The Rose That Grew from Concrete: A Study of Hip-Hop Based Education in Urban Fifth-grade Math

A Dissertation Submitted
to the Graduate School
Valdosta State University

in partial fulfillment of requirements
for the degree of

DOCTOR OF EDUCATION

in Curriculum and Instruction

in the Department of Curriculum, Leadership, and Technology
of the Dewar College of Education and Human Services

December 2019

Amity C. Lutes

Master of Education, American College of Education, 2013
Bachelor of Arts, Elon University, 2002

This dissertation, "The Rose That Grew from Concrete: A Study of Hip-Hop Based Education in Urban Fifth-grade Math," by Amity C. Lutes, is approved by:

Dissertation Committee Chair & Research Member

E-Ling Hsiao, Ph.D.
Associate Professor of Curriculum, Leadership, and Technology

Committee Members

Steven E. Downey, Ph.D.
Professor of Curriculum, Leadership, and Technology

Daesang Kim, Ph.D.
Associate Professor of Curriculum, Leadership, and Technology

Taralynn S. Hartsell, Ph.D.
Associate Professor of Curriculum, Leadership, and Technology

Associate Provost for Graduate Studies and Research

Becky K. da Cruz, Ph.D., J.D.
Professor of Criminal Justice

Defense Date

10/30, 2019

FAIR USE

DUPLICATION

I authorize the Head of Interlibrary Loan or the Head of Archives at the Odum Library at Valdosta State University to arrange for duplication of this dissertation for educational or scholarly purposes when so requested by a library user. The duplication shall be at the user's expense.

Signature 

I refuse permission for this dissertation to be duplicated in whole or in part.

Signature _____

ABSTRACT

The purpose of this study was to determine the effect of the implementation of a Hip-Hop Based Education (HHBE) Unit on fifth-grade students' math achievements and math attitudes. This was a mixed-methods study with an explanatory sequential design. The quantitative data about student math achievements were collected using a pretest and posttest created from a county test bank and the quantitative data about student math attitudes were collected using a pre-survey and post-survey (The Math and Me Survey). Both the pretest and pre-survey were given to 113 fifth-grade student participants at a high-minority, low-income school in North Central Georgia before the implementation of the HHBE unit. After the HHBE math unit was implemented by the six participating fifth-grade teachers for four weeks, the participating students were given the posttest and post-survey. Qualitative data were collected through 452 weekly student essays and through interviews with five of the six participating teachers. The results indicated that HHBE can be a useful strategy to increase student math achievements in a high-minority, low-income school. Although student attitudes did not significantly increase based on the results from the pre-survey to post-survey, student comments on the perceptions essays showed that a majority of students did perceive that their math attitudes increased during the implementation of the HHBE unit. Teachers also expressed that the HHBE unit created a positive engagement for most students. The results of the study also provided evidence that student gender does not significantly affect the changes in student math achievements and attitudes. Finally, the results of the study provided evidence that the use of specifically designed activities, such as rap songs and "creating the raps," are useful and culturally relevant strategies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

I would first like to thank my doctoral committee chair, Dr. E-Ling Hsiao for all of her knowledgeable feedback and assistance in the researching, analyzing, and writing of this research study. I would also like to thank my doctoral committee members, Dr. Steven Downey, Dr. Tarlynn Hartsell, and Dr. Daesang Kim for their knowledgeable feedback and assistance throughout this research study.

I would like to thank the teachers and students who participated in my research study. This study would not have been possible without the hard work and dedication of the teachers who implemented the HHBE unit in their classrooms.

Finally, I would like to thank my awesome support team: My wife, Shawnta, for her support and encouragement throughout the entire research study process. My mother for always supporting me in every educational endeavor throughout my life. My cohort friends, especially Mandy and Megan, for encouraging me when I needed it most.

This dissertation is dedicated to Mrs. Gloo, my fourth-grade teacher. She made a difference in my life, which inspired me to make a difference in the lives of others.

CHAPTER I

INTRODUCTION

During the 2014-2015 school year, the Georgia Department of Education introduced the Georgia Standards for Excellence in Mathematics (GSE), which increased the rigor of math instruction for all grades (GaDOE, 2017). Simultaneously, the Georgia Milestones Assessment (GMAS) replaced the Criterion Referenced Competency Test (CRCT) to assess third-, fourth-, and fifth-graders' math growth and achievement at the end of each school year. Georgia state officials predicted a drop in test scores due to the new implementations, and the results in 2015 matched their prediction (French, 2015).

The overall 2014-2015 fifth-grade GMAS math scores for the state of Georgia, according to the Georgia Department of Education, were low, including only 10.6% of students scoring at the distinguished level and 27.5% of students scoring at the proficient level. These results showed 38.1% of fifth-grade students in Georgia passed the GMAS math test. In some counties, especially high-minority, low-income districts, the results were even far lower than the state average. For example, in one suburb of Atlanta, a high-minority, low-income district in Georgia, only 2.5% of fifth-grade students scored at the distinguished level on the GMAS math test, while 16.5% scored at the proficient level. These results showed 19% of fifth-grade students in a sample high-minority, low-income district passed the GMAS math test (GaDOE, 2015). In another suburb of Atlanta, with several high-minority, low-income schools, the results were similar. An example high-minority, low-income school in this district, had similar results on the

2014-2015 math GMAS. At the example school, only 24.2% of fifth-grade students passed the GMAS (GaDOE, 2015).

In the 2015-2016 school year, a similar trend emerged regarding the fifth-grade GMAS math scores for the state of Georgia. In the spring of 2016, 25% of the fifth-grade students in Georgia scored a level one (beginning learner), 34.3% scored a level two (developing learner), 34.5% scored a level three (proficient learner), and 6.2% scored a level four (distinguished learner). In the second year of GMAS implementation, the percentage of passing fifth-grade students in Georgia was 40.7%. Again, districts with high-minority, low-income students produced even lower percentages. The results from an example high-minority, low-income district showed 37.2% scored a level one, 37.3% scored a level two, 23.3% scored a level three, and 2.2% scored a level four. The percentage of passing fifth-grade students in the example high-minority, low-income district was 25.5%. In a second district, similar results were reported in many of the high-minority, low-income schools within the district (GaDOE, 2016).

The trend in fifth-grade math GMAS scores continued into the 2016-2017 school year in the state of Georgia. The spring 2017 math GMAS scores for Georgia included 25.1% of students tested scoring a level one, 37.8% scoring a level two, 26.1% scoring a level three, and 11% scoring a level four. The percentage of fifth-grade students who passed the math GMAS in Georgia in 2017 was 37.1%. The results of three years of GMAS math testing showed fewer than half of the fifth-grade students in Georgia passing the test each year. In several high-minority, low-income districts in Georgia, an even smaller number of fifth-grade students passed the GMAS math test in the spring of 2017 (GaDOE, 2017).

Problem Statement

Fifth-grade students in high-minority, low-income schools in Georgia are not achieving high scores on the GMAS math test (GaDOE, 2017). There is a need to implement new strategies to help increase student achievement in math. Researchers (Lipnevich, Preckel, & Krumm, 2016; Wlodkowsi & Ginsberg, 1995) have also studied the effect of student math attitudes and motivation on student math achievement. Studies about math motivation are related to the concept of math attitudes. Wlodkowsi and Ginsberg (1995) stated, "when students can see that what they are learning makes sense and is important, their intrinsic motivation emerges" (p. 18). Lipnevich et al. (2016) found math attitudes had a higher effect on student achievement than both cognitive ability and personality dimensions.

Math achievements and attitudes can differ by gender. Several researchers (Dickhauser & Meyer, 2006; Lui, 2009; Reilly, Neumann, & Andrews, 2015) conducted studies about the differences in math achievements and attitudes between genders and found differences did exist in math achievement and math attitudes between males and females. Females tended to rely more on the ability perceptions of their teachers than males (Dickhauser & Meyer, 2006). Females also reported a higher level of math anxiety, while males had a higher level of belief in their math ability (Lui, 2009).

A possible strategy that could be implemented to improve both male and female students' math achievements and attitudes in high-minority, low-income schools is Hip-Hop Based Education (HHBE). HHBE is a Culturally Responsive Teaching (CRT) strategy that may work for minority students in low-income schools because students' culture is included in their learning. CRT is the use of Culturally Responsive Pedagogy

(CRP) in education. According to Ladson-Billings (1995), CRP is a theory that addresses student achievement while addressing cultural acceptance as well. Teaching students using CRT validates their cultural heritage and teaches the entire student (Gay, 2010). If students are taught through their own culture, their achievement may be increased. HHBE is the use of elements of hip-hop, including rap songs, cyphers, battling, graffiti, language, and break dancing, as pedagogical resources (Hill, 2009). The use of hip-hop elements to teach minority students relates to the hip-hop culture experienced by many of the students in their everyday lives. Due to the connection of hip-hop to students' culture, HHBE may improve student math achievements and attitudes toward math.

Previous studies using HHBE have been conducted in several disciplines, including language arts, social studies, and science (Emdin, 2013; Hill, 2009; Morrell & Duncan-Andrade, 2002; Petchauer, 2015). The results from these studies showed HHBE had a positive effect on minority students' achievement and attitudes. Hill (2009) created an HHBE course for high school students taking night classes at Howard High School in South Philadelphia. He used hip-hop songs to teach literature to struggling students and conducted interviews at the end of the course. The results of the interviews provided evidence that the use of hip-hop songs as literature motivated the students to participate and improved their attitudes. His study also provided many examples of creating a culturally responsive classroom.

Two experts in the field of HHBE, Hill and Petchauer (2013), offered several ways to expand HHBE. One of their suggestions was to use more elements of hip-hop in HHBE. They found many previous studies focused on rap music and left out other important elements of hip-hop such as DJing, cyphers, rap battles, visual art, language,

and graffiti writing. A second suggestion made by Hill and Petchauer was including HHBE in a wider range of subjects. The majority of HHBE research has been conducted in language arts and English classrooms. They suggested researchers branch out to other disciplines, including math and science. As Hill (2009) stated, "while the fields of literacy and English education have produced a sizeable amount of research in this area, there remains a need to link hip-hop to other subject areas such as mathematics, social studies, and health education" (p. 123). According to Love (2015), another gap that needs to be filled in the research of HHBE is the use of HHBE in elementary level classrooms. She found troubling HHBE had not reached young urban children after the successful research conducted at middle and high school levels.

Since the implementation of the GMAS at the end of the 2014-2015 school year, the percentage of fifth-grade math students in Georgia passing the test has remained low. The percentage of passing fifth-grade students in high-minority, low-income schools has remained even lower than the state percentage (GaDOE, 2015, 2016, 2017). Due to the lower fifth-grade GMAS math scores of students in high-minority, low-income schools, a new strategy is necessary to increase student achievement and attitudes toward math. HHBE may be a strategy to use with minority students as hip-hop is a major part of their cultures.

Purpose of the Study

As stated in the introduction, the fifth-grade GMAS math scores in a high-minority, low-income district, were far lower than the overall fifth-grade GMAS scores in the state of Georgia in both 2016 and 2017 (GaDOE, 2016, 2017). The low achievement of students in a high-minority, low-income district may be increased with the

implementation of HHBE, which is a CRP strategy used by previous researchers (Emdin, 2013; Hill, 2009; Morrell & Duncan-Andrade, 2002; Petchauer, 2015).

The purpose of this study was to determine the effect of a four-week HHBE unit on fifth-grade students' achievement and attitudes in math. The scope of this study covered six fifth-grade classrooms at a high-minority, low-income school in a specific county in the state of Georgia. All students in the participating fifth-grade classrooms, as well as the teacher of each classroom, were included as participants. I collected both quantitative and qualitative data to examine 1) the effect of an HHBE unit on students' math achievements and attitudes, 2) the difference in the HHBE's effect between genders, and 3) students' and teachers' perceptions about the HHBE unit.

Quantitative data related to student math achievements and attitudes. Student math achievements were examined to determine the effectiveness of HHBE in increasing students' math achievements. The scores of the pretest and posttest were analyzed to determine student growth following the HHBE unit. Students' math attitudes were also examined to determine if the HHBE had an effect on the attitudes of the participating students. The results of the pre-survey and post-survey were analyzed to determine the effectiveness of HHBE in increasing students' math attitudes. The HHBE unit may affect genders differently. The results of both the test and survey analysis were used to determine the differences in gender.

Qualitative data related to student and teacher perceptions of HHBE. Students' responses to weekly perceptions essays were examined to understand their perceptions of the effect of the overall HHBE unit and weekly activities on their math achievements and attitudes. The results of the weekly perceptions essays were used to further explain the

results of the quantitative data collected by the student surveys. Teachers were also interviewed to share their perceptions of the effect of HHBE on student math achievements and attitudes and provide suggestions for improvement.

Research Questions

The following research questions were used to understand if the implementation of a four-week HHBE unit in six fifth-grade math classes in a school in County A in the north-central portion of Georgia would cause a change in students' math achievements and attitudes. The first research question was used to determine any changes in student math achievements and the second research question was used to determine any changes in student math attitudes. Research questions one and two also have a sub-question that focuses on gender. The third research question was used to determine the participating fifth-grade students' perceptions of the overall effect of the HHBE on their math achievements and attitudes. The fourth research question was used to determine the participating teachers' perceptions of the overall effect of the HHBE on fifth-grade students' math achievements and attitudes.

RQ1.1. What changes, if any, occur in fifth-grade students' math pretest and posttest scores after the implementation of a Hip-Hop Based Education unit?

RQ1.2. To what degree, if any, is there a difference in gain scores from math pretest to posttest between fifth-grade students of different genders after the implementation of a Hip-Hop Based Education unit?

RQ2.1. What changes, if any, occur in fifth-grade students' math attitudes pre-survey and post-survey scores after the implementation of a Hip-Hop Based Education unit?

RQ2.2. To what degree, if any, is there a difference in gain scores from math attitudes pre-survey to post-survey between fifth-grade students of different genders after the implementation of a Hip-Hop Based Education unit?

RQ3. What are the fifth-grade students' perceptions of the overall effect of the Hip-Hop Based Education unit on their math achievements and attitudes?

RQ4. What are the teachers' perceptions of the overall effect of the Hip-Hop Based Education unit on fifth-grade students' math achievements and attitudes?

Theoretical Framework

Culturally Responsive Pedagogy (CRP) was used as a background theory to guide this study for resolving the problem of low math scores in high-minority, low-income schools in Georgia. Wlodkowski and Ginsberg (1995) described CRP as, "a pedagogy that crosses disciplines and cultures to engage learners while respecting their cultural integrity" (p. 17). They claimed a strong relationship between motivation and culture. They also expressed motivation is directly influenced by emotion, which relates directly to attitude. They argued the current structure of education remains mechanical in nature, and therefore, did not lead to the use of CRP. The key principles of CRP, according to Ladson-Billings (1995), include teachers setting high expectations, facilitating learning, including diverse students, being sensitive to students' cultures, and reshaping curriculum. A practical CRP guide titled "Madison Metropolitan School District (MMSD) Culturally and Linguistically Responsive Practices guidelines" included the following to facilitate student learning 1) setting high expectations for all students, 2) acknowledging all students, 2) developing self-efficacy, 3) connecting to students' lives, 4) applying high level learning, and 5) valuing cultural identities (MMSD, 2015).

Hill (2009) claimed the classroom application of Hip-Hop Based Education (HHBE) was greatly influenced by CRP. HHBE is one type of CRP, which particularly emphasizes the use of hip-hop based strategies including rap songs, dancing, sampling, cyphers, rap battles, and hip-hop word problems. Those hip-hop based strategies are sensitive to students' cultures while still requiring high expectations for both the teachers and students. The use of HHBE in minority classrooms is culturally responsive and may be useful to improve student math achievements and attitudes in a high-minority, low-income school district. As shown in Figure 1, student achievements and attitudes may be affected by the use of HHBE in the math classroom.

Hip-hop culture is an extremely important aspect of urban students' lives. As stated by Morell and Duncan-Andrade (2002), "whether the power in its messages can be used for good or ill, few can dispute the effect of Hip-Hop culture on the lives of working-class urban youth" (p. 89). Kitwana (2003) also discussed the importance of hip-hop to urban youth in his book, The Hip-Hop Generation: Young Blacks and the Crisis in African-American Culture. He explained young African-Americans increasingly turn to rap music and videos and rap music had shaped African-American culture more than any other aspect in their lives. Due to the importance of hip-hop in African-American culture, and the prevalence of African-American students in urban school districts, fusing hip-hop culture with education may be a strategy. Ginwright (2004) found, through his research of Afrocentric reform, hip-hop culture was very effective in increasing the engagement of black youth in learning. Some of the cultural elements of hip-hop he found useful to create a multicultural curriculum include music, language, style of dress, poetry, and art.

In this study, the target audience were low-income, minority students. The curriculum was reshaped with the creation of a four-week HHBE unit for a Georgia fifth-grade math unit to fit the cultural needs of minority students. Elements from hip-hop culture, which is a culture shared by many minority students, was used in the HHBE unit. Instead of teaching math using traditional strategies, the teacher participants taught math through a variety of hip-hop based strategies, including rap songs, dancing, sampling, cyphers, rap battles, and hip-hop word problems. Throughout the implementation of the HHBE unit, the key CRP principles were used and the participating teachers were required to facilitate student learning and include diverse students. The research questions for this study would determine if HHBE worked to improve math achievements and attitudes of low-income, minority students in a low-income school.

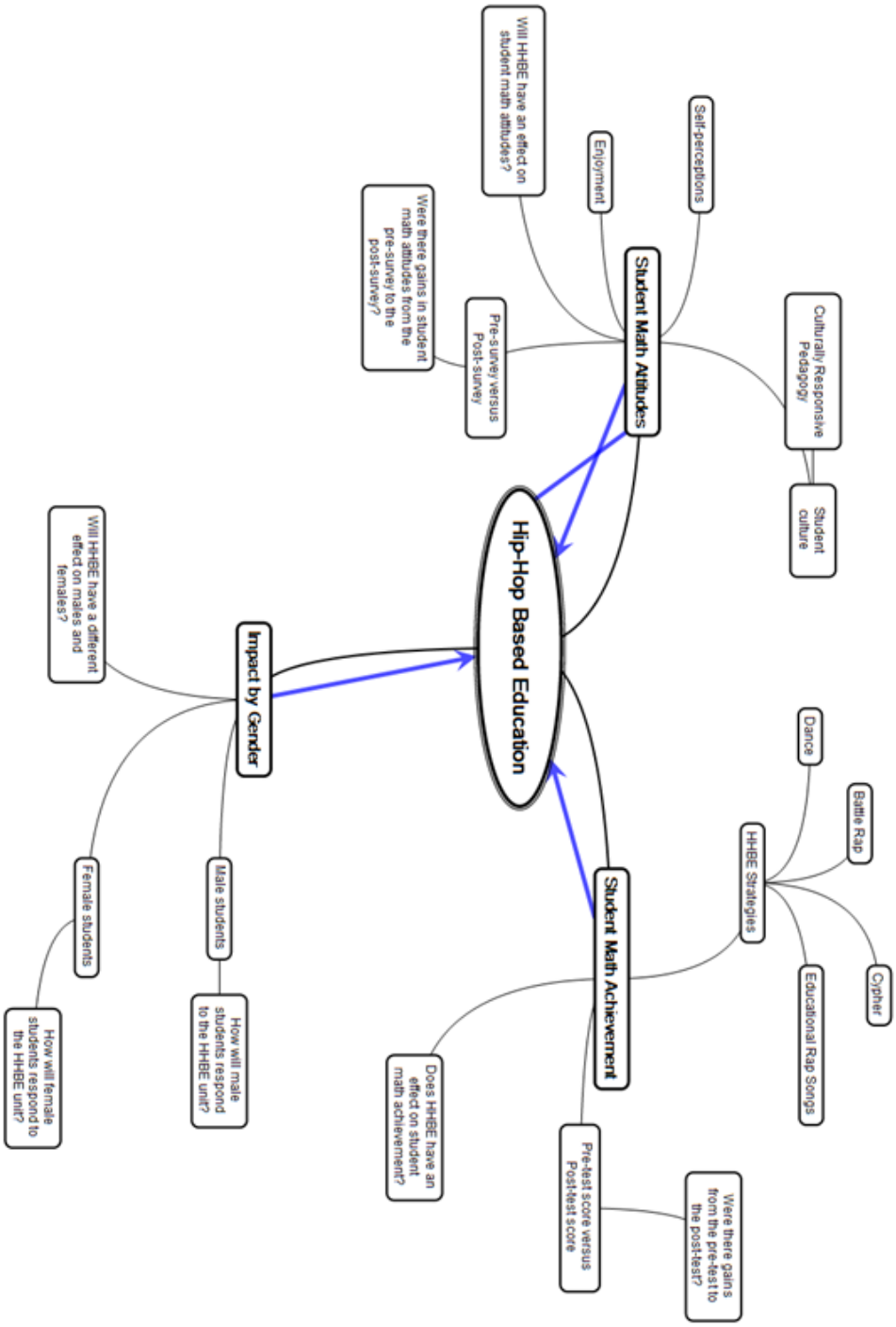


Figure 1. The theoretical framework of this study. This diagram shows the relationship between HHBE and student math achievements, student math attitudes, and effect by gender.

Methodology

This study was a mixed-methods study that employed the explanatory sequential design. To have a more in-depth understanding of the HHBE's effect on student math achievements and attitudes, I began with collecting quantitative data from six fifth-grade math classes taught by six different teachers at one high-minority, low-income school. The quantitative data included the pretest data before the HHBE unit was taught and posttest data after the implementation of the HHBE unit. The pre-survey data about student math attitudes before the HHBE unit and post-survey data after the implementation of the HHBE unit were also be included.

After collecting the quantitative data from the pretest and posttest, a paired-sample *t*-test was used to determine what changes, if any, there were in the scores and understand the effect of HHBE on student math achievements. One-way ANOVA test was used to examine the gain scores to determine the difference between genders and understand which gender had the largest increase in math achievements after the implementation of the HHBE unit. Similarly, after collecting the quantitative data from the pre-survey and post-survey, a paired-sample *t*-test was used to determine what changes, if any there were in the scores and understand the effect of HHBE on student math attitudes. One-way ANOVA test was run on the gain scores of the attitude surveys to determine any difference in gain scores between genders and to determine which gender had the largest increase in math attitudes after the implementation of the HHBE unit.

I also collected qualitative data to investigate both one hundred and thirteen students' and five teachers' perceptions of the HHBE's effect on student math

achievements and attitudes. During the 4-week implementation, students were asked to write a weekly student perceptions essay that contains questions about their perceptions of the HHBE implementation at the end of each week. The essay data were analyzed using a deductive approach and used to help explain the results of tests and surveys. The six participating teachers were invited for interviews to share their perceptions of the HHBE implementation. Five of them attended the interviews. The data were transcribed and analyzed using a deductive approach.

Significance of the Study

This study was significant for several important reasons. The low math scores in the state of Georgia, and even lower math scores in high-minority, low-income districts in Georgia must be improved. The statistics shared in the introduction, including only 40.7% of fifth-grade students passing the GMAS in math at the end of the 2015-2016 school year, provided the necessary evidence that research studies are needed in the area of fifth-grade math. The fact that an even lower percentage (25.5%) of students in a high-minority, low-income district in Georgia passed the GMAS in math provided further evidence that specific strategies are needed to teach high-minority, low-income students fifth-grade math (GaDOE, 2016).

After comparing the overall state scores with the scores of a high-minority, low-income district, new strategies must be created, implemented, and researched. HHBE, a type of CRP, has been chosen for this study as a strategy to increase student math achievements and attitudes in a high-minority, low-income district due to its cultural relevance to students' lives. HHBE particularly emphasizes the use of hip-hop elements. Ginwright (2004) reported from a student, coming to class with the type of activities (hip-

hop based) tricked the class into learning something because they were having fun. HHBE also helps reflect the culture of the minority students that should increase their math attitudes.

Additionally, this study would also fill in several gaps in the literature about HHBE. Hill and Petchauer (2013) discussed the fact that previous research studies about HHBE produced results to show its positive effect, but more research needed to be done. The first gap that needs to be filled is the use of more elements of hip-hop culture. Hill and Petchauer claimed most HHBE research has focused solely on rap music, but the use of other elements including graffiti, dance, visual art, rap battles, and cyphers, needs to be researched as well. In this study, the HHBE unit implemented in fifth-grade math classes included several elements of hip-hop, including rap music, dance, rap battles, cyphers, sampling, and hip-hop word problems. This study added to the research by including more elements of hip-hop culture.

Another gap that would be filled through this research study is the use of HHBE in elementary schools. Love (2015) stated the expansion of HHBE to early childhood and elementary levels is important for the growth of HHBE. The majority of research available about HHBE took place in middle school, high school, or college. This study would help fill in the gap in HHBE research by conducting research in an elementary school setting. If the implementation of an HHBE in fifth-grade math was successful, further research could be conducted at even lower levels in elementary schools.

Hill and Petchauer (2013) explained HHBE must be implemented in a wider range of disciplines as well. The majority of HHBE studies have taken place in language arts and English education classes. They introduced the idea that HHBE needs to be

implemented in subjects such as science and math as well. Once again, this study would fill in a gap in the literature because the research was conducted in a math classroom.

This study was significant to solve the problem of low math GMAS scores in high-minority, low-income schools, to fill in gaps in the literature about HHBE, and also to improve practices in fifth-grade math education. If the creation, implementation, and research of the HHBE unit in fifth-grade math classrooms were successful, the unit could be reproduced and used in other high-minority, low-income districts across the state of Georgia. Similar units could also be created for other elementary grade levels in high-minority, low-income schools. Overall, the results obtained from this study could have a possible effect on the instructional strategies of math teachers in high-minority, low-income schools in Georgia.

Assumptions, Limitations, and Delimitations

According to Roberts (2010), assumptions are things that are taken for granted in a study. One assumption of this study was participating teachers would do their best to teach the HHBE unit with fidelity, and participating students would try their best during the unit. Teachers were given specific lesson plans and PowerPoint lessons to teach the unit, and students were held accountable for their work during the unit. Another assumption was the student participants would answer all questions in the weekly student perceptions essays honestly and the teacher participants would answer all questions in the face-to-face interviews honestly. Both teacher and student participant names would remain confidential, assuring them that their identities would be secure.

Limitations are used to explain the boundaries of a study (Roberts, 2010). One limitation of this study was the use of a survey instrument. The survey was an example

of self-reported data, which was a limitation because the participating students might not answer each question on the survey truthfully. Another limitation was the purposeful sampling of the teacher and student participants. Because the participants were not chosen randomly, the results of the study might not be generalizable to a larger population. This limitation could be addressed in a future study by choosing the participants randomly. The amount of time for this study was also a limitation. The HHBE unit only lasted for four weeks, which might not be enough time to determine a change in either math achievements or math attitudes. Increasing the amount of time for the unit to two months or longer may allow for more time to determine a change. Also, the math concept taught during the HHBE unit was a limitation. The six teachers taught a unit about volume for the HHBE unit. The standards covered during the unit might be a limitation as they may be easier or harder than other standards taught in fifth-grade math. This limitation could be addressed in the future by including more than one unit of study in the research. Finally, the difference in the teacher participants is a limitation of the study. While the teachers were given the lesson plans and PowerPoint lessons to follow and were required to have some knowledge of hip-hop elements, there still would be differences in teaching styles that might affect the results.

One delimitation of this study was the sample used. Only one school was included in this study due to the limited resources that I was permitted to access. I understood using only one school as the sample might not help generalize the findings to the larger population. However, it helped me explore the HHBE's effect in depth from different aspects including student math achievements, student math attitudes, students' perceptions, and teachers' perceptions.

