the link below to open the survey. Thank you for your participation and support!

MS Science Online Survey:

[https://umdsurvey.umd.edu/jfe/form/SV\\_1MMczJI1MDvmwWF](https://umdsurvey.umd.edu/jfe/form/SV_1MMczJI1MDvmwWF)

If you have any questions, please contact me at XXX.XXX.XXXX or [telam-respass@ccboe.com](mailto:telam-respass@ccboe.com). You may also contact Dr. Ellen Fabian at [efabian@umd.edu](mailto:efabian@umd.edu) or XXX.XXX.XXXX.

Your assistance is greatly appreciated.

Sincerely,  
Treesa Elam-Respass,

Science Teacher

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