Definition of Terms

In this section, the key terms about Culturally Responsive Pedagogy and Hip-Hop Based Education are defined. The definitions help readers understand the concepts used in this study.

Culturally Responsive Pedagogy (CRP): A theory that is based on improving student achievements through culturally-based strategies.

Culturally Responsive Teaching (CRT): Teaching that is based on the theory of Culturally Responsive Pedagogy.

Hip-Hop Based Education (HHBE): A theory that is based on using elements of hip-hop as pedagogical strategies.

HHBE Unit: A four-week unit created to teach fifth-grade math students using elements of hip-hop including rap songs, cyphers, rap battles, and dancing.

Mathematic Attitudes: Student feelings and attitudes toward the subject of math including positivity towards learning math, working collaboratively, working privately, and use of technology. Math attitudes lead to math motivation; therefore, motivation is related to math attitudes.

Hip-hop: A subculture especially of inner-city youths who are typically devotees of rap music.

Cypher: A freestyle rap in which participants rap one after the other.

Rap Battle: A type of rapping that includes bragging, insults, and boasting content.

Breakdancing: An athletic style of street dance.

Graffiti: Writing or drawing that has been scribbled, scratched or painted illicitly on a wall or other surface, often within public view.

Rap Music: A style of popular music in which an insistent, recurring beat pattern provides the background and counterpoint for rapid, slangy, and often boastful rhyming patter intoned by a vocalist or vocalists.

Perceptions: a way of regarding, understanding, or interpreting something; a mental impression.

Summary

In this study, the use of HHBE as a CRP strategy to teach fifth-grade math students in high-minority, low-income schools was explored. The effect of HHBE on student math achievements and attitudes was examined. The effect of HHBE between different genders was also investigated. Finally, the perceptions of both student and teacher participants about the use of HHBE were included. This dissertation is organized into three chapters beginning with Chapter 1, the introduction, which introduces the purpose of the study. The second chapter is a review of the literature about previous studies in HHBE and the use of music, dance, and culturally responsive pedagogy to teach math. The third chapter, the methodology, explains the procedures of the data collection, including the instruments used and the participants in the sample. The fourth chapter, the analysis of the data, explains the results of the quantitative and qualitative data. The fifth chapter, the conclusions, implications, and recommendations, provides uses for the information gained from the study. Finally, there are a bibliography and appendixes containing pertinent information.

CHAPTER II

LITERATURE REVIEW

The purpose of this literature review is to introduce HHBE as a CRP strategy to improve math achievements and attitudes in high-minority, low-income schools. The problems in math achievements and attitudes trickle down from a national level to a state level, and then more specifically, a county level. Many strategies have been researched in attempts to solve the math problem in the United States, but the problem still exists. One of the CRP strategies that may work to improve math achievements and attitudes, especially in high-minority, low-income schools is the Hip-Hop Based Education. Studies of gender in math are also reviewed to provide evidence for studying the differences between gender groups in the implementation of an HHBE math unit.

The first topic that is covered in the literature review is problems in math achievements and attitudes in the United States and Georgia, and more specifically in high-minority, low-income schools. Previous studies that have been conducted in an attempt to increase math achievement and motivation is the second major topic. The use of Culturally Responsive Pedagogy is the third major topic and includes reviews of studies involving teacher preparation for CRP, CRP used in math, CRP used in other subjects, and CRP and motivation. The fourth major topic includes information about hip-hop culture to explain the importance of hip-hop to Black and Hispanic cultures in urban areas. The use of Hip-Hop Based Education is the fifth major topic and includes reviews of using various aspects of hip-hop to teach, as well as using music and

movement to teach. The sixth major topic included in the literature review includes information and previous studies that tie together CRP, HHBE, and math. The last major topic includes previous studies about the differences in math achievements and attitudes between genders.

Problems in Math Achievements and Attitudes

There are problems in math achievements and attitudes at a national level as well as at the state level in Georgia. The problems continue to trickle down to local levels, especially at high-minority, low-income schools. This section will explore national, state, and local problems in math achievements and attitudes.

In 2012, United States students performed 27th out of 34 countries on the Programme for International Student Assessment (PISA) despite the higher educational spending per student than most countries (OECD, 2012). Although the United States student math average decreased by two points on the PISA in 2015, the country still increased to 25th out of all countries tested (OECD, 2015). Carnoy and Rothstein (2015) discussed the threat of low math scores in the United States' economic growth. The results of international testing and the possible negative side effects of those results have led many researchers, including Jameson (2014), Kiger, Herro, and Prunty (2012), Kposowa and Valdez (2013), and Smith, Marchand-Martella, and Martella (2011), to look for alternative math strategies to help increase student math achievements in the United States.

In the United States, large differences exist between math achievement scores in various states. Based on results from the 2015 National Assessment of Educational Progress (NAEP), the state of Georgia scored higher than only 10 other states in the

country. Results from the same NAEP assessment, which is taken in fourth grade, also showed that the average Caucasian fourth-grade math score was a 248, while the average Black fourth-grade math score was 224 and the average Hispanic fourth-grade math score was 230 (NAEP, 2015). The low results in the state of Georgia, as well as the lower results of minority students, provided evidence that more research needs to be done in the area of math achievements and attitudes.

In the spring of 2016, 25% of the fifth-grade students in Georgia scored a level one (beginning learner), 34.3% scored a level two (developing learner), 34.5% scored a level three (proficient learner), and 6.2% scored a level four (distinguished learner) on the GMAS. The results from a sample high-minority, low-income district showed 37.2% scored a level one, 37.3% scored a level two, 23.3% scored a level three, and 2.2% scored a level four. The percentage of passing fifth-grade students in an example high-minority, low-income district was 25.5% (GaDOE, 2016). The specific results from the state of Georgia showed a high-minority, low-income district scored far below the state average on the GMAS (GaDOE, 2016).

The data from the above research provided a rationale for conducting this study. The data showed that there are problems in math achievements and attitudes across the United States and more specifically in Georgia. The data also showed the achievement problem in high-minority, low-income schools. These problems led to the research questions about the use of HHBE as a math strategy to teach students at high-minority, low-income schools.

Strategies to Improve Math Achievements and Attitudes

Researchers have worked to find strategies that could help to close the math achievement gap in the United States. Kposowa and Valdez (2013) conducted a study to determine the effect of laptop use on student math achievements. They found students who were able to use laptops more frequently scored higher than students who did not use laptops. Jameson (2014) worked to determine the effect of math anxiety on student math achievements in second-grade. He found math self-concept, which was related to math attitudes, was the strongest predictor of math anxiety. Another study conducted by Kiger et al. (2012) was completed to find out the effect of a mobile learning strategy on student math achievements. The results showed students who participated in the mobile learning strategy had higher math scores than students who did not participate. Finally, Smith et al. (2011) worked to determine the effect of the program Rocket Math on student achievements. After learning through the Rocket Math program, the first-grade students' math level increased from level 19 to level 26. While some researched strategies have been successful, the problem of math achievements and attitudes still exists in the state of Georgia as shown by the GMAS scores.

The use of HHBE, a CRP strategy, may be useful when working to improve the math achievements and attitudes of students in the United States, specifically in high-minority, low-income schools. Several hip-hop elements that have already been researched in the area of HHBE include sampling, rap battles, rap songs, and cyphers (An, Tillman, Boren, & Wang, 2014; Aponte, 2013; Emdin, 2013; Hill, 2009; Petchauer, 2012; Sawyer, 2015; Stovall, 2006). Several other elements, including hip-hop images

and hip-hop word problems, have not yet been researched but may prove to increase math achievements and attitudes as well.

In research about rap battles, both Emdin (2013) and Sawyer (2015) compared rap battles to debates and considered the fact that using rap could help students take more intellectual risks. Petchauer (2012) researched another hip-hop element of HHBE, sampling. He concluded taking two pieces of knowledge and mixing them together, similar to sampling in rap music, was a useful educational tool. In his research, both rap battles, used as debates, and sampling, used as a mixture of prior knowledge, increased math achievements and attitudes of students served in high-minority, low-income schools.

Emdin (2013) also discussed the use of hip-hop cypher as an educational strategy. He likened a cypher, or group rap, to students forming a circle and taking turns sharing information. Several researchers, including Stovall (2006), Hill (2009), and Aponte (2013) used rap music to increase student achievements and attitudes. Both rap music and hip-hop cyphers may help increase student achievements and attitudes in the subject of math.

Research conducted in the area of using music to teach math also provided evidence that rap music may be useful to student learning. An et al. (2014) conducted research about the use of educational songs in math classrooms and concluded students in classrooms where educational songs were used showed higher math gains than students who did not experience educational songs. An et al. discussed the importance of continuing research about the use of educational songs in high-minority, low-income

schools. This conclusion supported the use of HHBE as a strategy to increase student achievements and attitudes in math.

Culturally Responsive Pedagogy

According to Daniel (2016), teachers with a constructivist mind frame and cultural consciousness allow students to use background experiences to build new concepts and skills. Ladson-Billings (1995) suggested culturally and linguistically diverse (CLD) students should be given a chance to reach academic success while simultaneously maintaining their cultural integrity. After further research, Gay (2002) added CRP should include the use of cultural experiences of CLD students to help teach them effectively. Teachers can use CRP to incorporate culturally relevant ideas from students' lives to increase achievement and engagement in all subjects, including math.

CRP in Teacher Preparation

Several researchers have studied the importance of teacher preparation in CRP (Hernandez, Morales, & Shroyer, 2013; Williams, Edwards, Kuhel, & Lim, 2016). The studies showed the prevalence of CRP in education and the results show the need for the incorporation of CRP in teacher preparation courses and for the use of CRP in mathematics classrooms. The HHBE studies provided teachers with model CRP strategies to implement in their classrooms.

Hernandez et al. (2013) conducted a qualitative theoretical study in an attempt to develop a CRT model to be used for teacher candidate preparation and assessment in math and science. They conducted a literature review, created thematic categories, and then implemented a pilot study with teacher candidates to determine the usefulness of each category in creating their model. After determining the thematic categories (content

integration, facilitating knowledge construction, prejudice reduction, social justice, and academic development), they conducted an exploratory case study using 12 Latino students who were observed throughout their teacher preparation program. The results of the observations were coded under the same thematic categories that were determined from the literature review. The conclusions of their study included several important ideas for implementing HHBE. One of the key ideas found was the inclusion of real-world problems during both math and science instruction. Another useful idea was including a variety of learning methods for students to reach their learning goals in math and science.

Gay (2000) stated there is an imbalance between the dispositions of teachers and the theory of CRT. A teacher's cultural disposition is his or her attitude toward teaching students who are culturally diverse. In a qualitative study conducted by Williams et al. (2016), they sought to determine the effect of a cultural preparation program on the culturally responsive dispositions of five math teacher candidates who attended a Master of Arts in Teaching program. The five participants attended workshops aimed at influencing their culturally responsive dispositions and participated in both entry and exit interviews. The effect of the preparation program included the increase in awareness of others and the power to influence change for CLD students. In their study, culturally diverse dispositions played a large role in the development of strategies to teach CLD students in math. The majority of the participants continued to work in CLD settings, which provided further evidence that preparing teacher candidates for cultural differences in the classroom is necessary.

CRP in Math

Previous research pertaining to the use of CRP specifically in mathematics classrooms provided evidence that CRP strategies can be successful in the teaching of math. Researchers have conducted grounded studies (Bonner, 2014; Bonner & Adams, 2011) and qualitative studies (Harding-Dekam, 2014) to determine the importance and effectiveness of CRP in the mathematics classroom.

The grounded theory begun by Bonner and Adams (2011) and continued by Bonner (2014) was conducted to generate the theory of Culturally Responsive Math Teaching (CRMT). The initial research was conducted using one successful math teacher in a predominately African-American neighborhood and elementary school (Bonner & Adams, 2011). A series of four interviews and fifty observations were conducted over a four-month period. The collected and analyzed data pointed to relationships and trust, communication, knowledge, and reflection and revision as the four main foundations of CRMT. Bonner and Adams claimed the success of the teacher in their study and the resulting analysis had implications for future research, math classroom practice, and teacher preparation. The implementation of HHBE in mathematics classrooms will both continue similar research and indicate successful classroom practices.

In follow-up research to expand the grounded theory (Bonner, 2014), three female mathematics teachers were studied. In Bonner's study, the first participant was African-American and taught math in a high-minority, low-income high schools, the second was Caucasian and taught a remedial class (comprised mostly of minority students) in a majority Caucasian high school, and the third was Mexican and Arab and taught in an all-girls, low-income middle school. Once again, interviews and observations were

conducted and artifacts were collected. The analysis of the data resulted in five foundational categories, including the original four categories and adding pedagogy and discipline. The addition of pedagogy and discipline included the implementation of strategies and practices that gave students the best chance to master the math material. One of the participants used rap songs to help her students learn math topics and encouraged students to create their own raps to increase learning in a cultural way. Another participant also included movement in her math lessons to improve student engagement and understanding. Bonner's study provided evidence for the success of CRP in mathematics classrooms and implied the need for further research.

Harding-Dekam (2014) conducted a qualitative study about the use of culturally responsive math teaching in elementary schools across the state of Colorado. The study consisted of eight elementary teachers in eight districts in Colorado. The purpose was to determine math teaching practices that help make a connection between math and the real world through CRP. As stated by Harding-Dekam (2014), "culturally responsive mathematics is important in elementary classrooms because it allows students to make personal connections to mathematics content" (p. 2). Through pre and post interviews, observations, and artifact collection, Harding-Dekam was able to collect and analyze data from teachers about the use of culturally responsive teaching in math. While the eight teachers taught in different school settings, they each included their students' cultures when teaching math. Several similar ideas that were determined included the teachers' knowledge of student home and community life, building background knowledge before lessons, and incorporating elements of student culture into math lessons. The results provided evidence that culturally responsive math teaching is important in education.

CRP in Other Subjects

The use of CRP in classrooms has also been researched in other subjects, including reading (Bui & Fogan, 2013) and social studies (Taylor, Iroha, & Valdez, 2015). The studies about the use of CRP in both reading and social studies provided evidence that CRP is effective in improving student achievements.

Bui and Fogan (2013) conducted a quasi-experimental study to determine the effect of the Integrated Reading Comprehension Strategy (IRCS) reading framework that added cultural elements to reading instruction. The study involved 49 fifth-grade students in northern California from a variety of cultural backgrounds. Of the participants, 65% received free or reduced lunch. One group of fifth-grade students was taught reading using three CRT strategies from the IRCS, while the other group was taught reading with the three CRT strategies and an additional two strategies (IRCS Plus). After 400 minutes of reading instruction over a period of five sessions, students took a posttest to determine the effect of the IRCS and IRCS Plus reading framework. After analyzing the results, Bui and Fogan determined both groups of students made statistically significant increases in each of the reading categories that were tested. The IRCS Plus group had a higher mean increase than the IRCS group. Bui and Fogan explained these results showed the positive effect of using CRT strategies to teach CLD students reading.

A mixed-methods study conducted by Taylor et al. (2015) was used to determine the effect of integrating culturally-based arts into social studies instruction. The study was conducted in a public school in Detroit with a 98% African-American student population. The 16 participating students were introduced to one African-American,

male painter each month in their social studies class and ended up analyzing 76 total paintings and their importance to history. Students completed the surveys to determine their perceptions of studying art during the middle and at the end of the school year. After analyzing the survey data, Taylor et al. (2015) found integrating culturally-based art in social studies had a positive effect on student motivation to learn and their interest in the subject of social studies.

CRP and Attitudes

Not only have researchers found evidence that CRP can increase student achievements, but they have also found evidence of the increase in student motivation, specifically self-efficacy (Garcia & Chun, 2016; Kelley, Siwatu, Tost, & Martinez, 2015). The studies provided evidence that using culturally responsive strategies to teach minority students can influence student attitudes and self-efficacy.

In a study conducted by Garcia and Chun (2016), they compiled data to determine the effect of CRT on student academic achievement and self-efficacy. In their study, there were 110 participants from three middle schools near the Mexican border, with the majority being Hispanic. The participants completed a survey to determine their perceptions of diverse teaching practices and cultural engagement. The results provided evidence that CRT increases student self-efficacy by helping them have a more positive attitude toward math. Garcia and Chun (2016) determined the use of diverse teaching practices did help Hispanic students become more engaged in their learning and give them a positive outlook on their performance.

In another study about CRP and motivation, Kelley et al. (2015) worked to determine the effect of a culturally responsive reading task on Latino students'

achievement and self-efficacy. The participants in the study read a culturally responsive reading passage and a non-culturally responsive passage and then responded to questions about both. The participants also completed three self-efficacy surveys to determine the differences between reading self-efficacy, culturally responsive reading self-efficacy, and non-culturally responsive reading self-efficacy. After analyzing the results of the surveys, Kelley et al. were able to find a significant difference between student self-efficacy when reading a culturally responsive passage and a non-culturally responsive passage. These findings provided evidence that CRP has a positive effect on student attitudes and self-efficacy.

As stated by Gay (2010), CRP can be used to affirm the cultural heritage of CLD students, while holding them accountable for their learning. The above-mentioned studies showed a positive effect of CRP on CLD students including their academic achievements and attitudes. CRP was used as a background theory for the creation and implementation of the HHBE unit in this study. The previous research provided evidence that CRP is useful in teacher preparation, math, and other school subjects.

Hip-Hop Culture

Hip-hop culture, including rap music, is an extremely important aspect of urban students' lives. As stated by Morell and Duncan-Andrade (2002), "whether the power in its messages can be used for good or ill, few can dispute the effect of Hip-Hop culture on the lives of working-class urban youth" (p. 89). Kitwana (2003) also discussed the importance of hip-hop to urban youth in his book, *The Hip-Hop Generation: Young African-Americans and the Crisis in African-American Culture*. He explained youth African-Americans increasingly turn to rap music and videos. Rap music has shaped

African-American culture more than any other aspect of the young African-Americans' lives.

Due to the importance of hip-hop in African-American culture, and the prevalence of African-American students in urban school districts, fusing hip-hop culture with education may be a useful CRP strategy. Love (2015) indicated the use of HHBE works to teach academic skills and critical reflection in middle schools and high schools and expressed concern at the absence of this type of education in elementary schools.

Hip-Hop Based Education

Hip-Hop Based Education is a CRP that may meet the cultural needs of minority students in low-income schools. According to rapper KRS ONE (2003), "oppressed urban youth living in the ghettos of America are hip-hop" (p. 211). Using HHBE to teach these students may break through the barriers causing such low math test scores in urban areas. The purpose of hip-hop educational research is to evaluate and record the effective practices within HHBE that result in increased student knowledge and motivation in K-12 educational settings (Irby & Hall, 2010).

Studies have been conducted in several elements of HHBE including the use of cyphers and rap battles (Emdin, 2013), the use of HHBE in social studies (Stovall, 2006), the use of sampling (Petchauer, 2012), the use of HHBE in after-school educational programs (Aponte, 2013), and the use of HHBE in language arts (Hill, 2009). The overall results of the studies provided the necessary evidence that the use of HHBE is a successful strategy for student learning in educational settings. The results also provided examples of hip-hop elements that can be used in future HHBE units and programs.

Emdin (2013) reiterated the importance of validating HHBE as a way to close the achievement gaps between urban youth and youth from other settings. He discussed the idea that hip-hop culture has been subordinated in schools, which has caused urban student disinterest in conventional education techniques. Emdin expressed concern about the use of rap lyrics as the predominant method of HHBE and encouraged the use of cyphers and battles as well. He likened rap battles, which included two rappers rhyming back and forth, to debating, complex thinking, and in-depth questioning. He also likened cyphers, which included a group of rappers taking turns rapping, to structured dialogues in which students sit in a circular shape and have equal chances to speak. Another important hip-hop element of HHBE that Emdin focused on was the use of artifacts to engage students. Both cyphers and rap battles could be used in a fifth-grade math HHBE unit.

Stovall (2006) studied the use of HHBE to create a relevant curriculum in the social sciences in high school. Stovall used an ethnographic method to describe his students' experiences while he facilitated a series of social studies workshops in a public high school in Chicago. The participants included 19 African-American and Latino students. Stovall assumed the role of a facilitator in order to encourage participation and learn from the students. The students studied rap lyrics and discussed their historical value. Stovall stated due to the influence of hip-hop on high school students' lives, it could be used to create a bridge to critical thinking. Younger minority students are also immersed in hip-hop culture, and therefore could be influenced by HHBE strategies to improve critical thinking skills as well.

One hip-hop element that was researched by Petchauer (2012) is the use of sampling techniques in education. Sampling is the creation of hip-hop beats using parts of previously recorded songs. Petchauer gathered data from 28 African-American students at a historically African-American university in the Northeast. The participants were asked to choose two sampled memories from their educational background as part of a culminating task. The participants then constructed explanations of their two memories together. This task was similar to the art of sampling in hip-hop, as DJs take parts and join them together to create a whole beat. Participants were observed and interviewed and the culminating tasks were analyzed to determine the results of the study. From this study, Petchauer determined sampling can be used to create new knowledge from existing pieces of knowledge. A similar sampling technique can be used in math to allow students to join separate math ideas together to create new understanding.

Aponte (2013) conducted a study of an after-school program in Pittsburgh, Pennsylvania called The Arts Greenhouse. He spent three months at the after-school program completing observations and interviews with some of the teenage African-American students that attended the program. Some of the available sessions that students participated in included beat making, creative writing, discussion groups, and recording sessions. After several informal interviews with participating students, He found students felt more comfortable at the after-school program than they did at school, felt like they had the freedom to learn and discover information, and felt like their opinions mattered. In his conclusion, Aponte (2013) actually claimed HHBE can be best used in after-school programs due to the higher need for structure in regular educational settings. However, in public education, HHBE can still give students some of the similar

feelings of the students at the after-school program, including comfort, freedom, and feeling of belonging.

Hill (2009) created a curriculum for a course entitled Hip-Hop Lit, in which he taught students literature with hip-hop lyrics during a one-year ethnographic study. In his book, *Beats, Rhymes, and Classroom Life*, he described the implementation of his curriculum and the effect that the course had on the participants in the study. Participants were taught literature through the analysis of hip-hop lyrics, completing assignments such as journal writing and sharing, group reading, reading responses, formal lessons, and unit projects. The study provided several insights into the use of HHBE including the ideas that students can be given more power in creating the curriculum and that more freedom can be given to students in classrooms. Hill stated the insights from his work are important for teachers who want to transform schooling to provide more enriching strategies that provide more productive outcomes.

The previous HHBE studies provided evidence that HHBE is a successful strategy in many instances. The studies discussing the use of sampling, cyphers, rap battles, and word problems were used to guide similar sections of the HHBE unit that was taught to fifth-grade students in high-minority, low-income schools.

HHBE can also be linked to many other topics of educational research. Some of the areas that can be linked to HHBE include movement in math, music in math, and music and motivation. HHBE is based primarily on music and movement, so studies that supported the use of music and movement in education, especially in math also supported the ideas of HHBE.

Movement in Mathematics

Dance and movement are important elements of hip-hop culture and can be used as part of culturally responsive teaching using HHBE. Several researchers have conducted studies on the effect of movement and dance on math scores and motivation (Kercood, Grskovic, Lee, & Emmert, 2007; Mead, Scibora, Gardner, & Dunn, 2016). The results provided evidence that using music and movement in an HHBE unit can increase student math achievement and motivation.

Mead et al. (2016) found incorporating physical activity into math lessons led to a statistically significant increase in math standardized test scores. The sixth-grade students who were in the physical activity group had a larger increase than the students who were in the control group with no extra physical activity during math lessons. Their study showed a good example of using movement to increase math achievements. Mead et al. found increased physical activity led to increased alertness during math lessons and they connected that to the increase in math scores. Using HHBE songs and movements may also lead to more alertness during the math lesson and hopefully lead to increased math achievements as well.

In a study conducted by Kercood et al. (2007), fourth- and fifth-grade students with attention problems solved math word problems both with and without fine motor physical activity. They found the number of word problems completed correctly in the experimental group did not differ significantly from the number of word problems completed in the control group. However, the amount of off-task activity was lower for the students who had fine motor physical activity while working on their problems. Based on the results, students benefited from the movement as a way to help them focus

on the lesson and on their work. This movement also increased student attitudes toward math.

In this study, dance movements were included with each of the rap songs for the HHBE unit. The previous studies about using movement in math provided results supporting the use of dance movements in math. The dance movements included in the HHBE unit may help to increase student math achievements and attitudes.

Music in Mathematics

While the research specifically linking the use of educational hip-hop songs to improve achievement and motivation of minority students in mathematics is sparse, several researchers have conducted studies about the use of other genres of music (An, Capraro, & Tillman, 2013; An et al., 2014; Bamberger & Disessa, 2003; Courey, Balogh, Siker, & Paik, 2012; Harris, 2007; Yoho, 2011). The results of these studies provided evidence that using music to teach math can increase student achievements and attitudes.

An et al. (2013) conducted a study including 46 first- and third-grade students and their two math teachers. The teachers introduced one 45-minute music integrated math lesson each week for five weeks and collected data from Model-Strategy-Application (MSA) assessments. One of the activities used in the study was a song, "Five Little Speckled Frogs," which was used to teach students about addition. They found the music-math integrated lessons led to an increase in student mathematics ability. They concluded music can be used in numerous ways to increase student achievement and to increase student engagement and motivation.

In another research study, An et al. (2014) collected and analyzed data from two third-grade classes consisting of fifty-six students. In one of the classes, the teacher

integrated music-mathematics lessons and in the other class, the control group, the teacher used lectures and textbook lessons. The teacher gave students a pretest and posttest and then they compared the scores to determine the effect of the music-mathematics lesson on achievement. They found the music group had a significantly higher increase from the pretest to the posttest. They also reported the students in the music group developed a more positive disposition to math during the integration of music in their math lessons. They discussed the importance of conducting future studies involving minority students and low achieving students to continue adding to the literature on this topic. They stated in future studies they would like to include more African-American and Hispanic students. The authors concluded using music in math increased both achievement and motivation and provided reasoning for future research in similar areas.

Yoho (2011) also conducted research that provided evidence for the positive effect of using music to teach math in the general education classroom. In her study, she worked with 18 fourth-grade students and developed short songs to help them learn and retain pertinent vocabulary and concepts learned in a new unit. After learning the new concept and song, teachers gave students numerous chances to practice and memorize the song. Students in the class, as well as a control class, were tested prior to learning the new concepts through song and then at the conclusion of the unit through a unit assessment. Yoho found student scores increased by 57.7%, while the control student scores increased by only 47%. Her results provided evidence that the use of music to teach students important math concepts can lead to higher posttest scores and better memorization.

Courey et al. (2012) conducted research to determine the effect of using musical notation to teach third-grade students fractional concepts. The researchers collected data on a group of students whose teacher taught them fractions with musical notation and a group whose teacher did not teach with the musical notation. The students who were in the music group scored higher on the posttest than the group who were not in the music group. They described relating concrete models to abstract ideas can be difficult for students, but using the music notation did help students through this transfer and therefore led to increased scores on the posttest. Courey et al. (2012) provided more evidence for the use of music in mathematics teaching.

Harris (2007) conducted a study with three to five-year-old students attending a Montessori school that also added to the literature about using music to teach math. In the study, Harris studied a group of students who received music enriched math lessons and a group of students who did not receive the music-enriched lessons. The teachers assessed the students using the Test of Early Mathematics Ability test, and the results showed higher scores for the students who were involved in the music-enriched lessons. Harris concluded students who learned math enriched with music achieved at a higher rate than students who did not learn through music-enriched math.

Finally, Bamberger and Disessa (2003) conducted a study concerning the use of music to teach math in a general education classroom. In the study, the researchers worked with sixth-grade math students in an attempt to provide evidence of multiple uses of musical structure to teach math. Students met in small groups twice each week for six months and used both a computer program and musical instruments to learn several important mathematical concepts. The concepts taught through music included

proportions, patterns, and time. Bamberger and Disessa (2003) revealed the use of musical structure to teach structures did increase student math knowledge.

In this study, one of the main components of the HHBE unit was the use of music, specifically rap songs, to increase student math achievements and attitudes. While the previous studies about using music in math did not include rap music, the results of using music in math, in general, provided support for the use of any type of music to increase student math achievements and attitudes.

Music and Math Attitudes

Another aspect of music in education that researchers have studied is the link between music class and student achievement, motivation, and self-esteem. Wlodkowski and Ginsberg (1995) explained motivation is a reflection of emotions or attitudes. Research conducted in this area includes music mentorship programs at school to raise self-esteem (Darrow, Novak, & Swedberg, 2009) and the effect of increased school music class on student achievement and self-esteem (Rickard et al., 2012). The results of these studies added to the evidence that music, which is a large part of HHBE, can affect the attitudes and therefore, the motivation of students.

Darrow et al. (2009) studied the effect of a music mentorship program on the self-esteem of adolescent girls who were experiencing conflict in school behavior and academics. The study included 24 girls who they divided into a music mentorship group, music group, and control group. The girls in the music mentorship and music groups participated in several music-based activities including chorus, band, and step classes. After analyzing the results from the pretest to posttest, the researchers determined the music mentorship group and music group had larger increases in reported self-esteem.

They also used the girls' journals as more evidence of improved self-esteem in both music groups. The researchers concluded participation in music programs had a positive effect on the self-esteem of students struggling with conflict in school.

Another study, conducted by Rickard et al. (2012) determined the effect of music classes on social skills and self-esteem. In the study, the participants included 210 first-graders and 149 third-graders. In each grade level, there was a music group and a control group. They introduced the music group to music classes, while the control group did not receive any music classes. They found the students in the music classes reported higher self-esteem at the end of the study than the students who were not in the music classes. The study continued to provide evidence about the use of music to improve student motivation and self-esteem.

Previous studies involving the use of music to increase student motivation, which was linked to attitudes, provided additional evidence for the use of music in the HHBE unit. The use of music can be used to increase math achievements and math attitudes. In this study, rap music was used to help students increase both their math achievements and math attitudes.

Music in Education

Researchers (Gromko, 2005; Walton, 2014) conducted several studies regarding the use of music to teach both reading and language arts. Although none of the studies used hip-hop music specifically, the results showed using music in other subjects did increases student achievement and motivation to learn. The results provided continued evidence of the positive effect of using music to teach.

Walton (2014) completed a study about the use of music to teach reading skills to kindergarten students. Forty-four students in the music group received instruction that included the use of songs and movement to teach several reading skills. Forty-nine students in the control group received the literacy program that was already in place. While students in both groups showed equal improvements in rhyming and phonemic awareness, the music group had higher gains in letter-sounds and word reading. Although Walton concluded future researchers would need to explore the links between music and reading, the study did provide evidence for increased reading skills when teachers taught students with music.

In another study, Gromko (2005) worked with four kindergarten classes to determine the effect of music instruction on phonemic awareness. Teachers taught two kindergarten classes, consisting of 43 students, with music at one elementary school. At another elementary school, teachers taught 46 kindergarten students, the control group, without music lessons. The results of the study showed a significant difference in phonemic awareness between the kindergarteners taught with music and the control group. The students taught with the music lessons made greater gains in phonemic awareness throughout the four-month period. The results supported the transfer of music to reading skills.

The studies provided in this section showed positive results of using music to teach other school subjects and provided more evidence that using music to teach is an effective strategy. In this study, rap music was used in an attempt to increase student math achievements and attitudes.

CRP, HHBE, and Math

This section presents the relationship between CRP, HHBE, and math. Wlodkowski and Ginsberg (1995) described CRP as, "a pedagogy that crosses disciplines and cultures to engage learners while respecting their cultural integrity" (p. 17). HHBE was greatly influenced by CRP (Hill, 2009) and particularly emphasizes the use of elements relating to a hip-hop culture shared by many minority students. Ladson-Billings (2009) discussed the use of HHBE as an example of CRP and claimed it meets the three components of CRP, student learning, cultural competence, and socio-political competence. Hill (2009) also mentioned the influence of CRP on the use of HHBE in the classroom including the importance of using student experiences, values, and cultures to improve student outcomes. Another prominent promoter of HHBE, Petchauer (2009), claimed rap music texts have become prominent in education, through the lens of CRP, in high schools and higher education.

While there is little research about the use of HHBE in the subject of math, the research about HHBE in other subjects and the use of CRP in math has provided evidence that HHBE would be a relevant strategy in math classrooms. In a qualitative research study conducted by Cholewa, Goodman, West-Olatunji, and Amatea (2014), they attempted to determine the effect of CRP on the psychological well-being of CLD students. During observations of the participating teacher, Cholewa et al. (2014) discussed the use of both music and dance from the culture of the students in the classroom. An example was the use of a music beat to help students recall how to convert a mixed number into an improper fraction. The teacher also used dance to help students remember specific geometric figures. These are both examples of HHBE

strategies, which were used to increase student math achievements. In their conclusion, Cholewa et al. (2014) stated the study proved CRP had a positive effect on the psychological well-being of CLD students. The study results also showed the participating teachers' student math scores increased from 35% at or above grade level in fourth-grade to 56% at or above grade level in fifth-grade. The CRP strategies, including the HHBE strategies, proved useful in increasing student math achievements.

Hill (2009) suggested further research needs to be conducted in the subject areas of math, social studies, and health education. His book, as well as the majority of past studies, focused on the use of HHBE in reading or language arts. His suggestions for continuing the research in HHBE included using additional elements of hip-hop in classrooms instead of simply using rap songs. He included an example of relating algebra to the counting of beats in a song. Hill and Petchauer (2013) also discussed the gaps in research in HHBE, claiming educators need to use more elements of hip-hop in their classrooms and that other subjects need to be studied, including math and science. They introduced several ideas for including more elements of hip-hop in classrooms including rap battles, freestyles, and sampling techniques. They believed while math and science are more culturally neutral, meaningful connections to hip-hop can be made in both subjects. Finally, Emdin (2013) expressed concern that many teachers only use rap lyrics in their HHBE units. He suggested teachers need to include more elements of this complex culture.

Gender and Math

Some researchers have conducted studies that show that math achievement gaps exist between genders in America. Niederle and Vesterlund (2010) mentioned while the

gender gap of math ability is closing and more females are taking math courses, the difference in high performing male and female math students is still high. Research involving the math achievements and attitudes of students may be further useful if the differences between genders are determined as well.

There is research about the similarities and differences between genders in math achievements and attitudes (Dickhauser & Meyer, 2006; Lui, 2009; Reilly et al., 2015). The results of the research studies about gender differences and similarities in math provided evidence for researching the difference in the effect of HHBE based on gender.

Lui (2009) conducted a study about the differences in math motivation and ability between genders in both the United States and Hong Kong. The data used for the study were obtained from the 2003 Programme for International Student Assessment (PISA), which included both a math survey and a math achievement test. There were 5,465 participants from the United States and 4,478 participants from Hong Kong with approximately 50% males in each group. The participants were all 15 years of age. The survey was used to determine student motivational factors, affective factors, and self-concept in math as well as both learning strategies and situations. The results showed males in the United States had higher levels of interest in math and higher self-belief in their math ability. Females in the United States reported a higher level of math anxiety. The differences in math motivation and self-belief provided more evidence to support the continued study of gender in math.

Dickhauser and Meyer (2006) examined the differences between math ability and math perceptions of eight-year-old and nine-year-old male and female students from six elementary schools in Castrop-Rauxel, Germany. The participants, 152 males and 159

females, were given two questionnaires about their perceived math ability and were assessed using the Primary Mental Abilities subtests relating to math. The results of the math ability test showed the males and females did not have a significant difference in math ability. The results of the questionnaires, however, showed a difference in perceived ability as the females relied more on their teachers' perceived ability than the males did. While there was no gender gap in math ability based on this study, the differences in perceived ability can be further researched by determining the effect of HHBE on male and female math attitudes, because it is related to student self-perceptions.

In a meta-analysis conducted by Reilly et al. (2015), they analyzed previously recorded data to determine gender differences in both math and science. After reviewing several past reasonings for math and science gender differences, including biological theories, social contributions, and psychobiosocial theories, and reviewing past meta-analyses on the same research topic, Reilly et al. (2015) used the National Assessment of Educational Progress Data Source to conduct their meta-analysis. Approximately two million fourth-, eighth-, and twelfth-grade participants' math data were reviewed from the years 1990-2011. The results showed the gender gap was small in both fourth-grade and eighth-grade but grew larger in twelfth-grade. The results also provided evidence that the gender gap in mathematics is not closing, but remained approximately the same throughout the years 1990-2011. Finally, Reilly et al. (2015) found the number of high achieving male students in math was higher than the number of high achieving females at all three grade levels. The study provided a reason to research the different effects of HHBE on males versus females.

Cvencek, Meltzoff, and Greenwald (2011) conducted a study of math stereotypes by gender. In their study, they had 247 elementary-aged students complete Implicit Association Tests to determine math-gender stereotypes, gender identity, and math self-concept. The results of the study showed that both male and female participants indicated a stronger association of math with males than females. The results also showed that male students were more likely to associate themselves with math, which provided evidence that male students have higher math self-concept than female students. Cvencek et al. (2011) discussed the idea that the math-gender stereotype may develop as early as elementary school. The study provided additional reasons to include an analysis of male and female student gain scores on the posttest and post-survey after the implementation of the HHBE unit.

In this study, the effect of an HHBE unit on fifth-grade students' math achievements and attitudes was examined. The effect of the HHBE unit on different genders was also examined. The studies in this section provided support for researching the difference in effect between genders.

Summary

In chapter two, literature was reviewed to provide support for the current research involving the effect of HHBE on high-minority, low-income students in fifth-grade. Studies about the use of CRP were reviewed to support the use of CRP as the background theory for the HHBE unit creation. Studies about HHBE were included to support the use of HHBE to improve student math achievements and attitudes. The relationship between CRP, HHBE, and math was explained to show the possibilities of using HHBE, a CRP strategy, to teach math and meet the cultural needs of minority students. Finally,

studies that explained the differences in math ability between males and females were included to provide support for the need of having sub-questions about gender.

CHAPTER III

METHODOLOGY

The purpose of this chapter is to explain the research design, research questions, research setting and participants, description of the intervention, instrumentation, validity, and reliability, data collection procedure, and data analysis that was used to conduct this study. The results would add to the existing research about the use of HHBE in education. More specifically, this study would help close the gaps in the use of HHBE in mathematics and at the elementary level.

Research Questions

The following research questions were used to guide this study:

RQ1.1. What changes, if any, occur in fifth-grade students' math pretest and posttest scores after the implementation of a Hip-Hop Based Education unit?

RQ1.2. To what degree, if any, is there a difference in gain scores from math pretest to posttest between fifth-grade students of different genders after the implementation of a Hip-Hop Based Education unit?

RQ2.1. What changes, if any, occur in fifth-grade students' math attitudes pre-survey and post-survey scores after the implementation of a Hip-Hop Based Education unit?

RQ2.2. To what degree, if any, is there a difference in gain scores from math attitudes pre-survey to post-survey between fifth-grade students of different genders after the implementation of a Hip-Hop Based Education unit?

RQ3. What are the fifth-grade students' perceptions of the overall effect of the Hip-Hop Based Education unit on their math achievements and attitudes?

RQ4. What are the teachers' perceptions of the overall effect of the Hip-Hop Based Education unit on fifth-grade students' math achievements and attitudes?

Research Design

This study was a mixed-methods study that employed the explanatory sequential design. Quantitative and qualitative approaches were used in this study to find hidden meanings behind a phenomenon (Kitchenham, 2010). Quantitative approaches were used to answer the first two research questions and sub-questions because the questions were specific in nature. The third and fourth research questions, which were more open-ended, were answered using qualitative approaches (Onwuegbuzie & Leech, 2006). As explained by Ross and Onwuegbuzie (2012), both quantitative and qualitative approaches have weaknesses when used for research. While a quantitative approach can answer specific questions, the how and why are only answered using a qualitative approach. Therefore, using both quantitative and qualitative approaches was appropriate for this study, due to the need for both specific and open-ended questions to be answered.

For research question one, only a single group was studied and completed a researcher-created pretest before the implementation of the HHBE unit and a researcher-created posttest after the HHBE unit. The purpose of this research question was to examine the change in student math scores after the implementation of the HHBE unit. Research question one has a sub-question that determines any differences in the change in math scores between males and females. For research question two, only a single group was studied and took the Math and Me pre-survey before the implementation of the

HHBE unit and the Math and Me post-survey after the HHBE unit. *The Math and Me Survey* was created and evaluated by Adelson and McCoach (2011). The purpose of this research question was to investigate the change in student math attitudes after the implementation of the HHBE unit. Research question two also has a sub-question that determines any differences in the change in student math attitudes between males and females.

The third and fourth research questions were answered using qualitative approaches. Qualitative approaches focus on people and situations that produce rich, descriptive data (Maxwell, 2013). To answer the third research question, student participants were asked to complete a weekly perceptions essay at the end of each week to share perceptions of the overall HHBE unit and weekly activities on their math achievements and attitudes. The fourth question was answered by conducting face-to-face interviews with participating teachers for understanding their perceptions of the overall HHBE unit on student math achievements and attitudes. The qualitative data from the student perceptions essays and teacher interviews helped explain how and why of the quantitative data and provided additional information regarding the HHBE's effect.

Research Setting and Participants

The research setting for data collection was an elementary school located in County A, which is located in the north-central portion of Georgia. The demographics of several schools in County A compared to the state of Georgia showed the schools are located in high-minority, low-income areas. Based on the 2016 Census Bureau report, the state of Georgia is comprised of approximately 53.4% Caucasian s, 32% African-Americans, 9.4% Hispanics, and 4.1% Asians (U.S. Census Bureau, 2016). In the

research setting, a high-minority, low-income school in County A, 54% of the students are Hispanic, 26% are African-Americans, 11% are Asian, and 5% are Caucasians. At this school, 85% of the students receive free or reduced lunch. The percentage of high-minority, low-income students at this school are much higher than the overall state of Georgia. This school was chosen as the setting for this study due to their high percent of minority students and their high percent of students receiving free and reduced lunch. The school was chosen by viewing their school report on County A's website to determine if the school has a high-minority, low-income population. I was given permission to conduct research from the principal at the chosen school in County A. Six fifth-grade teachers at the school agreed to participate in this study. The teachers asked to participate had to teach math and had some knowledge of hip-hop.

At the research setting, six fifth-grade teachers were chosen to participate in the study regarding the use of HHBE in mathematics. The teachers chosen had to teach math and had some knowledge of hip-hop. The teachers were willing to implement the HHBE unit in their classroom and to participate in the teacher interview following the conclusion of the HHBE unit. The teachers' classrooms consisted of 22 students, 21 students, 23 students, 14 students, 18 students, and 15 students, which created a total of 113 fifth-grade participants for both the quantitative (pretest and posttest, pre- and post-surveys) and qualitative data collection (weekly perceptions essays). Each of the six classrooms consisted of high-minority, low-income students. Five of the six teachers were included in the qualitative data collection with face-to-face interviews. The sixth teacher declined to be interviewed as part of the data collection.

Description of Intervention

The intervention for this study was the HHBE unit that was taught to fifth-grade math students in a high-minority, low-income school. The standards covered in the HHBE unit were the same as in a traditional unit but have been reshaped to meet the cultural needs of students in high-minority, low-income schools. The HHBE unit was created using CRP principles and the hip-hop elements of HHBE.

A practical CRP guide titled "Madison Metropolitan School District (MMSD) Culturally and Linguistically Responsive Practices guidelines" was used to facilitate student learning including 1) setting high expectations for all students, 2) acknowledging all students, 2) developing self-efficacy, 3) connecting to students' lives, 4) applying high level learning, and 5) valuing cultural identities (MMSD, 2015).

The hip-hop elements of the HHBE unit were used as suggested by other researchers in the past, including rap songs, dancing, sampling, cyphers, rap battles, and hip-hop word problems. Each week in the four-week unit, students participated in activities related to each hip-hop element at least once.

The use of music in math education has been proven to increase student achievements and attitudes (An et al., 2013; An et al., 2014; Bamberger & Disessa, 2003; Courey et al., 2012; Harris, 2007; Yoho, 2011). In the HHBE unit, students learned rap songs to help them remember key ideas from the standards. The use of rap songs to remember information is similar to the use of notes that can be studied to remember information. However, the use of rap songs may be a better strategy for students who grew up in the hip-hop culture. The rap songs were created to the beat and flow of current rap songs that were popular with the majority of students.

Each rap song was accompanied by dance moves. The dance moves also helped students remember the information from the rap songs. The dance moves were created based on the topic that was being taught. For example, students pretended to fill up a box when they sang the song about using cubic units to find the volume of a three-dimensional shape. In a traditional math curriculum, students would sit still to complete their work. However, based on previous research (Mead et al., 2016; Kercood et al., 2007), movement may help students improve their math achievements and attitudes.

Another element of hip-hop culture that was used to reshape the traditional math curriculum for the HHBE unit is sampling. Petchauer (2012) found sampling can be used in education to use existing pieces of knowledge to create new knowledge. In the HHBE unit sampling was used as a prediction strategy. Students viewed existing knowledge and were asked to create new knowledge using the existing pieces. For example, students were shown an area problem and were asked to use their previous knowledge of the area to create new knowledge about volume. In a traditional curriculum, students may be asked to access their background knowledge, but not to mix it to create new knowledge. In the HHBE unit, the students also listened to a sampled hip-hop song while they completed their predictions to remind them that, similarly, existing music can be used to create new music. Students listened to the original song that was sampled and then also listened to the new song that borrowed the sample.

Emdin (2013) compared the use of cyphers in hip-hop to the use of structured dialogues in education. The use of cyphers was used in the HHBE unit to allow students to discuss their answers to math problems. Students were given several problems based on the standard being taught. Students had time to solve the problems using the strategy

of their choice. After solving the problems, students gathered in a circle to discuss and explain their answers. Students had a chance to agree or disagree with other answers and strategies as turns are taken around the cypher circle. A rap music beat was played during the cypher circle to allow students the chance to share their answers in rap form. In traditional math classrooms, students complete most work independently with only teacher feedback. The use of the cypher allowed students to create dialogue and to give and receive feedback.

Emdin (2013) also suggested using rap battles as part of HHBE, likening rap battles to debates. In the HHBE unit, rap battles were used after students have been taught a specific standard. Rap battles consisted of students debating with each other about the best strategy to solve a complex math problem. Students were given a complex math problem with several options to solve. Students chose their strategy and solved the problem. After solving the problems, students met in small groups to have rap battles, or debates, about the best strategy to solve the problem. Again, in traditional math classrooms, students complete most work independently and do not have a chance to debate different strategies. The use of rap battles allowed students to debate a variety of math strategies.

The final element of the HHBE unit was hip-hop word problems. Hernandez et al. (2013) conducted a CRP study that provided evidence for using real-world problems in math. The hip-hop word problems covered the same standards as traditional word problems but used scenarios from hip-hop culture. The word problems used popular rappers' names and cultural elements such as clothing, songs, and dances. The hip-hop word problems may increase student motivation to complete the work.

Each of the HHBE elements that were included in the HHBE unit was not used every day during the four-week unit. Students were exposed to each element several times during the unit, giving them opportunities to determine their perceptions of each element.

Instrumentation

Quantitative Instrument

The quantitative instrument that was used to collect data for the first research question was a math pretest and posttest. The pretest and posttest were created using the County approved test bank for County A. The pretest and posttest consisting of 15 multiple-choice questions covered the standards in the unit that was taught with HHBE (see Appendix A: Unit 2 Pretest and Appendix B: Unit 2 Pretest Blueprint). The posttest questions covered the same standards at the same ability level as the pretest questions, but the two tests were not replicas to avoid the testing effect (see Appendix C: Unit 2 Posttest and Appendix D: Unit 2 Posttest Blueprint).

The quantitative instrument that was used to collect data for the second research question was a pre- and post-survey that student participants completed. The survey was given before and after the implementation of the HHBE unit to determine changes, if any, in student math attitudes. The specific survey used was the *Math and Me Survey* created and evaluated by Adelson and McCoach (2011) (see Appendix E: Math and Me Survey). The Math and Me Survey was created for math students between the ages of eight and twelve and contains 18 Likert scale questions that are answered on a five-point scale. The scale includes the choices strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. The survey is composed of two attitude subscales including

mathematical self-perceptions and enjoyment of mathematics (see Appendix F: Math and Me Survey Table). Permission to use the survey for this study has been obtained from Adelson and McCoach (see Appendix G: Math and Me Survey Permission Emails).

Qualitative Instrument

Qualitative approaches were used to collect data for the third and fourth research questions in this study. To answer the third question, weekly student perceptions essays (see Appendix H: Weekly Student Perceptions Essay Questions) were used for data collection. In the essays, student participants answered questions about their perceptions of the HHBE unit at the end of each week. Each student completed a total of four perceptions essays throughout the HHBE unit, which resulted in 452 pieces of essays for data analysis to determine student perceptions of the HHBE unit. The essay questions were created by me and were reviewed by a peer math teacher before giving it to students. The peer math teacher reviewed the questions to ensure that they could be understood and answered by fifth-grade students. The peer math teacher agreed that the questions on the weekly perceptions essays were appropriate for the topic and the students. The purpose of the student perceptions essays was to help explain the quantitative data and provide additional information regarding the HHBE's effect.

A 60-minute face-to-face interview was conducted with each of the six participating teachers. The purpose of the interviews was to determine the participating teachers' first-hand perceptions about the implementation of the HHBE unit and its effect on student math achievements and attitudes. The interviews were conducted after the HHBE unit has been implemented and all quantitative data have been collected. The interview guide consists of 10 questions that would give teachers opportunities to explain

their perceptions of the HHBE unit. The purpose of the teacher interviews was to help explain the quantitative results and provide additional information regarding teachers' perceptions of the HHBE's effect. The interview questions were semi-structured and more questions may be added after the initial results of the pretest and posttest and pre-survey and post-survey are generated (see Appendix I: Interview Guide for Teachers of HHBE Unit). The interview questions in the interview guide were created by me and were reviewed by a peer math teacher before interviews. The peer math teacher reviewed the interview guide to determine if the questions were appropriate for the study, and agreed that they were.

As a researcher, I was also an instrument in this study. I collected and analyzed the qualitative data from the participating students and teachers. I had some previous experience conducting interviews, transcribing the interviews, and coding the resulting information. Because my experience was minimal, a researcher who was experienced in using similar research methods coded one of the transcribed interviews with me to establish the inter-coder reliability for data analysis. Once the inter-coder reliability was well-established, I continued the coding process. As stated by Maxwell (2013), researcher bias and reactivity can be minimized, but understanding how the subjectivity of the researcher affects the inferences from interviews is more important. The teacher interviews were face-to-face and were conducted in each participating teacher's classroom When conducting the teacher interviews, I refrained from asking leading questions and allowed the participants' responses to guide the interview. When analyzing the qualitative data, I worked to understand how my subjectivity affected the data.

Validity and Reliability

The validity and reliability of this study were checked using research techniques. Internal validity was established as follows. First, the questions in the pretest and posttest were reviewed by one peer math teacher to understand if both tests appear to measure what they claim to. Second, the posttest questions covered the same standards at the same ability level as the pretest questions, but the two tests were not replicas to avoid the testing effect. Third, the validity of the Math and Me survey has been well-established by Adelson and McCoach (2011) in their study by having 14 experts in the field of mathematics evaluate the survey. Fourth, the perceptions essay questions were reviewed by a peer math teacher to determine the validity of the questions before giving it to students. Fifth, the interview guide was also be reviewed by a peer math teacher to determine the validity of the questions. Sixth, I also used member checking by sharing transcripts and discussing my findings with the teacher participants to ensure accurate interpretations. Member checking adds credibility by allowing the participants to read the interview transcripts and findings to ensure accuracy (Houghton, Casey, & Shaw, 2013).

According to Roberts, Priest, and Traynor (2006), reliability means that a research instrument should give the same information no matter who implements the instrument or when it is implemented. Internal reliability was established as follows. First, the reliability of the pretest and posttest was checked by using County A's test creation website. Second, Adelson and McCoach (2011) have established the internal consistency reliability of the Math and Me survey. Their study results provided a Cronbach's coefficient alpha between .92 and .94 to prove that the survey is a reliable instrument. In

addition, the inter-coder reliability of the interviews and student essays was established with the help of another experienced researcher at the initial stage of qualitative data analysis. The same instructional materials (e.g., timeline, lesson plans, and powerpoints) were given to participating teachers. I also had weekly meetings with each participating teacher to ensure he or she used the same CRP principles to implement the HHBE unit, in the same way, each time.

Data Collection Procedure

Quantitative Data Collection

The quantitative data for the first research question were collected by the six participating teachers at the school. Each teacher assigned his or her students a pretest consisting of 15 multiple-choice questions that was completed on student laptops using Qualtrics. The pretest provided data about student knowledge of the topics covered in the HHBE unit before the unit was taught. Each student participant was assigned a unique ID and used it for tests, surveys, and student perceptions essays throughout the unit. For example, student 1 in class 1 was coded as C1S1.

After administering the pretest to all participating students, each of the six participating teachers taught the HHBE unit for four-weeks. The HHBE lessons were taught in four days each week for a 40-minute time period (see Appendix J: HHBE Unit Timeline). Each teacher was supplied with a PowerPoint lesson for each of the daily lessons, equaling a total of 16 PowerPoint lessons to be taught throughout the unit (see Appendix K: Sample HHBE Lesson PowerPoint (Week1, Day1)). The participating teacher was supplied with specific lesson plans to accompany each PowerPoint lesson.

The lesson plans include timeframes for the implementation of each slide of the PowerPoint lessons (see Appendix L: Sample HHBE Unit Lesson Plan (Week 1, Day 1)).

I met with each participating teacher weekly to review the PowerPoint lessons and to explain the structure and timeframe of each activity and provided answers to their questions to ensure all teachers were following the same procedures. All meetings with the participating teachers were face-to-face. During each meeting, I took notes about the progress of the HHBE unit in the classrooms. If teachers were in need of more training, I set up extra meeting times to ensure the accuracy and consistency of the teaching of the HHBE unit. After teaching the HHBE unit to the students for four weeks, each participating teacher assigned students a posttest consisting of 15 multiple-choice questions and completed through Qualtrics. The test results for all participating students were collected through Qualtrics for data analysis.

The six participating teachers at the school also collected the quantitative data for the second research question. The data were collected by first assigning each participating student the Math and Me pre-survey through Qualtrics. The students completed the Math and Me pre-survey prior to the implementation of the HHBE unit. The Math and Me pre-survey was used to measure student mathematical self-perceptions and student enjoyment of mathematics, which are both elements of math attitudes. Again, after teaching the HHBE unit to the students for four weeks, the participating teachers administered the Math and Me post-survey through Qualtrics. The Math and Me pre-survey and post-survey were identical. The results of the pre-survey and post-survey were imported from Qualtrics for data analysis.

All data from student tests and surveys were downloaded to a password-protected computer and were deleted from the website promptly. The data will be stored for up to three years after the dissertation is completed. After the three years, the data will be deleted completely. No identifiable information will be shown in the final report, dissertation and relevant publication.

Qualitative Data Collection

The qualitative data for the third research question were collected from the weekly student perceptions essays. Students answered five open-ended questions about their overall perceptions of the HHBE unit, their favorite and least favorite activities, and their perceived increase in math attitude and math achievements. The data were collected at the end of each week of the four-week HHBE unit by students completing essay questions through Qualtrics about their perceptions of the HHBE unit. The student responses to the essay questions were downloaded and will be stored in a password-protected computer for up to three years after the dissertation is completed. After three years, the data will be deleted completely. No identifiable information about the students will be included in the final report, dissertation, or relevant publications.

The qualitative data for the fourth research question were collected after the implementation of the HHBE unit. I used the interview guide to conduct a 60-minute face-to-face interview with each of the six participating teachers within two weeks of the end of the HHBE unit implementation. Each interview consists of questions to determine the teacher participants' perceptions about the overall effect of the HHBE unit on student math achievements and attitudes. Notes were taken during the interview. Interviews were audio-recorded and transcribed. The recordings will be stored in a password-

protected computer for up to three years after the dissertation is completed. After three years, the recordings will be deleted completely. No identifiable information will be shown in the final report, dissertation and relevant publication.

Data Analysis

Quantitative Data Analysis

The quantitative data were analyzed to determine findings for both the first and second research questions and sub-questions. After collecting the data from the pretest and posttest, a paired-sample *t*-test will be run for RQ1.1 to determine what changes, if any, there were in the scores after the HHBE implementation. A paired-sample *t*-test was used to compare the means of pretest and posttest scores for a group of participants. The resulting significant values would determine if the scores of the pretest and posttest were different. The mean and standard deviations for each variable were reported as well as the significance level. If there was a significant difference in the pretest and posttest scores and posttest scores were higher than pretest scores, it would help explain the positive effect of the HHBE unit on student math achievements.

A one-way ANOVA test was run for RQ1.2 on the gain scores from the pretest to posttest to determine the difference in gain scores between genders. The purpose of a one-way ANOVA was to compare the means of groups of participants that only differ by one independent variable (Cronk, 2012). In this study, the grouping of participants differs by gender. If the one-way ANOVA produced significant results, a post-hoc test would run to determine which gender group was significantly different from the other group. When reporting the results of a one-way ANOVA it is important to include the

degrees of freedom, the significance level, and the results of the post-hoc test (Cronk, 2012).

Similarly, after collecting the data from the pre-survey and post-survey, a paired-sample *t*-test was run for RQ2.1 to determine what changes, if any there were in the scores after the HHBE implementation. If there was a significant difference in the pre- and post-survey scores and post-survey scores were higher than pre-survey scores, it would help explain the positive effect of the HHBE unit on student math attitudes. A one-way ANOVA test was run for RQ2.2 on the gain scores of the attitude surveys to determine the difference in gain scores between genders.

Qualitative Data Analysis

The qualitative data collected from the student perceptions essays and teacher interviews were analyzed to determine findings for RQ3 and RQ4. Students' responses to the student perceptions essays were downloaded from Qualtrics and organized for data analysis. Once the essays were downloaded, I read through the essays, worked with another experienced researcher to establish inter-coder reliability, and continued the coding process. I followed Tesch's (1990) eight steps in the coding process to ensure accurate data analysis. I read the entire essay to get an overall sense of the data. I then chose one essay and made notes about the underlying meanings. Next, I created a list of themes and applied the list to the other essays. I made categories using the descriptions and made connections between the categories. Next, I abbreviated each category and put the codes in alphabetical order. Finally, I conducted a preliminary analysis using the codes and recoded the material if needed. I used the coded data to create categories to include in my findings.

The recordings from the six participating teachers' interviews were transcribed and organized for data analysis. Once the recordings have been transcribed, I read through the transcripts, worked with another experienced researcher to establish inter-coder reliability, and continued the coding process. I followed Tesch's (1990) eight steps, as described above, in the coding process to ensure accurate data analysis.

Data Integration

For the purpose of this study, a sequential quantitative-qualitative data analysis was used. According to Venkatesh, Brown, and Sullivan (2016), this type of analysis is used when quantitative data is analyzed before qualitative data. The quantitative analysis was conducted to determine the effect of the HHBE unit on student math achievements and attitudes. The quantitative findings would determine the relationships between the variables in this study (Venkatesh et al., 2016). The qualitative data would then be used to further investigate the results of the quantitative data. If both types of data provided similar results, the convergent results would add to the quality of the findings.

The results of the data from the pretest and posttest were used to determine the growth, if any, in student achievements. Then qualitative data, student perceptions essays and teacher interviews, would help explain the growth or lack of growth from the quantitative results. The results of the data from the pre-survey and post-survey were used to determine the growth, if any, in student attitudes toward math. Then qualitative data, student perceptions essays and teacher interviews, would help explain the growth or lack of growth in student attitudes toward math.

Summary

This chapter includes the research methods used to conduct this study. Both quantitative and qualitative approaches used were discussed. This chapter also includes research questions, research setting and participants, description of the intervention, instrumentation, validity, and reliability, data collection procedure, and data analysis that was used to conduct this study.

CHAPTER IV

DATA ANALYSIS

The results of this study are organized into five sections, including one section to describe the results of each of the four research questions and sub-questions and a final section to integrate the overall findings for the quantitative and qualitative data. In the first section, changes, if any, in student achievements after the implementation of the HHBE Unit in the fifth-grade math classes are discussed. In the second section, changes, if any, in student attitudes toward math after the implementation of the HHBE Unit in the fifth-grade math classes are discussed. In the third section, student perceptions of the HHBE Unit are discussed, and in the fourth section, teacher perceptions of the HHBE Unit are discussed. The final section focuses on the integration of quantitative and qualitative results.

Participant Demographics

The participants included in this study consisted of 113 fifth-grade students and 6 fifth-grade teachers at a high-minority, low-income school in a county in North Central Georgia. The student participants included 52 males and 61 females. The student participants completed a pretest and pre-survey at the beginning of the four-week HHBE unit and then completed a posttest and post-survey at the end of the HHBE unit. The results of the pretest and posttest were used to answer RQ1.1 and RQ1.2 and the results of the pre-survey and post-survey were used to answer RQ2.1 and RQ2.2. Student participants also completed weekly self-perceptions essays at the end of each of the four

weeks of the HHBE unit that were used to answer RQ3. Teacher participants were interviewed after the implementation of the HHBE unit and their responses were used to answer RQ4.

Analysis of Research Question 1.1

RQ1.1 What changes, if any, occur in fifth-grade students' math pretest and posttest scores after the implementation of a Hip-Hop Based Education unit?

In this study, a pretest and posttest was given to 113 student participants to determine the changes in achievements, if any, after the implementation of the HHBE Unit. The pretest and posttest both consisted of fifteen multiple-choice questions covering a total of six fifth-grade math standards related to volume. Students took the pretest on the day before the HHBE unit began in their classrooms and took the posttest on the day after the HHBE unit was completed in their classrooms. After the data were collected, a paired-sample *t*-test was run to determine the changes between the student pretest scores and the student posttest scores. The paired-sample *t*-test showed a statistically significant increase in student achievements from the pretest to posttest after the implementation of the HHBE Unit.

The pretest mean score was 5.51 ($SD = 2.409$) out of a possible 15 points. The posttest mean score was 10.92 ($SD = 2.696$) out of a possible 15 points. A significant increase from the pretest to posttest was found ($t(112) = 19.243$, $p = .000 < .05$) (see Table 1). The results of the paired-sample *t*-test showed that overall, the students scored significantly higher on the posttest than on the pretest. This indicated that the implementation of the HHBE Unit was successful in increasing student achievements. Although there was no control group in this study to compare the increased

achievements, the significant increase from the pretest to posttest proved that HHBE can be used as a math strategy in fifth-grade classrooms to increase student achievements.

Table 1

t-test Results for Pretest and Posttest Scores

Pretest		Posttest				
M	*SD*	*M*	*SD*	*df*	*t*	*p*
5.51	2.409	10.92	2.696	112	19.243*	.000

Note. * indicates significance at $p < .05$.

Additional paired-sample *t*-tests were also run for each of the six Georgia Standards of Excellence (GSE) volume standards covered in the HHBE Unit. The GSE standards included MGSE.5.MD.3a, MGSE.5.MD.3b, MGSE.5.MD.4, MGSE.5.MD.5a, MGSE.5.MD.5b and MGSE.5.MD.5c. Table 2 shows the test questions related to each standard. The results of the paired-sample *t*-tests run on the individual GSE volume standards showed a significant increase from the pretest to posttest on all six-volume standards (see Table 3).

Table 2

Question Numbers on Pretest and Posttest by Standard

Standard (GSE)	Questions on Pretest	Questions on Posttest
MGSE.5.MD.3a	1, 3, 4	1, 3, 4
MGSE.5.MD.3b	6, 7	6, 7
MGSE.5.MD.4	2, 5, 8	2, 5, 8
MGSE.5.MD.5a	9, 14, 15	9, 14, 15
MGSE.5.MD.5b	10, 13	10, 13
MGSE.5.MD.5c	11, 12	11, 12

The first GSE standard, MGSE.5.MD.3a, states that students would recognize that "a cube with side length 1 unit, called a unit cube, is said to have one cubic unit of volume, and can be used to measure volume." A paired-sample *t*-test was calculated to

compare the mean pretest scores on standard MGSE.5.MD.3a to the mean posttest scores on the same standard. There were three questions that tested the standard on both the pretest and posttest, questions 1, 3, and 4. The mean on the pretest was .24 (SD = .286), and the mean on the posttest was .78 (SD = .295). A significant increase on standard MGSE5.MD.3a from the pretest to posttest was found ($t(112) = 13.631$, $p = .000 < .05$). The significant increase in this GSE volume standard showed that HHBE was a useful strategy to teach students that cubic units are used to measure volume.

The second standard that was taught to the 113 fifth-grade students through the HHBE unit was MGSE.5.MD.3b, which states that students would recognize that "a solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units." There were two questions on both the pretest and posttest that addressed this standard, questions 6 and 7. A paired-sample t-test was calculated to compare the mean pretest score to the mean posttest score of questions 6 and 7. The mean of questions 6 and 7 on the pretest was .42 (SD = .371) and the mean of questions 6 and 7 on the posttest was .79 (SD = .297). A significant increase from the pretest to posttest was found for standard MGSE.5.MD.3b ($t(112) = 9.285$, $p = .000 < .05$). Again, the significant increase in this standard showed that HHBE was a useful strategy for teaching students standard MGSE.5.MD.3b about finding volume using concrete cubic units.

The third GSE volume standard, MGSE.5.MD.4, states that students would "measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units." The pretest and posttest both had three questions pertaining to this standard, questions 2, 5, and 8. A paired-sample t-test was run to determine changes, if

any, between the pretest and posttest on the three questions relating to MGSE.5.MD.4. The mean for this standard on the pretest was .72 (*SD* = .262) and the mean for this standard on the posttest was .92 (*SD* = .208). A significant increase was found from the pretest to posttest for standard MGSE.5.MD.4 ($t(112) = 7.193$, $p = .000 < .05$). The significant increase in this standard also showed that HHBE was a useful strategy to teach students standard MGSE.5.MD.4 about finding volume using concrete cubic units.

The fourth volume standard taught during the HHBE unit was MGSE.5.MD.5a, which states that students would "find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication." The pretest and posttest both assessed this standard in questions 9, 14, and 15. A paired-sample *t*-test was run to compare the mean pretest score to the mean posttest score for standard MGSE.5.MD.5a. The mean on the pretest was .26 (*SD* = .267) and the mean on the posttest was .68 (*SD* = .272). A significant increase from the pretest to posttest was found for this standard ($t(112) = 12.455$, $p = .000 < .05$). The significant increase in this standard showed that HHBE was a useful strategy to teach students standard MGSE.5.MD.5a about how to find volume using a formula.

The fifth volume standard that was taught during the HHBE unit was MGSE.5.MD.5b, which states that students would "Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real-world and mathematical problems."

The pretest and posttest both assessed this standard in questions 10 and 13. A paired-sample *t*-test was run to compare the mean pretest score to the mean posttest score for questions 10 and 13. The mean on the pretest was .32 (*SD* = .347) and the mean on the posttest was .69 (*SD* = .329). A significant increase from the pretest to posttest was found ($t(112) = 9.099$, $p = .000 < .05$). The significant increase in this standard further showed that HHBE was a useful strategy to teach students standard MGSE.5.MD.5b about how to use a formula to find the volume.

The final volume standard that was taught during the HHBE unit was MGSE.5.MD.5c, which states that students would "recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems." The pretest and posttest both assessed this standard in questions 11 and 12. A paired-sample *t*-test was run to compare the mean pretest score to the mean posttest score for this standard. The mean on the pretest was .19 (*SD* = .279) and the mean on the posttest was .42 (*SD* = .340). A significant increase from the pretest to posttest was found ($t(112) = 5.984$, $p = .000 < .05$). The significant increase in this standard shows that HHBE was a useful strategy to teach students standard MGSE.5.MD.5c about how to find the volume of composite rectangular prisms.

Table 3

t-test Results for Volume Standards

	Pretest		Posttest				
Standard	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*
MGSE.5.MD.3a	.24	.286	.78	.295	112	13.631*	.000
MGSE.5.MD.3b	.42	.371	.79	.297	112	9.285*	.000
MGSE.5.MD.4	.72	.262	.91	.208	112	7.193*	.000
MGSE.5.MD.5a	.26	.267	.68	.272	112	12.455*	.000
MGSE.5.MD.5b	.32	.347	.69	.329	112	9.099*	.000
MGSE.5.MD.5c	.19	.279	.42	.340	112	5.984*	.000

Note. * indicates significance at $p < .05$.

Analysis of Research Question 1.2

RQ1.2 To what degree, if any, is there a difference in gain scores from math pretest to posttest between students of different genders after the implementation of a Hip-Hop Based Education unit?

To determine the difference in change in math achievements, if any, between male and female students, a one-way ANOVA was run on the gain scores to compare male gain scores to female gain scores from the pretest to posttest (see Table 4). There were 52 male participants and 61 female participants included in this study. The gain score for male students was 5.19 ($SD = 3.080$) and the gain score for female students was 5.59 ($SD = 2.917$). No significant difference was found between the male and female scores from the pretest to posttest ($F(1, 111) = .496$, $p = .483 > .05$). Since the one-way ANOVA result was not significant, multiple comparisons tests were not run. The results of the one-way ANOVA provided evidence that gender is not a significant factor affecting the increase of student achievements after the implementation of the HHBE unit.

Table 4

Descriptive Statistics for Gain Score Difference by Gender

		Pretest	Posttest	Gain Scores	
Groups	*n*	*M*	*M*	*M*	*SD*
Male	52	5.60	10.79	5.19	3.080
Female	61	5.44	11.03	5.59	2.917

Additional one-way ANOVAs were also run for each of the six-volume standards to determine a difference, if any, in the changes in achievements between male and female students. The one-way ANOVAs were run to compare the mean gain scores of male students and female students (see Table 5 and Table 6). For the first volume standard, MGSE.5.MD.3a, there was no significant difference found between the mean gain scores for males and females ($F(1,111) = .229$, $p = .633 > .05$). For the second volume standard, MGSE.5.MD.3b, there was no significant difference found between male and female mean gain scores ($F(1,111) = .464$, $p = .497 > .05$). For the third volume standard, MGSE.5.MD.4, there was no significant difference found between male and female mean gain scores from the pretest to posttest ($F(1,111) = .019$, $p = .891 > .05$). For the fourth volume standard, MGSE.5.MD.5a, there was no significant difference found between male and female mean gain scores ($F(1,111) = 2.623$, $p = .108 > .05$). For the fifth volume standard, MGSE.5.MD.5b, there was not a significant difference between male and female mean gain scores from the pretest to posttest ($F(1,111) = .027$, $p = .871 > .05$). Finally, on the sixth volume standard, MGSE.5.MD.5c, there was not a significant difference between male and female mean gain scores ($F(1,111) = 1.139$, $p = .288 > .05$). Since none of the one-way ANOVA results was significant, multiple comparisons tests were not run. As shown by the results

of the one-way ANOVAs run on the mean gain scores for each standard, there was no significance found between male and female mean gain scores for any of the six-volume standards that were taught. The results of the one-way ANOVA provided evidence that gender did not have a significant effect on student mean gain scores from the pretest to posttest when analyzed by each individual standard taught during the HHBE unit.

Table 5

Descriptive Statistics for Mean Gain Score Difference by Gender for Each Standard

				Mean Gain Scores	
Standard	Gender	Pretest	Posttest	*M*	*SD*
MGSE.5.MD.3a	Male	.22	.74	.52	.519
	Female	.26	.82	.56	.557
MGSE.5.MD.3b	Male	.44	.79	.35	.346
	Female	.39	.80	.40	.402
MGSE.5.MD.4	Male	.71	.90	.20	.199
	Female	.73	.92	.19	.191
MGSE.5.MD.5a	Male	.32	.69	.37	.365
	Female	.20	.68	.48	.475
MGSE.5.MD.5b	Male	.33	.68	.36	.356
	Female	.32	.69	.37	.369
MGSE.5.MD.5c	Male	.16	.43	.27	.269
	Female	.21	.40	.19	.189

Table 6

ANOVA Results Based on Mean Gain Score Differences by Gender for Each Standard

Standard	Source	*SS*	*DF*	*MS*	*F*	*Sig.*
MGSE.5.MD.3a	Between	.041	1	.041	.229	.633
	Within	19.808	111	.178		
	Total	19.849	112			
MGSE.5.MD.3b	Between	.086	1	.086	.464	.497
	Within	20.679	111			
	Total	20.765	112			
MGSE.5.MD.4	Between	.002	1	.002	.019	.891
	Within	9.271	111	.084		
	Total	9.272	112			
MGSE.5.MD.5a	Between	.340	1	.340	2.623	.108
	Within	14.382	111	.130		
	Total	14.722	112			
MGSE.5.MD.5b	Between	.005	1	.005	.027	.871
	Within	20.119	111	.181		
	Total	20.124	112			
MGSE.5.MD.5c	Between	.183	1	.183	1.139	.288
	Within	17.813	111	.160		
	Total	17.996	112			

Note. * indicates significance at $p < .05$.

Analysis of Research Question 2.1

RQ2.1 What changes, if any, occur in fifth-grade math students' math attitudes pre-survey and post-survey scores after the implementation of a Hip-Hop Based Education unit?

In this study, a pre-survey and post-survey, The Math and Me Survey, was given to 113 student participants to determine the changes, if any, in student math attitudes after the implementation of the HHBE Unit. The pre-survey was given to the students the day before the HHBE unit began and the post-survey was completed by the students the day

after the HHBE unit was completed. After the data were collected, a paired-sample *t*-test was run for the overall survey to determine the changes, if any, in student attitudes toward math from the pre-survey to post-survey. The mean on the pre-survey was 2.30 (*SD* = .706) of a possible 5 points and the mean on the post-survey was 2.24 (*SD* = .730) out of a possible 5 points. No significant difference from the pre-survey to post-survey was found ($t(112) = -1.552$, $p = .124 > .05$). The results of the paired-sample *t*-test showed that there was not a large difference between the pre-survey and post-survey means. Based on the survey data, the HHBE unit did not have a significant effect on student attitudes toward math.

Additional paired-sample *t*-tests were also run to determine the changes, if any, in student attitudes toward math in the two subscales included in the Math and Me Survey (see Table 7). The first subscale, self-perceptions, included eight survey questions 1, 3, 5, 7, 9, 12, 15, and 17. A paired-sample *t*-test was calculated to compare the mean of the pre-survey score to the mean of the post-survey score for the questions included in the self-perceptions subscale. The mean for the self-perceptions subscale on the pre-survey was 2.47 (*SD* = .766) and the mean for the self-perceptions subscale on the post-survey was 2.31 (*SD* = .731). A significant decrease from the pre-survey to post-survey was found for the self-perceptions subscale ($t(112) = -3.803$, $p = .000 < .05$. This showed that the HHBE unit might not help increase student self-perceptions of their math ability. The second subscale, enjoyment, included ten survey questions 2, 4, 6, 8, 10, 11, 13, 14, 16, and 18. A paired-sample *t*-test was calculated to compare the mean of the pre-survey score to the mean of the post-survey score for the questions included in the enjoyment subscale. The mean for the enjoyment subscale on the post-survey ($M = 2.18$, $SD = .860$)

was slightly higher than the mean for the enjoyment subscale on the pre-survey (M = 2.17, SD = .810). However, the difference between the pre-survey and post-survey was not large enough to indicate a significant positive effect of the HHBE unit on student enjoyment of math ($t(112) = .186$, $p = .852 > .05$).

Table 7

t-test Results for Mean Subscale Scores

		Pre-survey		Post-survey				
Subscale	Questions	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*
Self-perceptions	1, 3, 5, 7, 9, 12, 15, 17	2.47	.766	2.31	.731	112	-3.803*	.000
Enjoyment	2, 4, 6, 8, 10, 11, 13, 14, 16, 18	2.17	.810	2.18	.860	112	.186	.852

Note. * indicates significance at $p < .05$.

Finally, paired-sample *t*-tests were run on each of the individual survey questions to determine the changes, if any, in specific student attitudes toward math. Table 8 shows the mean, standard deviation, degrees of freedom, and significance level of each separate survey question from pre-survey to post-survey. As seen in Table 8, a significant decrease from the pre-survey to post-survey was found for questions 1, 5, 7, and 15. Those four questions were all from the self-perceptions subscale which may be an indicator that the HHBE unit might not help increase student self-perceptions of their math ability. This may also be due to the amount of time the unit was implemented, since students may not have had enough time in the four weeks to actually determine changes in self-perceptions. The remaining questions did not show significant changes from the pre-survey to post-survey. The results of the paired-sample *t*-tests for each specific survey question showed that there was no significant increase in the majority of the survey questions. However, on survey questions 4, 6, 8, 14, and 16 there was a small

increase from the pre-survey to post-survey. All five of the survey questions that showed a small increase from the pre-survey to post-survey were from the enjoyment subscale. This finding was positive, but the increase was not large enough to indicate a significant positive effect of the HHBE unit on student enjoyment of math.

Table 8

t-test Results for Individual Survey Questions

		Pretest		Posttest				
Q.	Subscale	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*
1	SP	2.35	.943	2.18	1.002	112	-2.280*	.025
2	E	2.19	1.214	2.05	1.209	112	-1.501	.136
3	SP	2.21	.829	2.21	1.039	112	.020	.984
4	E	2.07	1.124	2.13	1.196	112	.463	.644
5	SP	2.78	1.024	2.45	.922	112	-3.612*	.000
6	E	2.32	1.151	2.39	1.158	112	.667	.506
7	SP	2.33	1.105	2.15	.975	112	-2.011*	.047
8	E	3.01	1.191	3.21	1.235	112	1.880	.063
9	SP	2.42	1.186	2.32	1.002	112	-.954	.342
10	E	2.06	1.120	1.97	1.098	112	-1.109	.270
11	E	1.86	1.016	1.77	1.009	112	-.907	.366
12	SP	2.58	1.065	2.47	.974	112	-1.210	.229
13	E	1.90	1.187	1.89	1.108	112	-.165	.870
14	E	1.78	.919	1.88	1.050	112	1.037	.302
15	SP	2.54	.945	2.29	.923	112	-3.135*	.002
16	E	2.32	1.167	2.34	1.207	112	.179	.858
17	SP	2.51	1.017	2.38	.909	112	-1.761	.081
18	E	2.19	1.122	2.17	1.133	112	-.195	.846

Note. SP = Self-Perceptions; E = Enjoyment; * indicates significance at $p < .05$.

Analysis of Research Question 2.2

To determine the difference in mean gain scores between male and female students, a one-way ANOVA was run for the overall survey to determine the difference, if any, in the mean gain scores between male and female students. The pre-survey and post-survey was given to 52 male and 61 female students. The gain scores from the pre-survey to post-survey were compared using a one-way ANOVA to determine the

difference in mean gain scores based on gender. The male students' mean gain score was -.12 (*SD* = .403) and the female students' mean gain score was -.06 (*SD* = .467). No significant difference was found between male and female students on the mean gain scores from the pre-survey to post-survey ($F(1, 111) = 1.700$, $p = .195 > .05$). The descriptive data results showed that both male and female students' scores decreased from the pre-survey to post-survey, but that the male students' scores slightly decreased more than the female students' scores.

Additional one-way ANOVAs were also run to determine the difference in gain scores from the pre-survey to post-survey between male and female students in the two subscales included in the Math and Me Survey. The mean gain score for male students was -.22 (*SD* = .422) while the mean for female students' gain score was -.10 (*SD* = .452). There was no significant difference found between male and female students on the gain scores for the self-perceptions subscale ($F(1,111) = 1.954$, $p = .165 > .05$). Based on descriptive data results, both the male and female student scores decreased from the pre-survey to post-survey in the self-perceptions subscale, but the male students' scores slightly decreased more than the female students' scores. This showed that gender was not a factor significantly affecting the changes to the student math self-perceptions after the implementation of the HHBE unit.

On the second subscale, enjoyment, the one-way ANOVA results showed that there was not a significant difference between male and female mean gain scores from the pre-survey to post-survey. The gain score mean for male students was -.04 (*SD* = .517) and the female gain score mean was .06 (*SD* = .660). There was no significant difference found between the gain scores for the enjoyment subscale ($F(1,111) = .808$, p

= .371 > .05). The mean gain score for male students was negative which showed that the male student math attitudes slightly decreased from the pre-survey to post-survey in the enjoyment subscale. The mean gain score for female students was positive which showed that the female student math attitudes slightly increased from the pre-survey to post-survey in the enjoyment subscale.

Finally, one-way ANOVAs were run on each survey question to determine the difference in gain score between the pre-survey and post-survey for male and female students on each individual survey question (see Table 9). Question one of the survey resulted in a significant difference between male and female students from the pre-survey to post-survey ($F(1,111) = 6.633$, $p = .011 < .05$). Since question one stated, "I am really good at math," this finding provided evidence that female students felt better about their math ability at the end of the HHBE unit than male students did. The results of the *t*-tests for the other survey questions did not result in a significant difference between male and female gain scores from the pre-survey to post-survey.

Table 9

ANOVA Results for Individual Survey Questions by Gender

		Male Gain Score		Female Gain Score				
Q.	Subscale	*M*	*SD*	*M*	*SD*	*dfB, dfW*	*F*	*p*
1	SP	-.37	.768	.00	.749	1, 111	6.633*	.011
2	E	-.19	.951	-.08	.936	1, 111	.384	.536
3	SP	-.17	.858	.15	1.046	1, 111	3.025	.085
4	E	-.09	1.162	.18	1.310	1, 111	1.361	.246
5	SP	-.36	.847	-.30	1.044	1, 111	.110	.741
6	E	.09	.848	.05	1.296	1, 111	.033	.857
7	SP	-.12	.746	-.23	1.102	1, 111	.397	.530
8	E	.10	1.034	.30	1.243	1, 111	.838	.362
9	SP	-.12	1.003	-.10	1.325	1, 111	.006	.940
10	E	-.23	.756	.03	.930	1, 111	2.685	.104
11	E	-.25	.968	.05	1.056	1, 111	2.471	.119
12	SP	-.12	.784	-.10	1.070	1, 111	.006	.936
13	E	.06	1.074	-.08	1.101	1, 111	.451	.503
14	E	.08	.992	.13	1.169	1, 111	.050	.823
15	SP	-.33	.785	-.18	.885	1, 111	.853	.358
16	E	.02	.980	.02	1.118	1, 111	.000	.989
17	SP	-.19	.742	-.08	.817	1, 111	.618	.433
18	E	-.02	1.075	-.02	1.054	1, 111	.000	.999

Note. SP = Self-Perceptions; E = Enjoyment; * indicates significance at $p < .05$.

Analysis of Research Question 3

RQ3. What are the students' perceptions of the overall effect of the Hip-Hop Based Education unit?

To determine student perceptions of the overall effect of the HHBE Unit, the 113 student participants responded to a student perceptions essay at the end of each of the four weeks of implementation of the HHBE Unit. Students responded to questions about their feelings about the HHBE Unit, their favorite activity, their least favorite activity, their changes in math attitudes, and their changes in math achievements. Students were identified using their teachers' participant number, an M or F for male or female, and a

number to represent which male or female they were. For example, student 4M6 represents male student number 6 in teacher participant number 4's class.

The weekly student perceptions essays were coded using Tesch's eight steps of coding. The essays were organized and read carefully to determine the categories that emerged. I found several strong categories that emerged throughout all four weeks of student perceptions essays. I compared the responses of the students in each category for each of the four weeks of data collection. After comparing the responses of the 113 students overall, I compared the responses of male students and female students.

The categories that emerged during the reading and coding of the student perceptions essays included overall student perceptions, with negative perceptions and positive perceptions as subcategories, specific activities, with favorite activities and least favorite activities as subcategories, math attitudes, with change and no change as subcategories, and math achievements, with change and no change as subcategories. I used the same categories for each week of student perceptions essays in order to compare the overall weekly responses. I also compared the responses of male and female students for each of the four weekly perceptions essays.

Overall Student Perceptions

The first category that emerged when I was coding the student perceptions essays was the overall perceptions or feelings, which students had about the HHBE lessons that had been taught by their teacher during the week. The subcategories included positive feelings about the lessons, negative feelings about the lessons, and neutral feelings about the lessons. Students' responses from each weekly perceptions essay were analyzed overall and by gender.

When the overall student responses from week one essays were analyzed, 74% of the students (84 students) made positive comments about the lessons they had been taught during the first week (see Table 10). For example, student 2F5 stated that "I really enjoy it because it makes math fun." Another student, 1M14, stated, "good because I like it." Overall student responses also showed that 19% of students (21 students) had neutral feelings about the lessons they had been taught in week one. For example, student 1F9 answered, "so-so" when asked about her feelings about the lessons. Of the remaining students, 4% of the students (5 students) had negative feelings about the lessons and 3% of the students (3 students) had an off-topic response. One of the five students who had a negative response, 3M9, stated, "it does not help me." The data showed that the majority of students felt positive about the first week of HHBE lessons.

Table 10

Week 1 Overall Student Perceptions

Response Type	*n*	*%*
Positive	84	74
Neutral	21	19
Negative	5	4
Off-Topic	3	3

When I analyzed the student responses for the second weekly perceptions essay, the majority of students made positive comments again (see Table 11). Overall, 81% of the students (91 students) made a positive comment about how they felt about the HHBE lessons after the second week of lessons. One student, 5M3, stated, "it's awesome because it's really fun to learn in a different style." Another student, 5f2, stated, "good, it's helping me a lot." Another 10% of the students (11 students) made a neutral comment after the second week of HHBE lessons. Student 1F7 responded, "it's ok."

Finally, 4% of the students (4 students) made a negative comment and 6% of the students (7 students) made an off-topic response. One student, 1M8, thought that the HHBE lessons were "boring." The data analysis from the second week showed an increase in positive comments from 74% in week one to 81% in week two. The data also showed that students with neutral comments decreased from 19% to 10% and the percentage of students with negative comments remained the same.

Table 11

Week 2 Overall Student Perceptions

Response Type	*n*	*%*
Positive	91	81
Neutral	11	10
Negative	4	4
Off-Topic	7	6

After analyzing the student responses from the third week of student perceptions essays, I found that the majority of students continued to make positive responses about their feelings toward the lessons (see Table 12). Overall, 84% of the students (95 students) made positive comments after the third week of HHBE lessons. One of the students, 6F6, stated that she "felt happy and excited to learn math." Another student, 2F7, stated, "I love them and I feel like math is a lot easier this way." Another 11% of the students (12 students) made neutral comments about the lessons. For example, one student, MF11, stated, "I feel okay, not good, not bad." After the third week of HHBE lessons, 4% of the students (5 students) made negative comments and 1% of the students (1 student) made an off-topic comment. Student SM1 stated, "I don't like it." The overall percentage of positive comments made by students increased again, from 81% to 84%, from week two to week three.

Table 12

Week 3 Overall Student Perceptions

Response Type	*n*	*%*
Positive	95	84
Neutral	12	11
Negative	5	4
Off-Topic	1	1

After analyzing the student perceptions for week four, I discovered that the majority of students overall continued to respond positively when answering how they felt about the HHBE lessons (see Table 13). Overall, 84% of the students (95 students) made positive comments after week four. One student, 5F3, commented that "I really like the HHBE because it is really helpful and my grades keep going up even more and I like it." Another student, 6F9, stated, I felt like I understood everything and everything is simple now." At the end of week four, 5% of the students (6 students) had neutral responses and 5% of the students (6 students) had negative comments. One student, 6M1, stated that he "felt bad" after the fourth week of HHBE lessons. The percentage of students who made off-topic comments was 5% (6 students). The percentage of students who made positive comments remained the same from week three to week four. From the beginning of the unit in week one to the end of the unit in week four, the percentage of positive comments increased from 74% to 84%.

Table 13

Week 4 Overall Student Perceptions

Response Type	*n*	*%*
Positive	95	84
Neutral	6	5
Negative	6	5
Off-Topic	6	5

The number of positive student perceptions of the HHBE unit from week one (74%) to week two (81%) and week two (81%) to week three (84%) increased slightly (see Figure 2). The number of positive student perceptions of the HHBE unit remained the same from week three (84%) to week four (84%). The results of the student responses to the weekly student perceptions essays provided evidence that overall, students enjoyed the HHBE unit and made positive comments about the unit.

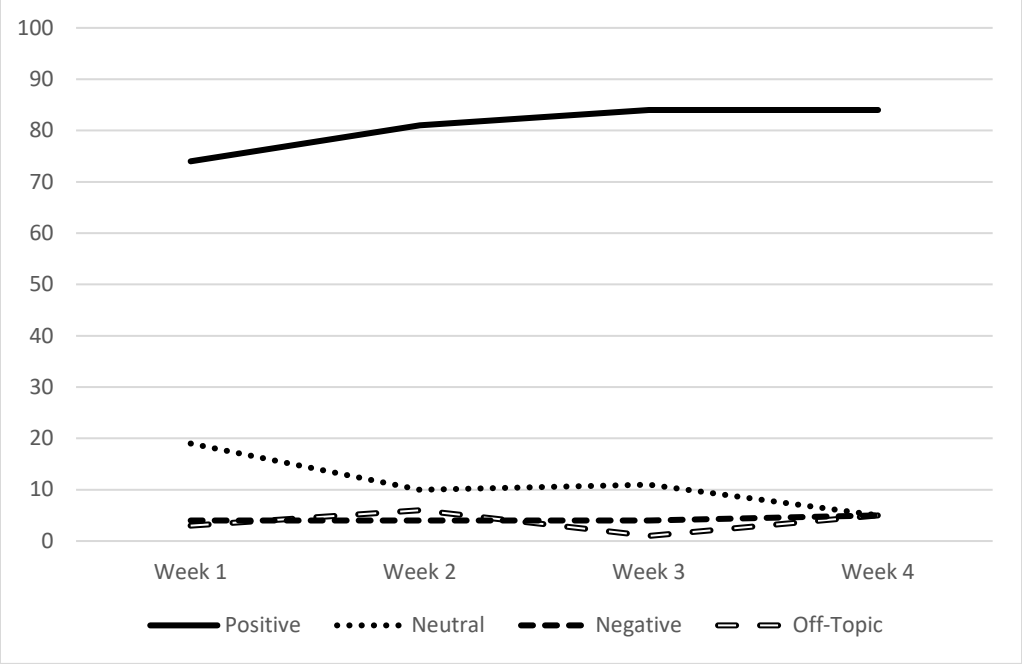


Figure 2. The percentage change in overall student perceptions from week one to week four.

I further analyzed the student responses by gender to compare the overall perceptions of male and female students (see Table 14). After week one, of the 113 student participants, 52 were male and 61 were female. Of the 52 male students, 77% of them (40 students) made positive comments about the lessons in week one, 13% of them (7 students) made neutral comments, 4% of them (2 students) made negative comments, and 6% of them (3 students) made off-topic comments. For example, student 5M3 made the positive comment, "I feel like it's a better way to learn and it makes me understand

volume better too." Another student, 1M12, made the neutral comment, "so-so." Student SM1 made the negative comment, "I hate them." Of the 61 female students, 72% of them (44 students) made positive comments, 23% of them (14 students) made neutral comments, and 5% of them (3 students) made negative comments. For example, student 4F2 made the positive comment, "I feel very confident when I'm doing math because I can just think of the song and I'll remember the strategies." A second student, 3F8 made the neutral comment, "I feel okay." Student 4F10 stated, "I feel a little confused", which is an example of a negative comment. The data showed that a higher percentage of males than females made positive comments and a higher percentage of females than males made neutral comments about the first week of HHBE lessons. The data also showed that a small percentage of both males and females made negative comments about the first week of HHBE lessons taught in their class.

Table 14

Week 1 Overall Student Perceptions by Gender

	Male		Female	
Response Type	*n*	*%*	*n*	*%*
Positive	40	77	44	72
Neutral	7	13	14	23
Negative	2	4	3	5
Off Topic	3	6	0	0

Next, I analyzed the week two student perceptions by gender. Of the 52 male students, 77% (40 students) made positive comments about their feelings about the HHBE lessons after week two (see Table 15). For example, student 2M9 stated, "I liked the HHBE lessons my teacher teaches." Another 15% of the male students (8 students) made neutral comments and 4% of the male students (2 students) made negative

comments. For a neutral example, student 5M8 stated, "so-so." For a negative example, student 1M8 stated that the HHBE lessons were, "kind of boring." There were also 4% of the male students (2 students) who made responses that were off-topic. After the second week, the same percentage of male students made positive comments about the HHBE lessons. Of the 61 female students, 84% of them (51 students) made positive comments after the second week of HHBE lessons. For example, student 4F1 stated, I feel like it helped me because now I feel that math is important for life." Another 5% of the female students (3 students) made neutral comments and 3% of the female students (2 students) made a negative comment. For a neutral example, student 1F7 stated, "It's ok." For a negative example, student 5F5 stated, "I don't like that much because I don't like singing to others." There were also 7% of the female students (4 students) who made responses that were off-topic. The percentage of female students who made positive comments increased from 72% to 84% after the second week of HHBE lessons were taught. The percentage of female students who made neutral comments decreased from 23% to 5% from week one to week two. As shown by the data, the female students' positive responses increased from week one to week two, while the male students' positive responses remained the same.

Table 15

Week 2 Overall Student Perceptions by Gender

	Male		Female	
Response Type	*n*	*%*	*n*	*%*
Positive	40	77	51	84
Neutral	8	15	3	5
Negative	2	4	2	3
Off-Topic	2	4	4	7

The student responses from week three perceptions essays were analyzed by gender as well. Of the 52 male students, 88% of them (46 students) made positive comments after the third week of HHBE lessons (see Table 16). For example, student 1M10 stated, "I feel energetic because it's positive music and I learned more." Another 8% of the male students (4 students) made neutral comments and 4% of them (2 students) made negative comments. For a neutral example, student 5M7 stated, "I feel good and bad about it." For a negative example, student 6M1 stated, "I didn't like it." The percentage of male students who made positive comments about their feelings about the HHBE lessons after week three increase from 77% to 88%. The percentage of neutral comments and negative comments made by male students both decreased from week two to week three. Of the 61 female students, 80% of them (49 students) made positive comments after the third week of HHBE lessons. For example, student 3F7 stated, "I love them and I feel like math is a lot easier this way." Another 13% of the female students (8 students) made neutral comments and 5% of the female students (3 students) made negative comments. For a neutral example, student 6F9 stated, "I feel okay, I guess." For a negative example, student 6F10 stated, "I feel bored." Finally, 2% of the female students (1 student) made an off-topic comment. After the third week of HHBE lessons, the percentage of female students who made positive comments decreased from 84% to 80%. The percentage of female students who made neutral and negative comments both increased from week two to week three.

Table 16

Week 3 Overall Student Perceptions by Gender

	Male		Female	
Response Type	*n*	%	*n*	%
Positive	46	88	49	80
Neutral	4	8	8	13
Negative	2	4	3	5
Off-Topic	0	0	1	2

The student responses for week four were then analyzed by gender. Of the 52 male students, 83% of them (43 students) made positive comments about their feelings toward the HHBE lessons after the fourth week (see Table 17). For example, student 4M8 stated, "I feel good because I have been working hard lately." Another 2% of the male students (1 student) made a neutral comment and 8% of the male students (4 students) made a negative comment. For a neutral example, student 4M2 stated, "I feel a weird way of learning math." For a negative example, student 2M1 stated, "I feel that the HHBE lessons haven't really done anything." Additionally, 8% of the male students (4 students) made an off-topic comment. The percentage of male students who made a positive comment decreased from 88% to 83% from week three to week four. From the beginning of the HHBE unit in week one to the end of the HHBE unit in week four, the percentage of positive comments made by male students increased from 77% to 83%. Of the 61 female students, 85% of them (52 students) made positive comments about their feelings toward the HHBE unit after week four. For example, student 3F8 stated, "The HHBE lessons that my teacher is using to teach us math for the past week is a very creative way to teach us math and that it is helping me a lot." Another 8% of the female students (5 students) made neutral comments and 3% of the female students (2 students) made negative comments. For a neutral example, student 2F3 stated, "it's okay." For a

negative example, student 3F7 stated, “I feel like math is harder and takes longer.” Another 3% of the female students (2 students) made an off-topic comment. From week three to week four, the percentage of female students who made positive comments increased from 80% to 85%. From the beginning of the HHBE unit in week one to the end of the HHBE unit in week four, while the percentage of male students who made positive comments increased from 77% to 83%, the percentage of female students who made positive comments increased from 72% to 85% (see Figure 3).

Table 17

Week 4 Overall Student Perceptions by Gender

	Male		Female	
Response Type	*n*	*%*	*n*	*%*
Positive	43	83	52	85
Neutral	1	2	5	8
Negative	4	8	2	3
Off-Topic	4	8	2	3

The overall positive student perceptions of the HHBE unit from week one to week four increased for both male and female students (see Figure 3). Male students’ positive perceptions remained the same from week one (77%) to week two (77%), increased from week two (77%) to week three (88%), and then decreased slightly again from week three (88%) to week four (83%). Female students’ positive perceptions increased from week one (72%) to week two (84%), decreased slightly between week two (84%) and week three (80%), and then increased slightly from week three (80%) to week four (85%). Although there were both increases and decreases in both genders’ positive perceptions, they both experienced an overall increase in positive perceptions from week one to week four.

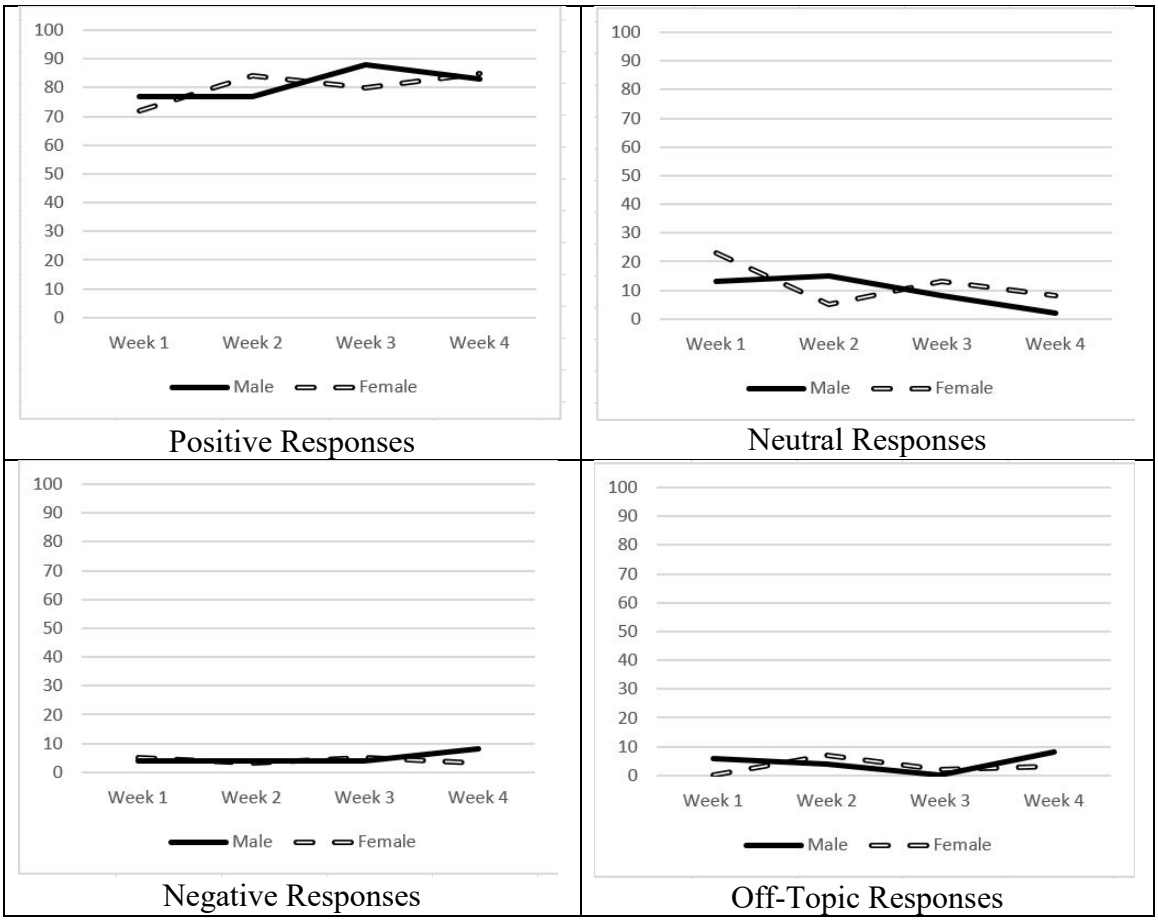


Figure 3. The percentage change in overall student perceptions by gender from week one to week four.

Favorite Activities and Least Favorite Activities

The second category that emerged during the coding of the weekly student perceptions essays was specific activities, with favorite activities and least favorite activities as sub-categories. Student responses from each of the four weekly perceptions essays were analyzed overall and by gender to determine the favorite and least favorite activities throughout the HHBE unit.

After the first week of HHBE lessons were taught, the majority of students chose "creating the rap" as part of the cypher (25%), rapping (15%), using models (14%), and the rap song (13%) as their favorite activities (see Table 18). Those four activities accounted for 67% of the overall student responses about their favorite activity. The

overall favorite activity was "creating the rap" as part of the cypher that was chosen by 25% of the overall students. Student 3F8 stated, "creating a rap activity was my favorite. I think this because writing rap songs is something new to me." Rapping was also listed as the favorite activity of 15% of the students. One student, 5F13, stated, "my favorite part of this week was the rap part because it was fun going in front of the class and rapping our raps."

When analyzing the least favorite activity after week one, 39% of the students responded that none of the activities was their least favorite. The data showed that the majority of the students enjoyed all of the activities during the first week of HHBE lessons. Rapping was listed as the least favorite activity of 14% of the students. One of the students, 5F8, who listed rapping commented, "rapping, because I was scared to rap."

Table 18

Week 1 Student Favorite and Least Favorite Activities

	Favorite		Least Favorite	
Activity	*n*	%	*n*	%
Creating Rap	28	25	11	10
Rapping	17	15	16	14
Using Models	16	14	4	4
Rap Song	15	13	13	12
Rap Battle	8	7	4	4
Everything	6	5	0	0
The Math	6	5	2	2
No Response	6	5	11	10
Nothing	4	4	44	39
Volume	4	4	0	0
Word Problem	1	1	7	6
Dancing	1	1	1	1
Sampling	1	1	0	0

When students responded about their favorite activity after the second week of HHBE lessons, the majority of the students chose "creating the rap" as part of the cypher

(18%), rapping (12%), and the rap song (21%) again (see Table 19). For example, student 5F6 stated, "when we did the rap because it was fun making the lyrics up but with learning." Students did not choose using models for the second week as the models were only used during the first week of the HHBE unit. After the second week, the highest percentage of students, 21%, chose the rap song as their favorite activity. The percentage of students who chose the rap song increased from week one, most likely because it was a new volume song with a new beat and the students possibly liked the second song better. The percentage of students who chose "creating the rap" as their favorite activity decreased from week one (25%) to week two (18%), which also could have been a result of students choosing the week two rap song as their favorite activity instead.

Once again, when asked about their least favorite activity after week two of the HHBE lessons, the majority of students responded that they did not have a least favorite activity. Overall, 41% of the students chose no activity as their least favorite. One student, 3F9, stated, "none of them because they were all great." The data showed that the majority of the students continued to enjoy the majority of the activities during the week two HHBE lessons as well. The percentage of students who chose no activity as their least favorite increased from 39% in week one to 41% in week two. The second-highest percentage of students, 20%, chose the rap song as their least favorite activity, which was an increase from 12% in week one. For example, student 3M4, stated, "the songs because they were corny." Once again, the songs were different, so student opinions may have changed because of the different beat or different lyrics. A high percentage of students chose rapping as their favorite activity and others chose rapping as their least favorite activity. This could be due to student personality and choice of music.

Table 19

Week 2 Student Favorite and Least Favorite Activities

	Favorite		Least Favorite	
Activity	*n*	%	*n*	%
Creating Rap	20	18	8	7
Rapping	14	12	10	9
Group	7	6	0	0
Rap Song	24	21	23	20
Rap Battle	10	9	6	5
Everything	6	5	0	0
The Math	4	4	5	4
Off Topic	11	10	7	6
Nothing	2	2	46	41
Volume	8	7	6	5
Word Problem	6	5	2	2
Sampling	1	1	0	0

The results of the analysis for the week three student essays about favorite activities showed that the rap song (27%), rapping (19%), and the rap battle (14%) were the top three favorite activities of the students overall (see Table 20). Similar to the second week, the highest percentage of students, 27%, chose the rap song as their favorite activity. Student 1F3 stated, "song part 3 because it is fun." Another 19% of the overall students chose rapping as their favorite activity from week three. For example, student 6F6 stated, "rapping because it made math more fun." In the third week, the rap battle was one of the top three favorite activities, increasing from 9% in week two to 14% in week three. The increase in the rap battle activity may be because students were becoming more familiar with the activity. The creation of the rap for the cypher activity decreased to only 10% of students from 18% the previous week.

When asked about their least favorite activity in week three, the majority of students (39%) commented that they did not have a least favorite activity. The

percentage of students who chose no activity for their least favorite decreased from 41% to 39% in the third week but remained the highest percentage. One student, 5M3, stated, "everything about the hip-hop is my favorite." These results continued to show that students enjoyed the majority of the activities and could not choose one that they did not like. The second least favorite activity was the rap song, which 19% of the students chose as their least favorite activity. Once again a high percentage of students (27%) chose the rap song as their favorite activity, but a high percentage (19%) also chose the rap song as their least favorite activity. This could be due to student personalities based on if they are outgoing and like to participate in class or not.

Table 20

Week 3 Student Favorite and Least Favorite Activities

	Favorite		Least Favorite	
Activity	*n*	%	*n*	%
Creating Rap	11	10	3	3
Rapping	22	19	9	8
Group	4	4	0	0
Rap Song	31	27	21	19
Rap Battle	16	14	4	4
Everything	8	7	1	1
The Math	3	3	7	6
Off Topic	2	2	9	8
Nothing	4	4	44	39
Volume	7	6	8	7
Word Problem	5	4	3	3
Error Analysis	0	0	4	4

After the fourth week of HHBE lessons, the percentage of overall students who chose the rap song as their favorite activity was still the highest, at 25% (see Table 21). Student 5F4 stated, "when we were listening to the rap songs." The rapping activity was chosen by 15% of the students, volume was chosen by 12% of the students, and the rap

battle was chosen by 11% of the students. The creating a rap activity continued to decrease and was at 6% after the fourth week of HHBE lessons. The reason for this decrease could be students becoming tired of similar activity or students becoming more interested in other activities, such as the rap battle and rap songs.

Once again, in the fourth week, the highest percentage of overall students chose no activity as their least favorite activity. For example, student 4F6 stated, "I liked all because they have music and math." In week four, 35% of the students chose this as their response. This is only a slight decrease from 39% at the beginning of the HHBE unit in week one to 35% at the end of the HHBE unit in week four. The data provided evidence that students enjoyed the majority of the HHBE activities. The rap song was also listed as a least favorite activity by 18% of the students. This may be due to the repetition of the rap songs throughout the week or due to students not liking the beat or lyrics of the weekly song. Again, a large percentage of students (25%) chose the rap song as their favorite activity, while a large percentage (18%) also chose the rap song as their least favorite activity. As stated previously, student personality most likely caused some students to love the rap song and some students to dislike the rap song.

Table 21

Week 4 Student Favorite and Least Favorite Activities

	Favorite		Least Favorite	
Activity	*n*	%	*n*	%
Creating Rap	7	6	2	2
Rapping	17	15	6	5
Test	2	2	3	3
Rap Song	28	25	20	18
Rap Battle	12	11	3	3
Everything	9	8	3	3
The Math	5	4	6	5
Off Topic	5	4	10	9
Nothing	7	6	40	35
Volume	13	12	6	5
Word Problem	6	5	9	8
Error Analysis	0	0	3	3
Video	2	2	2	2

The results of the student responses about favorite and least favorite activities were also analyzed by gender. When I analyzed the week one responses about favorite activities by gender, I found that both male and female students' favorite activity with the highest percentage was "creating the rap" as part of the cypher. Of the 52 male students, 21% (11 students) chose "creating the rap" as their favorite activity and of the 61 female students, 28% (17 students) chose "creating the rap" as their favorite activity. One female student, 2F10, stated, "making the rap was my favorite." One male student, 6M6, stated, "when we did the rap song I liked it." One difference between male and female students' favorite activities was rapping. While 20% of the female students (12 students) chose rapping as their favorite activity, only 10% of the male students (5 students) chose the activity as their favorite.

When I analyzed the week one responses about least favorite activities by gender and found that both male and female students' least favorite activity was listed as none of

the activities. Of the 52 male students, 38% (20 students) stated that they did not have a least favorite activity, and of the 61 female students, 39% (24 students) stated that they did not have a least favorite activity. An example female student, 6F3, stated, "I don't have a least favorite." An example male student, 1M10, stated, "no I like everything because I learned more with everything." The data showed that the majority of males and females had similar responses when answering the question about their least favorite activity. A difference was also found for the rapping activity as a least favorite activity. While 18% of the female students chose rapping as their least favorite activity, only 10% of the male students chose the same activity.

When comparing favorite activities based on gender, I noticed that a higher percentage of male students chose the rap song for week two. Of the 52 male students, 15 of them (29%) chose the rap song as their favorite activity, while, of the 61 female students, only 9 of them (15%) chose the rap song as their favorite activity. The highest percentage of females chose "creating the rap" as part of the cypher as their favorite activity. While 21% of the females chose "creating the rap" as their favorite activity, only 13% of the male students chose the same activity as their favorite. The percentage of both male and female students that chose "creating the rap" decreased from week one to week two, with the female percentage dropping from 28% to 21% and the male percentage dropping from 21% to 13%.

Based on week two student essays, the highest percentage of both male and female students chose no activity as their least favorite activity. Of the male students, 35% chose no activity as their least favorite and of the female students, 46% chose no activity as their least favorite activity. While the percentage of male students who chose

no activity decreased slightly from 38% to 35% from week one to week two, the percentage of female students who chose no activity increased from 39% to 46% from week one to week two. Both male and female students also chose the rap song as their second least favorite activity from week two.

When I analyzed the results of the week three essays by gender, I found that both male and female students chose the rap song as their favorite activity. The percentage of male students who chose the rap song as their favorite activity was 29%, while the percentage of female students who chose the rap song as their favorite activity was 26%. An example male student, 3F2, stated, "the songs." An example female student, 4F7, stated, "my favorite activities from this week were the rap." Both male and female responses about the rap song were very similar this week. Male and female responses were similar for rapping as a second favorite activity as well, with 21% of the male students choosing rapping and 18% of the female students choosing rapping as their favorite activity.

After I analyzed the results of the least favorite activity by gender, I found that the majority of both male students and female students responded that no activity was their least favorite. The percentage of male students who chose no activity as their least favorite was 33%, while the percentage of female students who chose no activity as their least favorite was 44%. One male student, 4M10, stated, "none of them." A female student, 6F9, stated, "none honestly, I liked everything." Both male and female percentages of students who chose no activity decreased slightly from week two results.

When I analyzed the week four essays for favorite activity by gender, I found that both male and female students had the highest percentage of students who chose the rap

song as their favorite activity. The percentage of male students who chose the rap song as their favorite activity was 29%, and the percentage of female students who chose the rap song as their favorite activity was 21%. An example male student, 5M3, stated, "my favorite activities are when we rap." An example female student, 4F5, stated, "the rapping parts and the math problems because they're challenging and I like challenging." Both male and female students also had high percentages who chose rapping as the second favorite activity at the end of the fourth week of HHBE lessons.

My analysis of the week four essays about least favorite student activities showed that 29% of male students chose no activity as their least favorite, while 41% of female students chose no activity as their least favorite. For example, student 6F4 stated, "none because they all taught me new things." The percentage of male students who did not have a least favorite activity decreased from 38% in week one to 29% in week four. For example, student 6M2 stated, "none all was good." The percentage of female students who did not have a least favorite activity increased from 39% in week one to 41% in week four.

The data showed that the highest percentage of both male and female students chose rapping or "creating the rap" as their favorite activity in all four weeks of the HHBE implementation. This provided evidence that using rap songs to teach math concepts and using cyphers ("creating the raps") during math lessons were enjoyed by students and may be useful strategies for other students. There was only a slight difference between male and female students when discussing favorite activities. This provided evidence that both male and female students enjoyed the rap songs and "creating the raps." The highest percentage of both male and female students also chose

no activity as their least favorite in all four weeks of the HHBE implementation. However, in each of the four weeks a higher percentage of female students chose no least favorite activity each week. This may provide evidence that more female students than male students enjoyed the variety of activities used during the HHBE implementation.

Attitudes toward Math

The third category that emerged during the coding of the weekly student perceptions essays was the students' perceived changes in their attitudes toward math during the HHBE lessons. The subcategories that emerged included change, no change, and couldn't tell. The student responses were analyzed for each of the four weeks of student essays by overall students and by gender.

After the first week of HHBE lessons were taught by their teachers, the majority of students responded that their attitudes toward math had changed in a positive way (see Table 22). Of the 113 total student participants, 67% (76 students) claimed that their attitudes toward math had changed when responding to the week one student perceptions essay. One of the students who responded that his attitude had changed, 6M8, stated, "yes, because it was exciting to me." Another student, 5F5, stated that her attitudes changed "because now I have more fun and like math more." Another 28% of the students (32 students) stated that their attitudes toward math had not changed after the first week of HHBE. One of the students who responded that his attitude did not change, 6M11, stated, "no, because I didn't like the math song." A female student, 4F8, responded that "my attitude toward math has not changed." The remaining students didn't know if their attitudes had changed or had an off-topic response.

Table 22

Week 1 Perceived Change in Student Math Attitudes

Change in Math Attitudes	*n*	*%*
Yes	76	67
No	32	28
Can't Tell	3	3
Off-Topic	2	2

After analyzing the student responses from week two perceptions essays, I found that 60% of the students (68 students) responded that their math attitudes had changed (see Table 23). This was a decrease from week one responses from 67% in the first week to 60% in the second week. One student, 2F2, stated, "yes, because I actually look forward to math" when asked if her attitudes had changed. Another student, 2F5, stated, "yes, I really do believe my attitudes changed because I don't want to miss school anymore." Another 29% (33 students) of the overall students responded that they did not have a perceived change in attitude after the second week of HHBE lessons. This was a slight increase from 28% in the first week. One of the students, 1M5, stated, "no, because we haven't taken a test yet." This student, and possibly others, wasn't able to perceive any changes since he had not been given a grade from his teacher. These results showed that perceived attitude changes were not as prevalent in week two as in week one.

Table 23

Week 2 Perceived Change in Student Math Attitudes

Change in Math Attitudes	*n*	*%*
Yes	68	60
No	33	29
Can't Tell	6	5
Off-Topic	6	5

After the third week of HHBE lessons, the majority of students still perceived a change in their attitudes toward math (see Table 24). Of the 113 students, 59% of them (67 students) perceived a change in their attitudes toward math. When asked about a change in attitude, one student, 4F6, replied, "yes, I think that it changes because music and math are mixed." Another student, 3F12, stated, "yes, because it helps." This was a slight decrease from the previous week when 60% of the students perceived a change in their attitudes toward math. Of the 113 students, 37% of the students (42 students) did not perceive a change in their attitudes toward math after the third week of HHBE lessons. This was an increase from 29% in the previous week. One student, 6M10, stated, "no, I liked it from the start." This response may explain that this student, and possibly others, did not perceive a change after the third week because they had already had a change in attitudes after the first week of HHBE lessons.

Table 24

Week 3 Perceived Change in Student Math Attitudes

Change in Math Attitudes	*n*	*%*
Yes	67	59
No	42	37
Can't Tell	1	1
Off-Topic	3	3

After analyzing the student perceptions essays from the fourth week of the HHBE unit, I found that the majority of students continued to have a perceived increase in math attitudes. Out of the 113 student participants, 56% of them (63 students) responded that they had a perceived change in their attitudes toward math after the fourth week of HHBE lessons. One student, 4F3, stated, "my attitudes did change this week because when we start it, I didn't want to do it, but I didn't know we were going to do all this

stuff which is really fun." Another student, 6F12, stated, "yes because I got to know more things and get to improve." This was a decrease from 59% after the third week of HHBE lessons and an overall decrease of 11% from 67% in the first week to 56% in the fourth week. Again, this may be because students had a change in attitudes after the first week and did not perceive any further changes by the fourth week. Out of the 113 student participants, 35% of them (40 students) did not perceive a change in their attitudes toward math after the fourth week of HHBE lessons. For example, one student, 5F1, stated, "No my attitude has not changed." This was a slight decrease from 37% of overall students who had no perceived change in attitudes after the third week of HHBE lessons. However, from the first week to the fourth week, there was an increase from 28% to 35% of students that did not perceive a change in their math attitudes. Once again, this increase may be due to students having a change in attitudes after the first week and not feeling any other changes throughout the remainder of the HHBE unit.

Table 25

Week 4 Perceived Change in Student Math Attitudes

Change in Math Attitudes	*n*	*%*
Yes	63	56
No	40	35
Can't Tell	5	4
Off-Topic	5	4

From the first week of student perceptions essays (67%) to the fourth week of student perception essays (56%), the number of students who perceived a change in their math attitudes decreased slightly (see Figure 4). This may be due to students perceiving a large change after the first week of HHBE implementation and then not noticing another large change throughout the rest of the unit.

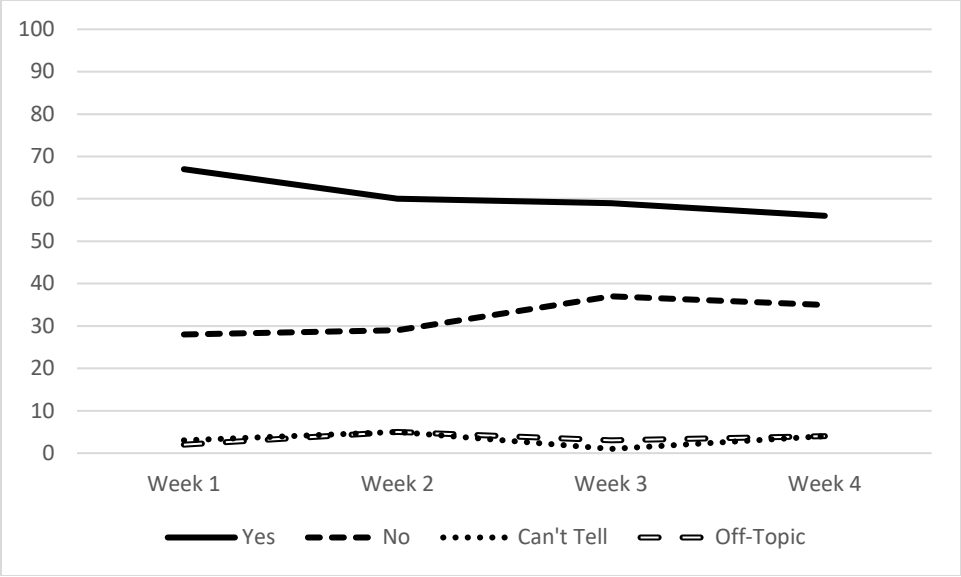


Figure 4. The percentage change in student math attitudes from week one to week four.

I also analyzed the results of the student essay responses about perceived change in attitude by gender. The results of the analysis by gender showed that a higher percentage of female students perceived a change in their attitudes toward math after the first week of HHBE lessons (see Table 26). Of the 61 female students, 77% of them (47 students) reported that their attitudes toward math had changed after the first week. For example, student 2F1 stated, "I think my attitude toward math changed this week because at first I did not really like math, but with the lessons, I am learning I feel amazing because we learn math but with it we have fun." Of the 52 male students, 56% of them (29 students) reported that their attitudes toward math had changed after the first week. For example, student 6M8 stated, "yes, because I got to use hip-hop math." This data showed that there was a difference between male and female students' perceived changes in attitudes toward math after the first week of HHBE lessons. The percentage of female students who responded that they had no change in attitudes toward math was 16% (10 students), while the percentage of male students who responded that they had no change in attitudes toward math was 37% (19 students). This data also showed a difference

between genders' perceived changes in attitudes toward math after the first week of HHBE lessons.

Table 26

Week 1 Perceived Change in Student Math Attitudes by Gender

	Male		Female	
Change in Math Attitudes	*n*	%	*n*	%
Yes	29	56	47	77
No	19	37	10	16
Couldn't Tell	2	4	3	5
Off-Topic	2	4	1	2

Once again, after the second week, the results of the analysis by gender showed that a higher percentage of female students perceived a change in math attitudes than male students (see Table 27). The percentage of female students that perceived a change in math attitudes after the second week of HHBE lessons was 72% (44 students). For example, student 1F6 stated, "yes, because I learned for fun so I want to learn more and more about volume." The percentage of male students that perceived a change in math attitudes after the second week of HHBE lessons was 46% (24 students). For example, student 4M1 stated, "yes it really did, me and others enjoyed how we learned this week." The data showed a difference between the percentage of female and male students who perceived a change in their attitudes toward math. The data also revealed that the percentage of female students who perceived a change in their math attitudes decreased from 77% to 72% in week two and the percentage of male students who perceived a change in their math attitudes decreased from 56% to 46% in the second week. This decrease in perceived attitude changes could be due to students becoming familiar with the HHBE teaching strategy. In the second week, 38% of the male students (20 students)

responded that they did not have a change in math attitudes, while only 21% of the female students (13 students) responded that they did not have a change in math attitudes. The data showed a slight increase in the percentage of both male and female students who did not perceive a change in their attitudes toward math.

Table 27

Week 2 Perceived Change in Student Math Attitudes by Gender

	Male		Female	
Change in Math Attitudes	*n*	*%*	*n*	*%*
Yes	24	46	44	72
No	20	38	13	21
Couldn't Tell	4	8	2	3
Off-Topic	4	8	2	3

After the third week of HHBE lessons, a higher percentage of female students continued to perceive a change in their attitudes toward math than male students (see Table 28). After the third week, 60% of the female students (36 students) perceived a change in math attitudes, while 58% of the male students (30 students) perceived a change in math attitudes. One female student, 1F4, stated, "yes, I like it more because have more music." One male student, 6M8, stated, "yes because there are new kinds of things for math." The percentage of female students who perceived a change in math attitudes continued to decrease, dropping from 72% in the second week to 60% in the third week. The percentage of male students who perceived a change in math attitudes increased, going from 46% in week two to 58% in week three. The percentage of female students who did not perceive a change in math attitudes after week three was 34% (21 students) and the percentage of male students who did not perceive a change in math attitudes after week three was 40% (21 students). Male and female students both had an

increase in the percentage of students who did not perceive a change in math attitudes from week two to week three.

Table 28

Week 3 Perceived Change in Student Math Attitudes by Gender

	Male		Female	
Change in Math Attitudes	*n*	*%*	*n*	*%*
Yes	30	58	36	60
No	21	40	21	34
Couldn't Tell	1	2	1	2
Off-Topic	0	0	3	5

After the fourth week, when analyzed by gender, the majority of both male and female students continued to have a perceived change in math attitudes. Of the 61 female students, 62% of them (38 students) perceived a change in their attitudes toward math after the fourth week of HHBE lessons (see Table 29). For example, student 4F6 stated, "yes it got better because they have music and math." Of the 52 male students, 48% of them (25 students) perceived a change in their attitudes toward math after the fourth week of HHBE lessons. For example, student 4M2 stated, "I think it did change because it was a fun way of learning math." Once again, the percentage of female students who perceived a change in math attitudes was higher than the percentage of male students who perceived a change in math attitudes. The data showed that more male and female students perceived a change in math attitudes after the first week of HHBE lessons. The percentage of female students who perceived a change in math attitudes decreased from 77% after the first week to 62% after the fourth week. The percentage of male students who perceived a change in math attitudes decreased from 56% after the first week to 48% after the fourth week.

Table 29

Week 4 Perceived Change in Student Math Attitudes by Gender

	Male		Female	
Change in Math Attitudes	*n*	*%*	*n*	*%*
Yes	25	48	38	62
No	21	40	19	31
Couldn't Tell	3	6	2	3
Off-Topic	3	6	2	3

From week one to week four, the percentage of both male and female students who perceived a change in their math attitudes decreased. The male students' perceived change in math attitudes decreased from week one (56%) to week two (46%), increased from week two (46%) to week three (58%), and then decreased from week three (58%) to week four (48%). The female students' perceived change in math attitudes decreased from week one (77%) to week two (72%), decreased again from week two (72%) to week three (60%), and increased slightly from week three (60%) to week four (62%). Some students may have perceived a change the first week and then not noticed another change in the following weeks. Some students may also have perceived a bigger change in the first week because the HHBE unit was new to them. Overall, the percentage of female students who perceived a change in math attitudes was higher than the percentage of male students who perceived a change in math attitudes.

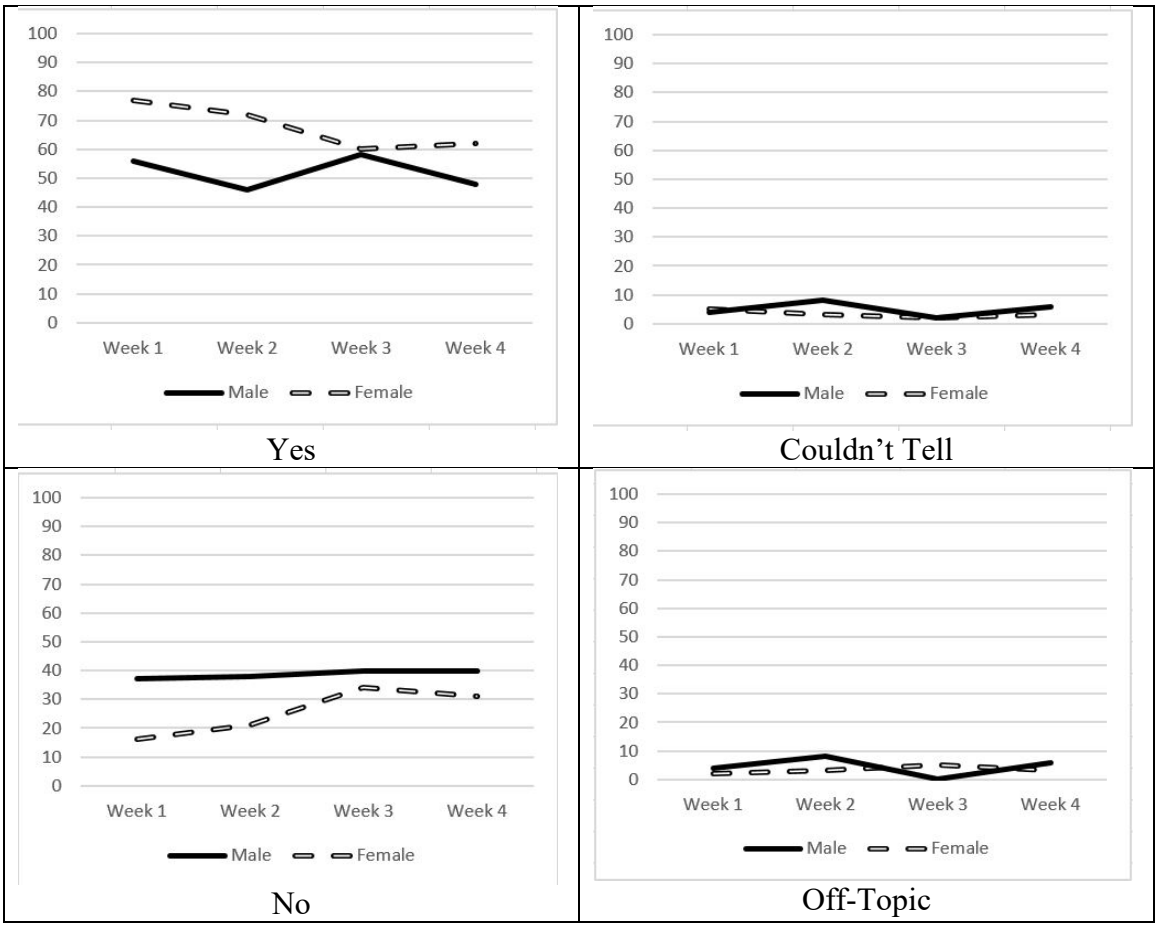


Figure 5. The percentage change in math attitudes by gender from week one to week four

Student Math Achievements

The final category that emerged during the coding of the weekly student perceptions essays was perceived change in student math achievements. The subcategories that emerged included change, no change, and couldn't tell if there was a change. The student responses were analyzed overall and by gender.

After one week of HHBE lessons, the majority of students responded that their math achievements had changed. Of the 113 student participants, 58% of them (65 students) perceived that their math achievements had changed after the first week (see Table 30). One of the students, 1F1, stated, "I think it is going up because I am doing good with volume." Another student, 2M6, claimed, "my achievements changed because

I like to do it that way." Of the 113 participants, 32% of them (36 students) responded that their math achievements had not changed after the first week of HHBE lessons. One of the 36 students, 5M8, stated, "no, because it's too hard." Another student, 5F5, who did not perceive a change in her achievements said, "not really, I was about getting the same grades that I did without the hip-hop or rap."

Table 30

Week 1 Perceived Change in Student Math Achievements

Change in Math Achievements	*n*	*%*
Yes	65	58
No	36	32
Can't Tell	9	8
Off-Topic	3	3

After analyzing the student perceptions essays for the second week, I found that the majority of students continued to perceive an increase in their math achievements. After the second week, 64% of the students (72 students) responded that their math achievements had changed (see Table 31). This was an increase from 58% at the end of week one of the HHBE lessons. This increase may be due to the fact that students had learned more about volume by the end of the second week. One student, 4M10, stated, "yes, because of this I got smarter." Another student, 4F5, stated, "yes, because I understood volume clearer." After the second week of HHBE lessons, 25% of the students (28 students) responded that they did not have a perceived change in math achievements. This was a decrease from 32% of the students in the first week. One of those students, 3F10, stated, "not really, but still fun though." The data provided evidence that student perceptions of an increase in math achievements increased from week one to week two.

Table 31

Week 2 Perceived Change in Student Math Achievements

Change in Math Achievements	*n*	*%*
Yes	72	64
No	28	25
Can't Tell	8	7
Off-Topic	5	4

After the third week of HHBE lessons, the majority of students continued to perceive a change in math achievements. Of the 113 students, 63% of them (71 students) perceived a change in math achievements after the third week of HHBE lessons (see Table 32). This was the same percentage of students from the previous week. One student, 2M6, stated, "my achievements change by me wanting to do better." Another student, 5M9, stated, "yes, because I am learning about length, width, height." Of the 113 students, 30% of them (34 students) did not perceive a change in math achievements after the third week of HHBE lessons. One of the students, 3F7, responded, "I don't think that my math achievements changed during this week's HHBE lessons." This was an increase from 25% in week two to 30 % in week three of students who did not perceive a change in math achievements.

Table 32

Week 3 Perceived Change in Student Math Achievements

Change in Math Achievements	*n*	*%*
Yes	71	63
No	34	30
Can't Tell	4	4
Off-Topic	4	4

After the fourth week of HHBE lessons, the majority of students continued to perceive a change in their math achievements. Of the 113 students, 56% of them (63 students) responded that they perceived a change in their math achievements (see Table 33). One of the students, 4M7, stated, "yes it has changed because the lyrics of the song make sense and helps me." Another student, 5M4, stated, "yes, HHBE motivates me to do better in math." This was a slight decrease from 58% after the first week of HHBE lessons. Of the 113 students, 33% of them (37 students) did not perceive a change in math achievements after the fourth week of HHBE lessons. One student, 4M4, stated, "not at all, it's the same." This was a slight increase from 32% of the students after the first week of HHBE lessons. This data provided evidence that while the percentages changed slightly, the majority of students perceived a change in their math achievements throughout the entire unit.

Table 33

Week 4 Perceived Change in Student Math Achievements

Change in Math Achievements	*n*	*%*
Yes	63	56
No	37	33
Can't Tell	9	8
Off-Topic	4	4

The majority of students responded that their math achievements were increasing due to the use of HHBE in their math lessons. From the first week of HHBE implementation (58%) to the second week (64%), students' perceived change in math achievements increased (see Figure 6). From the second (64%) to the third week (63%), students' perceived change in math achievements decreased very slightly. From the third week (63%) to the fourth week (56%), students' perceived change in math achievements

decreased. The decrease at the end of the fourth week may be due to the difficulty level of the standard taught during the fourth week of HHBE unit implementation. The standard about compound volume was much more difficult than the previous standards that were taught during weeks one through three.

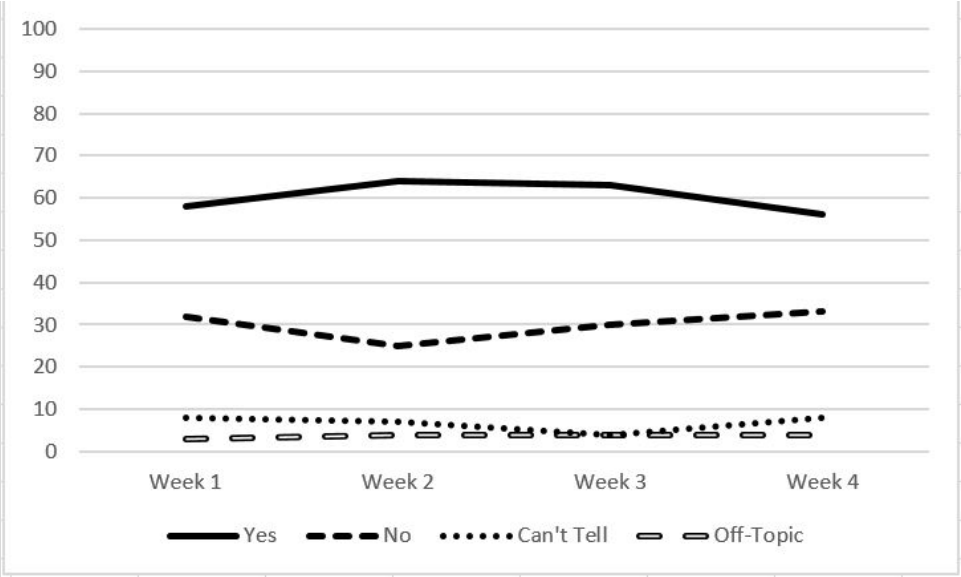


Figure 6. The percentage change in student math achievements from week one to week four.

The student responses about their perceived change in math achievements were also analyzed by gender. The percentage of female students who responded that they had a perceived change in math achievements was 67% (41 students), while the percentage of male students who responded that they had a perceived change in math achievements was 46% (24 students) (see Table 34). One female student, 6F9 stated, "I think I have been more interested, so yes." One male student, 5M4, stated, "yes, I did bad in math but now I'm doing better." The data provided evidence that the female students' perceived that the HHBE lessons helped improve their math achievements more often than the male students after week one. The percentage of female students who responded that they did not have a perceived change in math achievements was 23% (14 students), while the

percentage of male students who responded that they did not have a perceived change in math achievements was 42% (22 students). Again, this data provided evidence that female students were more likely to have a perceived change in math achievements after the first week of HHBE lessons.

Table 34

Week 1 Perceived Change in Student Math Achievements by Gender

	Male		Female	
Change in Math Achievements	*n*	*%*	*n*	*%*
Yes	24	46	41	67
No	22	42	14	23
Couldn't Tell	4	8	5	8
Off-Topic	2	4	1	2

After analyzing the student perceptions essays for week two by gender, I found that a higher percentage of female students perceived a change in math achievements than male students (see Table 35). Of the 61 female students, 69% of them (42 students) perceived a change in math achievements after the second week of HHBE lessons. For example, student 5F13 stated, "yes because I really love doing the volume lessons." Of the 52 male students, 58% of them (30 students) perceived a change in math achievements after the second week of HHBE lessons. For example, student 4M10 stated, "yes because of this I got smarter." The percentage of female students increased from 67% in the first week, while the percentage of male students increased from 46% in the first week. The male students had a much larger increase in the percentage of students who perceived a change in math achievements from the first week to the second week of HHBE lessons. The percentage of female students who did not perceive a change in achievements was 21% (13 students), while the percentage of male students

who did not perceive a change in achievements was 29% (15 students). The data showed a decrease in the percentage of both male and female students that did not perceive a change in math achievements after week two.

Table 35

Week 2 Perceived Change in Student Math Achievements by Gender

	Male		Female	
Change in Math Achievements	*n*	*%*	*n*	*%*
Yes	30	58	42	69
No	15	29	13	21
Couldn't Tell	4	8	4	7
Off-Topic	3	6	2	3

After analyzing the student perceptions essays from week three, I found that the majority of both male and female students continued to perceive a change in their math achievements. Of the 61 female students, 66% of them (40 students) perceived a change in their math achievements (see Table 36). For example, student 5F12 stated, "yes because it is making me want to see what we can do and what we can learn." Of the 52 male students, 60% of them (31 students) perceived a change in their math achievements. For example, student 6M8 stated, "yes because it makes me do better with songs in it." The percentage of female students who perceived a change in math achievements decreased from 69% after week two to 66% after week three. The percentage of male students who perceived a change in math achievements increased from 58% after week two to 60% after week three. While the percentage of females who perceived a change in math achievements was still higher than the percentage of males, the percentage of males continued to increase while the percentage of females decreased from week two to week three. Of the 61 female students, 26% of them (16 students) did not perceive a change in

math attitudes after the third week. Of the 52 male students, 35% of them (18 students) did not perceive a change in math attitudes after the third week. Once again, the percentage of male students who did not perceive a change in math achievements was higher than the percentage of female students who did not perceive a change in math achievements after the third week of HHBE lessons.

Table 36

Week 3 Perceived Change in Student Math Achievements by Gender

	Male		Female	
Change in Math Achievements	*n*	*%*	*n*	*%*
Yes	31	60	40	66
No	18	35	16	26
Couldn't Tell	1	2	3	5
Off-Topic	2	4	2	3

Finally, I analyzed the results of the week four perceptions essays by gender. Of the 61 female students, 57% of them (35 students) perceived a change in their math achievements after the fourth week of HHBE lessons (see Table 37). For example, student 4F1 stated, "yes, I am starting to like math more." Of the 52 male students, 54% of them (28 students) perceived a change in their math achievements after the fourth week of HHBE lessons. For example, student 4M7 stated, "yes it has changed because the lyrics of the song make sense and helps me." The percentage of female students who perceived a change in math achievements decreased from 67% after the first week to 57% after the fourth week. The percentage of male students who perceived a change in math achievements increased from 46% after the first week to 54% after the fourth week. Again, even though the percentage of female students who perceived a change in achievements was higher than the percentage of male students, the percentage of male

students increased from week one to week four. Of the 61 female students, 34% of them (21 students) did not perceive a change in math achievements after week four. Of the 52 male students, 31% of them (16 students) did not perceive a change in math achievements after week four. These results provided evidence that the majority of students perceived a change in math achievements throughout the HHBE unit.

Table 37

Week 4 Perceived Change in Student Achievements by Gender

	Male		Female	
Change in Math Achievements	*n*	*%*	*n*	*%*
Yes	28	54	35	57
No	16	31	21	34
Couldn't Tell	5	10	4	7
Off-Topic	3	6	1	2

From week one to week four male students' perceptions of their change in math achievements increased, while female students' perceptions of their change in math achievements decreased. Male students' perceptions increased from week one (46%) to week two (58%), increased again from week two (58%) to week three (60%), and then decreased from week three (60%) to week four (54%). Female students' perceptions increased slightly from week one (67%) to week two (69%), decreased from week two (69%) to week three (66%), and decreased again from week three (66%) to week four (57%). Some students may have perceived a change the first week and then not noticed another change in the following weeks. Overall, a higher percentage of female students perceived a change in their math achievement after the first week of HHBE lessons.

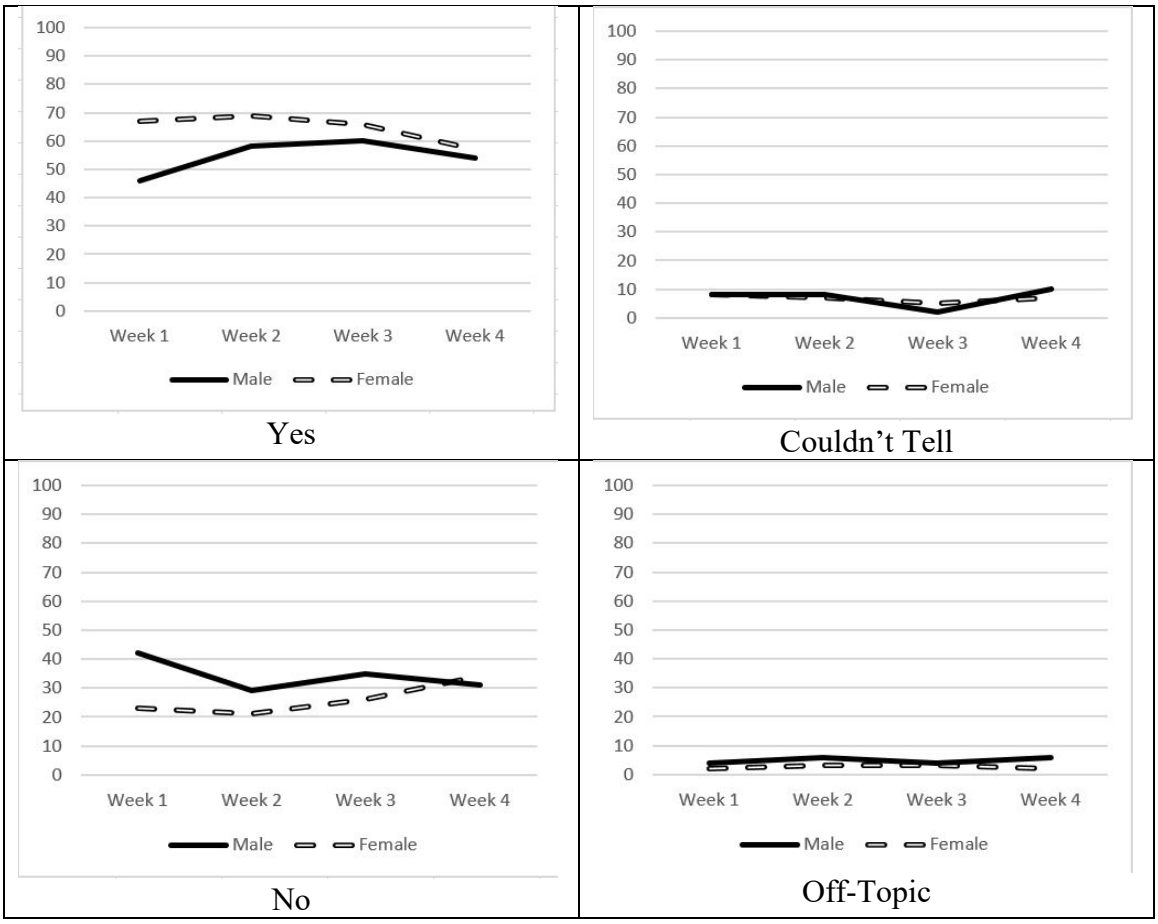


Figure 7. The percentage change in math achievements by gender from week one to week four

Analysis of Research Question 4

RQ4. What are the teachers' perceptions of the overall effect of the Hip-Hop Based Education unit?

To determine teacher perceptions of the overall effect of the HHBE Unit, five teachers were interviewed for approximately sixty minutes each. The teachers responded to questions about their overall perceptions of the unit, feelings about specific activities, opinions of HHBE in the future of education, and possible changes that could be made. The teacher interviews were coded by me using Tesch's eight steps of coding. The interviews were transcribed and sent to the teacher participants for member checking of the data. Once the interviews were validated, one interview was sent to a researcher who

was more proficient in qualitative research. The researcher read and coded the interview for inter-coder reliability. The coding completed by the researcher was compared to the coding completed by myself to determine the categories used in the analysis of the five interviews.

I determined several strong categories that were present in all of the five interviews with the teacher participants. The categories include student engagement, with subcategories of positive engagement, hesitancy, and negative engagement, teacher perceptions, with subcategories of gender, ethnicity, and culturally responsive education, student achievements, with a subcategory of increased, and expansion, with subcategories of time and other subjects.

Each of the five teachers was assigned a unique ID for the analysis of the interviews. The teachers were given IDs of teacher participant 1 (TP1), teacher participant 2 (TP2), teacher participant 3 (TP3), teacher participant 4 (TP4), and teacher participant 5 (TP5). The table below gives some details about each of the teacher participants.

Table 38

Teacher Participant Information

Participant	IDs	Years of Teaching	Previous Experience with HHBE
1	TP1	9	Some
2	TP2	8	Some
3	TP3	1	None
4	TP4	8	None
5	TP5	3	A lot

Student Engagement

The first category that emerged during the coding of the interviews was student engagement. In the category of student engagement, three subcategories, positive engagement, hesitancy, and negative engagement were discussed by the participants. The overall opinion of the teacher participants was that the students were hesitant to participate and engage in the HHBE lessons at the beginning. As teacher TP2 stated, "at first they were pretty hesitant to make their own raps." When discussing students rapping in front of the class, teacher TP5 said it "forces them out of their comfort zone" and "some of those nerves just kind of come back and they get a little stage fright." This comment helped explain why some students may have been hesitant at the beginning of the HHBE unit. A third participant, teacher TP4 stated, "they didn't feel comfortable with the rapping and maybe they didn't know hip-hop much since they weren't familiar with the beat." The comments from the teacher participants provided evidence that students may have been hesitant to participate in the HHBE lessons, especially at the beginning of the unit.

Another overall opinion was that most students began showing more positive engagement once they saw others participating. The positive engagement was the strongest category that emerged from the interview coding, as all five of the teacher participants discussed student engagement, and had the opinion that overall the HHBE unit created a positive engagement for most students. One participant, teacher TP2 noted that "once the kids started to get brave, all it took was one kid to do it and then all of a sudden the rest of the class was like okay we can do this." Teacher TP5 stated, "students were excited and engaged for the lessons." Teacher TP1 expressed a similar opinion,

stating, “any time you can get kids up and you can get kids interacting and engaged, it increases their engagement, which will increase their learning.” When discussing the changes to student attitudes during the HHBE unit, teacher TP3 also commented that it was a “fun way for them to kind of get into it a little bit more than they would have if it wasn’t cool rappers.” Teacher TP5 also added,

> “I would say the kids who are on the bubble, this activity, or this unit was good for them because I think that they got pushed into the sphere of loving math for four weeks. And, now maybe some of them will stay there. So, I think that’s really positive about this unit.”

All of the teacher participants who were interviewed shared a common opinion that the students became more engaged in math due to the implementation of the HHBE unit. As evidenced by the teacher participants’ opinions about positive engagement, the HHBE unit created an increase in student engagement in the participating classrooms.

Another prevalent opinion of the teacher participants was that the rap battle created some negative engagement and feelings of frustration for the student participants. When discussing the similarities between the cyphers and the rap battles, teacher TP5 noted that the rap battles, “just kind of served as somewhat similar, except it just had negative aspects for some students because of the battle and there’s gotta be a winner, there’s gotta be a loser.” Teacher TP4 shared similar feelings about the rap battles, saying that, “we tried to create our own the first time and it was an epic fail, and it just caused confusion and frustration.” While two of the five teacher participants, teachers TP2 and TP3, did not share any negative opinions about the rap battles, I would still

reevaluate the rap battle strategy before using it again in the future due to the negative opinions from several teacher participants.

Teacher Perceptions Related to Gender

The second category that was discovered during the coding of the teacher participant interviews was teacher perceptions. In this category, three subcategories were determined, including gender, ethnicity, and culturally responsive education. The role of gender during the HHBE unit differed between classrooms, with teachers TP1 and TP4 sharing that gender made no difference, teachers TP3 and TP5 sharing that the boys were more engaged, and teacher TP2 sharing that the females took more control and more leadership during the HHBE lessons. Teacher TP4 commented, "I even have more boys than girls, but that did not seem to make a difference." On the other hand, teacher TP3 stated, "the boys probably had more of a connection with it" and "there were a few shy girls who were just too shy to even sing along with the class." A final viewpoint, shared by teacher TP2 was, "I have more girls than boys, so the girls kind of took over, and they were the first ones to start dancing to the music and kind of singing along to the music." As shown by the varying viewpoints, the effect of HHBE on males versus females cannot be determined and may vary from class to class.

Teacher Perceptions Related to Ethnicity

The subcategory of ethnicity also emerged when teacher participants were discussing their perceptions of the HHBE unit. Only teachers TP2, TP4, and TP5 noted differences between students of different ethnicities in their classrooms. The overall viewpoint of those teachers on ethnicity was that Black students were more engaged and more likely to participate than other ethnicities. Teacher TP5 stated, "I would just say,

that when it came to leading the groups or being, quote-unquote, in charge, it did tend to fall more to African-American students." Teacher TP2 stated, "the Hispanic kids were pretty close behind them, but I would definitely say that the Black kids were the most excited." Finally, teacher TP4 stated, "the African-American students, they loved it. They were the ones who took the lead of the group to actually write the lyrics." The comments from teachers TP2, TP4, and TP5 showed that HHBE may be a more useful strategy for Black students than students of other ethnicities. However, since teachers TP1 and TP3 did not comment on a difference between ethnicities, this topic may need further research to determine which ethnicity is more affected by the use of HHBE in the classroom.

Teacher Perceptions Related to Culturally Responsive Teaching

A final subcategory that emerged while teacher participants discussed their perceptions was culturally responsive teaching. Teachers TP1, TP2, TP4, and TP5 discussed the idea that HHBE was a culturally responsive strategy for teaching the students math. When discussing teacher learning during the unit, teacher TP4, "I learned a lot too, like how being culturally responsive is so important to these kids and their learning." Teacher TP1 stated, "I think this unit made me more aware of how we can connect to our kids' experiences and how we can engage them in current ways that are more meaningful to them." Through the teaching of the HHBE unit, both participants realized the importance of reaching students through the use of parts of their own culture. Teacher TP2 also shared an opinion about the use of music from students' lives in the classroom. Teacher TP2 stated,

> "It makes them kind of feel like they are understood a little bit better, because now that there's so much of life that's based around music and that's the music that they hear all the time, so I think it does touch them on a different level. So if we are able to read those students a little deeper than normal, I definitely think it's a potential for success."

When discussing how powerful the tool of hip-hop can be in the classroom, teacher TP5 stated, "the black and brown kids who live in these places and these cities who would then get marginalized and their voices aren't listened to, and, so they go home and they play this music that they can relate to, or their parents might be able to relate to." Teacher TP5 also discussed the importance of using hip-hop effectively and not making it into a gimmick to be used in the classroom. Effective ways to use hip-hop in the classroom may be another topic for further research.

Increased Student Math Achievements

The third category that emerged during the coding of the teacher interviews was increased student achievements. All five of the teacher participants discussed increased student achievements during their interviews. When discussing the scores on the post-test for the volume unit, teacher TP3 stated, "the scores were much better for a lot, compared to some of our summative tests in math." Similarly, teacher TP5, "this unit's district assessment was our highest scoring" and "I would say that it was probably better than if we were to teach it the way we usually teach it." Teacher TP2 discussed student use of strategies on the assessment, claiming, "Because we had so much fun with it, they had a lot more memories from the lessons, so I hope that kind of engrained in their brains, the strategies." Teacher TP2 also stated, "I assume they were able to kind of sing

the songs in their heads when they were taking the post-test, so I hope they were able to use those tools while they were testing." It was the overall opinion of all five teachers interviewed that student achievements had increased because of the HHBE unit.

The Expansion of HHBE in Education

The final category that emerged during the five teacher interviews was the expansion of HHBE in education. All of the teacher participants believed that HHBE could be a useful strategy for other grade levels and subjects. Some of the suggestions for expansion of HHBE included using HHBE in third-, fourth-, and fifth-grade, expanding to other subjects including reading and language arts, using the rap battles to debate in reading, and allowing for more time to teach using HHBE strategies. Teacher TP1 suggested, "we could easily transfer this to language arts," while teacher TP5 similarly stated, "giving kids the space to work independently and maybe integrate some reading or writing in it would have been really productive." Also discussing the idea of using HHBE in writing, teacher TP4 stated, "I think also in writing, before they brainstorm, like opinion writing, they can battle what the claim is." Finally, when discussing the use of HHBE in any other subject, teacher TP2 suggested, "coming up with raps for other things that they have to know and remember would be a good idea." The information collected from this category showed that the teachers found HHBE useful as a strategy and could see it transferring to other subjects and grade levels.

Integrating Quantitative and Qualitative Data

The overall purpose of this study was to determine the effect of an HHBE unit in fifth-grade math on student attitudes and achievements in math. The overall changes in overall perceptions, math achievements and math attitudes, the changes in, overall

perceptions, math achievements and attitudes by gender, favorite and least favorite activities, and culturally responsive teaching were all supported by quantitative and qualitative data collected in this study.

Overall Student Perceptions

The qualitative data collected from weekly student perceptions essays provided evidence that overall, students enjoyed the HHBE unit and made positive comments about the unit. The number of positive student perceptions of the HHBE unit from week one (74%) to week two (81%) and week two (81%) to week three (84%) increased slightly. The number of positive student perceptions of the HHBE unit remained the same from week three (84%) to week four (84%).

Changes in Math Achievements

The quantitative data that was collected by analyzing the difference in student scores from a pretest to a posttest showed that the HHBE unit was successful in increasing student achievements. The pretest mean was 5.51 (SD = 2.409), while the mean of the post-test student scores was 10.92 (SD = 2.696). A significant increase from the pretest to posttest was found ($t(112) = 19.243$, $p = .000 < .05$). This showed a significant increase in student math achievements following the implementation of the HHBE unit for four weeks. Additional paired-sample t-tests were also run for each of the six Georgia Standards of Excellence (GSE) volume standards covered in the HHBE Unit. The results of the paired-sample t-tests run on the individual GSE volume standards showed a significant increase from the pretest to posttest on all six-volume standards.

The qualitative data collected to explain the results of the quantitative data were both weekly student perceptions essays and teacher interviews. In the weekly student

perceptions essays, the majority of students responded that their math achievements were increasing due to the use of HHBE in their math lessons. The number of students who perceived a change in their math achievements from week one (58%) to week two (64%) increased, but then from week two (64%) to three (63%) and three (63%) to four (56%) the number of students who perceived a change in math achievements decreased. The decrease at the end of the fourth week may be due to the difficulty level of the standard taught during the fourth week of HHBE unit implementation. The standard about compound volume was much more difficult than the previous standards that were taught during weeks one through three. In the interviews, all of the teachers claimed that student math achievement had increased because of the HHBE unit. The qualitative results validated the quantitative results by giving more details about the perceptions of both the student participants and teacher participants. Both the quantitative and qualitative data showed that student achievements increased during the implementation of the HHBE unit.

Changes in Math Attitudes

The quantitative data used to determine a change, if any, in student attitudes toward math was a pre-survey and post-survey about math self-perceptions and enjoyment. The pair-sample *t*-test analysis of the pre-survey and post-survey showed that student math attitudes did not increase from the beginning of the HHBE unit to the end of the HHBE unit. The mean on the pre-survey was 2.30 (SD = .706) and the mean on the post-survey was 2.24 (SD = .730). No significant difference from the pre-survey to post-survey was found ($t(112) = -1.552$, $p = .124 > .05$). Additional paired-sample *t*-tests were also run to determine the changes, if any, in student attitudes toward math in the two

subscales included in the Math and Me Survey. For the self-perceptions subscale, the results showed a significant decrease from the pre-survey to post-survey ($t(112) = -3.803$, $p = .000 < .05$, which indicated that the HHBE unit might not help increase student self-perceptions of their math ability. For the enjoyment subscale, the mean for the enjoyment subscale on the post-survey ($M = 2.18$, $SD = .860$) was slightly higher than the mean for the enjoyment subscale on the pre-survey ($M = 2.17$, $SD = .810$). However, the difference between the pre-survey and post-survey was not large enough to indicate a significant positive effect of the HHBE unit on student enjoyment of math ($t(112) = .186$, $p = .852 > .05$). Additional paired-sample *t*-tests were run on each of the individual survey questions to determine the changes, if any, in specific student attitudes toward math. A significant decrease from the pre-survey to post-survey was found for questions 1, 5, 7, and 15. Those four questions were all from the self-perceptions subscale which may be an indicator that the HHBE unit might not help increase student self-perceptions of their math ability. This may also be due to the amount of time the unit was implemented, since students may not have had enough time in the four weeks to actually determine changes in self-perceptions. The remaining questions did not show significant changes from the pre-survey to post-survey. However, on survey questions 4, 6, 8, 14, and 16 there was a small increase from pre-survey to post-survey. All five of the survey questions that showed a small increase from the pre-survey to post-survey were from the enjoyment subscale. This finding was positive, but the increase was not large enough to indicate a significant positive effect of the HHBE unit on student enjoyment of math.

The qualitative data from the weekly student perceptions essays and teacher interviews showed a different result. The qualitative data collected from the weekly

student essays showed that a majority of students thought their math attitudes had increased. Although the number of students who perceived a change in math attitudes decreased from week one to week four, the majority of students each week perceived a change in their math attitudes. The teacher interviews also showed that the teachers saw an increase in engagement in math lessons. While the quantitative data showed that student math attitudes did not increase, the qualitative data indicated that students and teachers perceived student attitudes increased during the implementation of the HHBE unit.

Gender Effect on Overall Student Perceptions

The qualitative data collected from student perceptions essays showed that overall student perceptions increased from week one to week four for both male and female students. Male students' positive perceptions remained the same from week one (77%) to week two (77%), increased from week two (77%) to week three (88%), and then decreased slightly again from week three (88%) to week four (83%). Female students' positive perceptions increased from week one (72%) to week two (84%), decreased slightly between week two (84%) and week three (80%), and then increased slightly from week three (80%) to week four (85%). Although there were both increases and decreases in both genders' positive perceptions, they both experienced an overall increase in positive perceptions from week one to week four.

Gender Effect on Math Achievements

The results of the quantitative data from this study showed that gender did not have a significant effect on student math achievements. The quantitative results of the pretest to posttest ANOVA showed that there was no significant difference between the

male and female gain scores. The gain score for male students was 5.19 (SD = 3.080) and the gain score for female students was 5.59 (SD = 2.917). No significant difference was found between the male and female gain scores from the pretest to posttest ($F(1, 111) = .496$, $p = .483 > .05$). Additional one-way ANOVAs were also run for each of the six-volume standards to determine a difference, if any, in the changes in achievements between male and female students. No significant difference was found between the male and female mean gain scores from the pretest to posttest for each of the six-volume standards.

The qualitative data from this study showed a different result indicating males and females might have different perceptions related to the effect of the HHBE unit on their math achievements. Based on the weekly student perceptions essay results, male students' perceptions of a change in their math achievements increased from week one (46%) to week four (54%), while female students' perceptions of a change in their math achievements decreased from week one (67%) to week four (57%). Overall, a higher percentage of female students perceived a change in their math achievement after the first week of HHBE lessons. While the results of the quantitative data did not show a significant difference between male and female mean gain scores from the pretest to posttest, the qualitative data collected from the weekly student essays indicated that males and females may have different perceptions of the effect of the HHBE implementation on their perceived changes in math achievements.

Gender Effect on Math Attitudes

The results of the quantitative data did not show that gender had a significant effect on student math attitudes in this study. The results of the pre-survey to post-survey

ANOVA showed that there was no significance between male and female mean gain scores. The male students' mean gain score was -.12 (SD = .403) and the female students' mean gain score was -.06 (SD = .467). No significant difference was found between male and female students on the gain scores from the pre-survey to post-survey ($F(1, 111) = 1.700$, $p = .195 > .05$). Additional one-way ANOVAs were also run to determine the difference in gain scores from the pre-survey to post-survey between male and female students in the two subscales included in the Math and Me Survey. For self-perceptions subscale, no significant difference was found between male and female students ($F(1,111) = 1.954$, $p = .165 > .05$). For enjoyment scale, no significant difference was found between male and female students ($F(1,111) = .808$, $p = .371 > .05$). The mean gain score for male students was negative, but the mean gain score for female students was positive, which showed that the female students' math attitudes slightly increased from the pre-survey to post-survey in the enjoyment subscale. Additional one-way ANOVAs were run on each survey question to determine the difference in gain score between the pre-survey and post-survey for male and female students on each individual survey question. Only question one of the survey resulted in a significant difference between male and female students from the pre-survey to post-survey ($F(1,111) = 6.633$, $p = .011 < .05$). Since question one stated, "I am really good at math," this finding provided evidence that female students felt better about their math ability at the end of the HHBE unit than male students did. However, the results of the t-tests for the other survey questions did not result in a significant difference between male and female gain scores from the pre-survey to post-survey.

The results of the qualitative data from the weekly student essays and teacher interviews also showed no significant difference in perceived changes in math attitudes between male and female students. Based on the student perceptions essays, the percentage of students who perceived a change in their math attitudes decreased from week one to week four for both male and female students. Overall, the percentage of female students who perceived a change in math attitudes was higher than the percentage of male students who perceived a change in math attitudes. The results from the teacher interviews varied and therefore could not be used to determine a significant difference between male and female students' changed math attitudes. Both the quantitative and qualitative data showed that gender might have some effect on student math attitudes, but not a significant factor affecting the changes in student math attitudes after the implementation of the HHBE unit.

Favorite Activities and Least Favorite Activities

While the quantitative data collected could not be used to determine students' favorite and least favorite activities, the qualitative data collected from both weekly student essays and teacher interviews allowed for analysis of these activities. The results from the weekly student perceptions essays showed that the favorite activities each week were rap songs and "creating the raps." The majority of the teacher participants felt that students were hesitant to participate at first but then began enjoying participating in the rap songs and cyphers.

The analysis of the weekly student perceptions essays also showed that the majority of students did not have a least favorite activity during each week of the HHBE unit implementation. In particular, in each of the four weeks, a higher percentage of

female students chose no least favorite activity. In the teacher interviews, a majority of the teachers discussed the rap battles as the students' least favorite activity. This may have been because of the length of time the rap battles took or due to students not wanting to compete against other students during the unit.

Culturally Responsive Teaching

The idea of Culturally Responsive Teaching was only addressed during the qualitative data analysis using the teacher interviews. Based on the teacher interviews, the majority of the teachers made comments about the use of HHBE being helpful to teach students using aspects of their own culture. One teacher even made a comment about learning more about Culturally Responsive Teaching through the implementation of the HHBE unit. Overall, the results of the teacher interviews provided evidence that the HHBE unit was useful for teaching math to students using aspects from their own culture. According to teachers, in particular, Black students were more engaged and more likely to participate than other ethnicities.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to determine the effect of an HHBE unit in fifth-grade math on both student achievements and student attitudes toward math. This study was conducted due to the gap between GMAS math scores in the overall state of Georgia compared to GMAS math scores in high-minority, low-income schools in the state of Georgia. This chapter includes discussions of the findings that were described in chapter four. This chapter also includes a section about the implications that this study has for practice in education. Finally, this chapter includes recommendations for future research to continue the study of HHBE in similar areas and a conclusion to summarize the overall analysis of the study results.

Discussions of the Findings

The discussions of the findings are presented by the research questions.

RQ1.1. What changes, if any, occur in fifth-grade students' math pretest and posttest scores after the implementation of a Hip-Hop Based Education unit?

After analyzing both quantitative and qualitative data from the research the answer to RQ1.1 was a positive increase in student math achievements. The analysis of the quantitative data showed a significant increase in student scores from the pretest to posttest, which suggested that HHBE was a successful strategy to use in fifth-grade math in a high-minority, low-income school. A cause for the increase in test scores could be increased student attention because of the use of HHBE. The positive student perceptions

in all four weeks of the HHBE provided evidence that students enjoyed the unit and therefore had increased achievements. While the results did indicate that HHBE was a successful strategy, there was not a control group to determine if the HHBE unit caused higher scores than a typical math unit would have. Additional paired-sample *t*-tests were also run for each of the six Georgia Standards of Excellence (GSE) volume standards covered in the HHBE Unit. The results of the paired-sample *t*-tests run on the individual GSE volume standards showed a significant increase from the pretest to posttest on all six-volume standards. These results provided evidence that the use of HHBE was successful on all six-volume standards and therefore can be useful for a variety of standards. The analysis of the qualitative data, weekly student perceptions essays and teacher interviews, also showed a positive increase in perceived student math achievements. The weekly student perception essays showed that each week the majority of the fifth-grade students perceived a positive change in math achievements. In the interviews, the teachers reported that student achievements seemed to have improved because of the implementation of the HHBE unit. Due to the strong evidence from both the quantitative and qualitative analyses in the area of student achievements, it can be inferred that HHBE is a useful strategy to increase student achievements in math.

The significant increase from the pretest to posttest and the positive results from the qualitative data in this study confirmed the results of previous studies conducted by Emdin (2013), Hill (2009), Morrell and Duncan-Andrade (2002), and Petchauer (2015) that also showed increases in student achievements with the use of the HHBE. Previous studies about the use of music in education were also supported, including studies by An et al. (2013), An, et al. (2014), Bamberger and Disessa (2003), Courey et al. (2012),

Harris (2007), and Yoho (2011). The results of these previous studies provided evidence that using music to teach math can increase student achievements, just as this study provided evidence that using music to teach math increases student achievements.

RQ1.2. To what degree, if any, is there a difference in gain scores from math pretest to posttest between students of different genders after the implementation of a Hip-Hop Based Education unit?

The results from the pretest and posttest were analyzed to determine if there was a difference in gain scores between male and female students. No significant difference was found between male and female gain scores. Additional one-way ANOVAs were also run for each of the six-volume standards to determine a difference, if any, in the changes in achievements between male and female students. Similarly, no significant difference was found between the male and female mean gain scores from the pretest to posttest for each of the six-volume standards. Based on the results of the one-way ANOVA, there was not a significant difference in test scores between males and females in this study. The study conducted by Dickhauser and Meyer (2006) also showed that there was no difference in math achievements between the genders.

The qualitative data was also analyzed to determine if there was a difference between male and female changes in math achievements. Although no significant results were found in quantitative data, the qualitative data showed that males and females might have different perceptions related to the effect of the HHBE unit on their math achievements. This data showed that after the four weeks of HHBE implementation the male students' perceived change in math achievements increased, while the female students' perceived change in achievements decreased. However, overall, a higher

percentage of female students perceived a change in their math achievements after the first week of HHBE lessons. This qualitative data provided some evidence that there may be differences between gender perceptions of an HHBE unit in math. Reilly et al. (2015) also found that the number of high achieving female students was higher than the number of high achieving male students. It was hard to draw a conclusion for this research question because of the inconsistent findings between quantitative and qualitative data. Gender might have some effect on student math achievements, but not a significant factor affecting the changes in student math achievements after the implementation of the HHBE unit. More research should be done using different methods to investigate the effect of gender on math achievements after the HHBE implementation.

RQ2.1. What changes, if any, occur in fifth-grade math students' math attitudes pre-survey and post-survey scores after the implementation of a Hip-Hop Based Education unit?

Based on the paired-sample *t*-test results from student mean scores from pre-survey to post-survey, student attitudes did not change significantly after the implementation of the HHBE unit. Additional paired-sample *t*-tests were also run to determine the changes, if any, in student attitudes toward math in the two subscales included in the Math and Me Survey. For the self-perceptions subscale, the results showed a significant decrease from the pre-survey to post-survey, which indicated that the HHBE unit might not help increase student self-perceptions of their math ability. For the enjoyment subscale, the mean for the enjoyment subscale on the post-survey was slightly higher than the mean for the enjoyment subscale on the pre-survey. The slight

increase provided evidence that student enjoyment of math was affected more than student self-perceptions of math. However, the difference between the pre-survey and post-survey was not large enough to indicate a significant positive effect of the HHBE unit on student enjoyment of math.

Interestingly, the qualitative data, including students' responses to the weekly student perceptions essays and teacher interviews, showed a different result. Although the number of students who perceived a change in math attitudes decreased from week one to week four, the majority of students each week perceived a change in their math attitudes. The teachers also expressed that they saw an increase in engagement in math lessons. The possible causes for the decrease in student math attitudes on the survey may be due to the Math and Me survey not aligning as well as needed for this study. The decrease in the surveys may also be the result of students becoming tired of completing tests, perceptions essays, and surveys throughout the HHBE unit. One teacher participant even mentioned that her students did not want to complete the perceptions essays and surveys toward the end of the HHBE unit. The results of several previous studies suggested an increase in student math attitudes after the music was used in their lessons (Darrow et al., 2009; Rickard et al., 2012). It was hard to draw a conclusion for this research question because of the inconsistent findings between quantitative and qualitative data. The HHBE implementation may have some effect on student math attitudes, but the effect was not significant in this study. More research should be done using different methods to investigate the effect of the HHBE implementation on student math attitudes.

RQ2.2. To what degree, if any, is there a difference in gain scores from math attitudes pre-survey to post-survey between students of different genders after the implementation of a Hip-Hop Based Education unit?

The difference in change in mean gain scores from the pre-survey to post-survey between males and females was also insignificant. Additional one-way ANOVAs were also run to determine the difference in mean gain scores from the pre-survey to post-survey between male and female students in the two subscales included in the Math and Me Survey. For the self-perceptions subscale, no significant difference was found between male and female students. For the enjoyment scale, no significant difference was found between male and female students. However, the mean gain score for male students for the enjoyment scale was negative, but the mean gain score for female students was positive, which showed that the female students' math attitudes slightly increased from the pre-survey to post-survey in the enjoyment subscale. This result provided some evidence that male students and female students may have been affected differently by the use of the HHBE unit. Additional one-way ANOVAs were run on each survey question to determine the difference in gain score between the pre-survey and post-survey for male and female students on each individual survey question. Only question one resulted in a significant difference between male and female students from the pre-survey to post-survey. The question asked students if they perceived they are good at math. The finding provided evidence that female students might feel better about their math ability at the end of the HHBE unit than male students did. However, the results of the *t*-tests for the other survey questions did not result in a significant difference between male and female gain scores from the pre-survey to post-survey.

The results of the qualitative data from the weekly student essays and teacher interviews also showed no significant difference in perceived changes in math attitudes between male and female students. Based on the student perceptions essays, the percentage of students who perceived a change in their math attitudes decreased from week one to week four for both male and female students. However, overall, the percentage of female students who perceived a change in math attitudes was higher than the percentage of male students who perceived a change in math attitudes. The results from the teacher interviews varied and therefore could not be used to determine a significant difference between male and female students' changed math attitudes.

According to the inconsistent findings between quantitative and qualitative data in this study, gender may have some effect on the change in math attitudes after the HHBE implementation, but it was not a significant factor affecting the results, which differed from the results found in the previous study conducted by Lui (2009). In Lui's study, it was found that males in the United States had higher levels of self-belief in their math ability.

RQ3. What are the students' perceptions of the overall effect of the Hip-Hop Based Education unit?

After coding and analyzing the four weeks of student perceptions essays, several important results appeared to help answer RQ3. First, the overall student perceptions of the HHBE unit remained positive for the entire four weeks of HHBE implementation. The number of students who responded positively about their overall perceptions of the HHBE unit increased from week one to week four. This suggested that the majority of students enjoyed the HHBE unit throughout the entire implementation.

Second, the overall opinions of the students were that rap songs and "creating the raps" were their favorite activities. It can be inferred that the most useful activities from the HHBE were the rap songs and the creation of the cypher raps by the students. It appeared that these two could be useful strategies to use in future teaching. The majority of students did not have a least favorite activity during each week of the HHBE unit implementation. These results showed that overall, students enjoyed the HHBE unit and did not find any activities that they disliked. It appeared that all of the activities included in the unit were enjoyed by most of the students.

Third, while the results of the pre-survey and post-survey did not show an increase, actual student responses to the weekly perceptions essays about their math attitudes showed a majority of students perceived that their math attitudes did increase after the first week of HHBE implementation. Fourth, the overall opinions of the students about math achievements increasing matched the results of the pretest to posttest increase in achievements. After the first week of HHBE implementation, the majority of students responded that they had a perceived change in math achievements. However, throughout the remaining three weeks, students perceived changes decreased slightly. This may have been because they noticed a large increase at first and then did not notice another large increase again. Combing the quantitative and qualitative results, it appeared that the HHBE unit was successful in increasing student math achievements.

The results of the students' perceptions in this study aligned with the previous research findings related to the effect of music on student achievements (Emdin, 2013, Hill, 2009, Morrell & Duncan-Andrade, 2002, Petchauer, 2015) and the previous research findings related to the effect of music on student attitudes (Darrow et al., 2009, Rickard et

al., 2012). While the previous and current research used different styles of music, the results still showed that music, in general, can be a useful strategy when teaching students math.

RQ4. What are the teachers' perceptions of the overall effect of the Hip-Hop Based Education unit?

Finally, the results of the coding and analysis of the teacher interviews supported much of the previous research included in the literature. First, when discussing student engagement, the majority of teacher participants indicated that students were hesitant at first, but became more positively engaged as other students began participating. The teacher perceptions of student engagement matched the student perceptions of engagement overall. This showed that the use of HHBE as a way to get students more engaged in math lessons can be useful. Second, teacher perceptions of the HHBE unit also included majority opinions that gender did not seem to have a significant effect on student achievements and attitudes during the implementation of the unit. Third, the use of culturally responsive teaching was realized as important in the classroom by the majority of the teacher participants as well. According to teachers, Black students were more engaged in the HHE activities and more likely to participate than other ethnicities. Fourth, the teacher perceptions of student achievements matched the increased results from the pretest to posttest scores. The majority of teachers shared the opinions that the HHBE unit increased student math achievements in their classrooms.

During the interviews, the majority of the teachers shared similar opinions of Gay (2002) and Ladson-Billings (1995), when they discussed the inclusion of culturally responsive pedagogy to help teach culturally and linguistically diverse students

effectively. Previous research was conducted about teacher preparation in culturally responsive teaching, including research by Hernandez et al. (2013) and Williams et al. (2016). These researchers found evidence that more CRP should be included in teacher preparation classes and in professional development for teachers. Including more strategies may help increase the number of teachers who feel comfortable implementing CRP strategies.

Implications for Practice

The results of this study suggested that HHBE can be a successful strategy for math instruction in fifth-grade at a high-minority, low-income school. These results provided significant evidence for schools to implement culturally-based teaching strategies such as HHBE at their schools. The teacher participants in this study claimed that they will continue to use the HHBE lessons in years to come to teach their fifth-grade students the volume standards.

As discussed previously, student achievements increased from the pretest to posttest after the implementation of an HHBE unit in fifth-grade math. The same or similar units can be implemented in the school from the current research or in schools with similar demographics. Before implementing any HHBE lessons, teachers should be trained on how to use HHBE as an effective strategy in the classroom. A training guide may need to be presented with any HHBE lessons that are created to be used in schools. With the implementation of HHBE in math, I believe that student math scores will increase at high-minority, low-income schools where hip-hop is a large part of the students' culture.

Although student attitudes did not significantly increase based on the results from the pre-survey to post-survey, student opinions on the perceptions essays showed that a majority of students did perceive that their math attitudes increased during the implementation of the HHBE unit. Due to these results, it can be assumed that using HHBE in fifth-grade math may have some positive effect on student math attitudes. In high-minority, low-income schools, especially where many students dislike math, HHBE can be implemented in math to increase student math achievements and attitudes.

Finally, the teachers interviewed all discussed the use of culturally responsive education in their classrooms. The majority of the teachers realized that using the culture of their students in their teaching can produce increased engagement and achievement in their classrooms. Training for teachers about ways to implement more culturally responsive teaching strategies, including HHBE may be necessary for some schools. This will give teachers background knowledge to begin teaching in ways that align with their students' cultures at high-minority, low-income schools.

The results of this study also provided evidence that gender may not a significant factor affecting student math achievements and attitudes during the HHBE implementation. More research should be done using different methods to investigate the effect of gender on math achievements and attitudes after the HHBE implementation. Also, due to the results of this study, it can be assumed that the design of the activities used for this HHBE unit could be useful for other teachers in high-minority, low-income schools. The favorite activities of the students, including the rap songs and "creating the raps," could be used or different math topics and different levels of math. The activities

that were not enjoyed as much by the students and teacher, including the rap battles and sampling, may not be replicated for future use.

Recommendations for Future Research

This study was limited in some aspects and can be expanded on in a variety of ways. After conducting the research about the use of HHBE to teach fifth-grade math, I was able to conclude that HHBE is a useful strategy for teaching math, based on the positive change between student pretest and posttest scores, analysis of the weekly student perceptions essays, and analysis of the teacher interviews. However, this study did not include a control group, so there was no way to compare the results of students taught using HHBE to students taught using more conventional strategies. I would strongly recommend future research that includes a control group to provide even more evidence that HHBE is a successful strategy in the subject of math.

Another recommendation for future research on the topic of HHBE in math is to conduct student focus groups throughout the implementation of the unit, instead of using weekly student perceptions essays. As stated by several of the participating teachers, the students began to get bored completing the same questions each week, and their answers became shorter and shorter as the weeks passed. The quality of student responses decreased from week one to week four, which may have been averted if I had met with students in focus groups and allowed them to discuss their perceptions openly. I think that conducting further research with the inclusion of focus groups will add to the depth and value of the qualitative data.

In addition, due to the inconsistent results between quantitative and qualitative data related to the effect of gender on student math achievements and attitudes during the

HHBE implementation. More research should be done using different methods to investigate the difference between males and females. A final recommendation for future research is the use of a different survey to determine student change, if any, in math attitudes. In this study, student math attitudes decreased overall based on the quantitative results from the pre-survey to the post-survey. However, based on the qualitative results from the weekly student perceptions essays, the majority of students claimed that their math attitudes had improved during the implementation of the HHBE unit. I would recommend creating a new survey that better compliments the purpose of the research question about student math attitudes. The survey may even be given at the beginning, middle, and end of the HHBE unit to determine if students' attitudes continued to change throughout the entire implementation.

Conclusions

The overall goal of this study was to determine if the use of HHBE in fifth-grade math would increase student math achievements and attitudes. The results of both the quantitative data and qualitative data provided evidence that HHBE can be a useful strategy to increase student math achievements in a high-minority, low-income school. This information can be useful to schools and teachers to realize the importance of teaching students using culturally relevant lessons. Although student attitudes did not significantly increase based on the results from the pre-survey to post-survey, student opinions on the perceptions essays showed that a majority of students did perceive that their math attitudes increased during the implementation of the HHBE unit. Teachers also expressed that the HHBE unit created a positive engagement for most students. Due to these results, it can be inferred that using HHBE in fifth-grade math may have some

positive effect on student math attitudes. The results of the study also provided evidence that student gender does not significantly affect the changes in student math achievements and attitudes. Finally, the results of the study provided evidence that the use of specifically designed activities, such as rap songs and "creating the raps," are useful and culturally relevant strategies. This information can be used by teachers as evidence to support their use of HHBE or other culturally relevant lessons in math.

REFERENCES

Adelson, J., & McCoach, B. (2011). Development and psychometric properties of the math and me survey: Measuring third through sixth-graders' attitudes toward mathematics. *Measurement and Evaluation in Counseling and Development, 44*(4), 225-247.

An, S., Capraro, M., & Tillman, D. (2013). Elementary teachers integrate music activities into regular mathematics lessons: Effects on students' mathematical abilities. *Journal for Learning through the Arts*, *9*(1), 1-19.

An, S., Tillman, D., Boren, R., & Wang, J. (2014). Fostering elementary students' mathematical disposition through music-mathematics integrated lessons. *International Journal for Mathematics Teaching and Learning*, *15*(3), 1-18.

Aponte, C. (2013). *When hip-hop and education converge: A look into hip-hop based education programs in the United States and Brazil*. Retrieved from http://shelf1.library.cmu.edu/HSS/2013/a1491874.pdf

Bamberger, J., & Disessa, A. (2003). Music as embodied mathematics: A study of a mutually informing affinity. *International Journal of Computers for Mathematical Learning*, *8*, 123-160.

Bonner, E. (2014). Investigating practices of highly successful mathematics teachers of traditionally underserved students. *Educational Studies in Mathematics*, *86*(3), 377-399.

Bonner, E., & Adams, T. (2011). Culturally responsive teaching in the context of mathematics: A grounded theory case study. *Journal of Mathematics Teacher Education*, *15*(1), 25-38. doi:10.1007/s10857-011-9198-4

Bui, Y., & Fagan, Y. (2013). The effects of an integrated reading comprehension strategy: A culturally responsive teaching approach for fifth-grade students' reading comprehension. *Preventing School Failure*, *57*(2), 59-69. doi:10.1080/1045988X.2012.664581

Carnoy, M., & Rothstein, R. (2015). What international test scores tell us? *Society*, *52*(2), 122-128.

Cholewa, B., Goodman, R., West-Olatunji, C., & Amatea, E. (2014). A qualitative examination of the impact of culturally responsive educational practices on the psychological well-being of students of color. *The Urban Review*, *46*(4), 574-596. doi:10.1007/s11256-014-0272-y

Courey, S., Balogh, E., Siker, J., & Paik, J. (2012). Academic music: Music instruction to engage third-grade students in learning basic fraction concepts. *Educational Studies in Mathematics*, *81*(2), 251-278. doi:10.1007/s10649-012-9395-9

Cronk, B. (2012). *How to use SPSS: A step-by-step guide to analysis and interpretation.* Glendale, CA: Pyrczak Publishing.

Cvencek, D., Meltzoff, A., & Greenwald, A. (2011). Math-gender stereotypes in elementary school children. *Child Development, 82*(3), 766-779.

Daniel, S. (2016). Grappling with culturally responsive pedagogy: A study of elementary-level teacher candidates' learning across practicum and diversity coursework experiences. *The Urban Review*, *48*, 579-600. doi:10.1007/s11256-016-0369-6

Darrow, A., Novak, J., & Swedberg, O. (2009). The effect of participation in a music mentorship program on the self-esteem and attitudes of at-risk students. *Australian Journal of Music Education*, *2*, 5-16.

Dickhauser, O., & Meyer, W. (2006). Gender differences in young children's math ability attributions. *Psychology Science*, *48*(1), 3-16.

Emdin, C. (2013). The rap cypher, the battle, and reality pedagogy: Developing communication and argumentation in urban science education. In M. Lamont Hill & E. Petchauer (Eds.), *Schooling hip-hop: Expanding hip-hop based education across the curriculum* (pp. 11-27). New York, NY: Teachers College Press.

French, R. (2015). *Many students struggle to pass new Georgia Milestones test*. Retrieved from https://www.myajc.com/news/local-education/many-students-struggle-pass-new-georgia-milestones-tests/GLwdgCpTjsIquhz9M5FuNJ/

Garcia, C., & Chun, H. (2016). Culturally responsive teaching and teacher expectations for Latino middle school students. *Journal of Latina/o Psychology*, *4*(3), 173-187. doi:10.1037/lat0000061

Gay, G. (2000). *Culturally responsive teaching*. New York, NY: Teachers College Press.

Gay, G. (2002). Preparing for culturally responsive teaching. *Journal of Teacher Education*, *53*(2), 106-116.

Gay, G. (2010). *Culturally responsive teaching* (2nd ed.). New York, NY: Teachers College Press.

Georgia Department of Education [GaDOE]. (2015). *EOG statewide testing*. Retrieved from http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-Statewide-Scores.aspx

Georgia Department of Education [GaDOE]. (2016). *EOG statewide testing*. Retrieved from http://www.gadoe.org/Curriculum-Instruction-and-

Assessment/Assessment/Pages/Georgia-Milestones-2015-2016-Statewide-Scores.aspx

Georgia Department of Education [GaDOE]. (2017). *EOG statewide testing*. Retrieved from http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-2016-2017-Statewide-Scores.aspx

Ginwright, S. (2004). *Black in school: Afrocentric reform, urban youth, and the promise of hip-hop culture*. New York, NY: Teachers College Press.

Gromko, J. (2005). The effect of music instruction on phonemic awareness in beginning readers. *Journal of Research in Music Education*, *53*(3), 199-209.

Harding-Dekam, J. (2014). Defining culturally responsive teaching: The case of mathematics. *Cogent Education, 1*(1), 1-18. doi:10.1080/2331186X.2014.972676

Harris, M. (2007). Differences in mathematics scores between students who receive traditional Montessori instruction and students who receive music enriched Montessori instruction. *Journal for Learning through the Arts*, *3*(1), 1-52.

Hernandez, C., Morales, A., & Shroyer, M. G. (2013). The development of a model of culturally responsive science and mathematics teaching. *Cultural Studies of Science Education*, *8*, 803-820. doi:10.1007/s11422-013-9544-1

Hill, M. L. (2009). *Beats, rhymes, and classroom life*. New York, NY: Teachers College Press.

Hill, M. L., & Petchauer, E. (2013). *Schooling hip-hop: Expanding hip-hop based education across the curriculum*. New York, NY: Teachers College Press.

Houghton, C., Casey, D., & Shaw, D. (2013). Rigour in qualitative case-study research. *Nurse Researcher*, *20*(4), 12-17.

Irby, J., & Hall, B. (2010). Fresh faces, new places: moving beyond teacher-researcher perspectives in hip-hop based education research. *Urban Education*, *46*(2), 216-240.

Jameson, M. (2014). Contextual factors related to math anxiety in second-grade children. *The Journal of Experimental Education*, *82*(4), 518-536. doi:10.1080/00220973.2013.813367

Kelley, H., Siwatu, K, Tost, J., & Martinez, J. (2015). Culturally familiar tasks on reading performance and self-efficacy of culturally and linguistically diverse students. *Educational Psychology in Practice*, *31*(3), 293-313. doi:10.1080/02667363.2015.1033616

Kercood, S., Grskovic, J., Lee, D., & Emmert, S. (2007). The effects of fine motor movement and tactile stimulation on the math problem solving of students with attention problems. *Journal of Behavioral Education*, *16*, 303-310.

Kiger, D., Herro, D., & Prunty, D. (2012). Examining the influence of a mobile learning intervention on third-grade math achievement. *Journal of Research on Technology in Education*, *45*(1), 61-82.

Kitchenham, A. (2010). *Encyclopedia of case study research: Mixed methods in case study research.* Thousand Oaks, CA: SAGE Publications, Inc.

Kitwana, B. (2003). *The hip-hop generation: Young blacks and the crisis in African-American culture*. New York, NY: Civitas Books.

Kposowa, A., & Valdez, A. (2013). Student laptop use and scores on standardized tests. *Journal of Educational Computing Research*, *48*(3), 345-379.

KRS ONE. (2003). *Ruminations*. New York, NY: Welcome Rain Publishers.

Ladson-Billings, G. (1995). *The dream keepers: Successful teachers of African-American children*. San Francisco, CA: Jossey Bass.

Ladson-Billings, G. (2009). *The dream keepers: Successful teachers of African-American children* (2nd ed.). San Francisco, CA: Jossey Bass.

Lipnevich, A., Preckel, F., & Krumm, S. (2016). Mathematics attitudes and their unique contribution to achievement: Going over and above cognitive ability and personality. *Learning and Individual Differences*, *47*, 70-79.

Love, B. (2015). What is hip-hop based education doing in nice fields such as early childhood and elementary education? *Urban Education*, *50*(1), 106-131. doi:10.1177/0042085914563182

Lui, O. (2009). An investigation of factors affecting gender differences in standardized math performance: Results from U.S. and Hong Kong 15 year olds. *International Journal of Testing*, *9*, 215-237. doi: 10.1080/15305050903106875

Maxwell, J. (2013). *Qualitative research design: An interactive approach* (3rd ed.). Los Angeles, CA: Sage Publications.

Mead, T., Scibora, L., Gardner, J., & Dunn, S. (2016). The impact of stability balls, activity breaks, and a sedentary classroom on standardized math scores. *The Physical Educator*, *73*, 433-449. doi: 10.18666/TPE-2016-V73-I3-5303

MMSD. (2015). Culturally and linguistically responsive strategies. Retrieved from: http://www.tolerance.org/sites/default/files/general/CLRP-project-overview-8-2015.pdf.

Morrell, E., & Duncan-Andrade, J. (2002). Promoting academic literacy with urban youth through hip-hop culture. *English Journal*, *91*(6), 88-92.

NAEP. (2015). *State achievement level results*. Retrieved from https://www.nationsreportcard.gov/reading_math_2015

Niederle, M., & Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *Journal of Economic Perspectives*, *24*(2), 129-144.

OECD. (2012). *PISA 2012 United States results*. Retrieved from https://www.oecd.org/unitedstates/PISA-2012-results-US.pdf

OECD. (2015). *PISA 2015 results in focus*. Retrieved from http://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf

Onwuegbuzie, A., & Leech, N. (2006). Linking research questions to mixed methods data analysis procedures. *The Qualitative Report*, *11*(3), 474-498.

Petchauer, E. (2009). Framing and reviewing hip-hop educational research. *Review of Educational Research*, *79*(2), 946-978.

Petchauer, E. (2012). Sampling memories: using hip-hop aesthetics to learn from urban schooling experiences. *Educational Studies, 48*, 137-155. doi:10.1080/00131946.2011.647148

Petchauer, E. (2015). Starting with style: Toward a second wave of hip-hop education research and practice. *Urban Education*, *50*(1), 78-105. doi:10.1177/0042085914563181

Reilly, D., Neumann, D., & Andrews, G. (2015). Sex differences in mathematics and science achievement: A meta-analysis of national assessment of educational progress assessments. *Journal of Educational Psychology*, *107*(3), 645-662. doi:10.1037/edu0000012

Rickard, N., Appelmen, P., James, R., Murphy, F., Gill, A., & Bambrick, C. (2012). Orchestrating life skills: The effect of increased school-based music classes on children's social competence and self-esteem. *International Journal of Music Education*, *31*(3), 292-309. doi:10.1177/0255761411434824

Roberts, C. (2010). *The dissertation journey: A practical and comprehensive guide to planning, writing, and defending your dissertation* (2nd ed.). Thousand Oaks, CA: Corwin Press.

Roberts, P., Priest, H., & Traynor, M. (2006). Reliability and validity in research. *Nursing Standard, 20*(44), 41-45.

Ross, A., & Onwuegbuzie, A. (2012). Prevalence of mixed methods research in mathematics education. *The Mathematics Educator, 22*(1), 84-113.

Sawyer III, D. (2015). Step your game up: Teaching sociology through the art of the hip-hop rap battle. *Humanity and Society*, *39*(2), 224-235. doi:10.1177/0160597615574552

Smith, C., Marchand-Martella, N., & Martella, R. (2011). Assessing the effects of the rocket math program with a primary elementary school student at risk for school failure: A case study. *Education and Treatment of Children*, *34*(2), 247-258.

Stovall, D. (2006). We can relate: Hip-hop culture, critical pedagogy, and the secondary classroom. *Urban Education, 41*(6), 585-602.

Taylor, J., Iroha, O., & Valdez, V. (2015). Culturally responsive teaching with visual art in social studies. *The Councilor*, *76*(1), 1-18.

Tesch, R. (1990). *Qualitative research: Analysis types and software tools.* New York: Falmer.

United States Census Bureau. (2016). *Quick facts: Georgia*. Retrieved from https://www.census.gov/quickfacts/GA.

Venkatesh, V., Brown, S., & Sullivan, Y. (2016). Guidelines for conducting mixed-methods research: An extension and illustration. *Journal of the Association for Information Systems*, *17*(7), 435-495.

Walton, P. (2014). Using singing and movement to teach pre-reading skills and word reading to kindergarten children: An exploratory study. *Language and Literacy, 16*(3), 54-77.

Williams, D., Edwards, B., Kuhel, K., & Lim, W. (2016). Culturally responsive dispositions in prospective mathematics teachers. *Discourse and Communication for Sustainable Education*, *7*(2), 17-33.

Wlodkowski, R., & Ginsberg, M. (1995). A framework for culturally responsive teaching. *Educational Leadership*, *53*(1), 17-21.

Yoho, C. (2011). Using music to increase math skill retention. *Journal of the American Academy of Special Education Professionals*, 146-151.

APPENDIX A:

Unit 2 Pretest

Unit 2 Pretest

1. Elliot and his family bought a new house. The inside dimensions of the house are 25 feet wide, 30 feet long, and 9 feet high. What unit of measurement would be used to report the volume of the house?

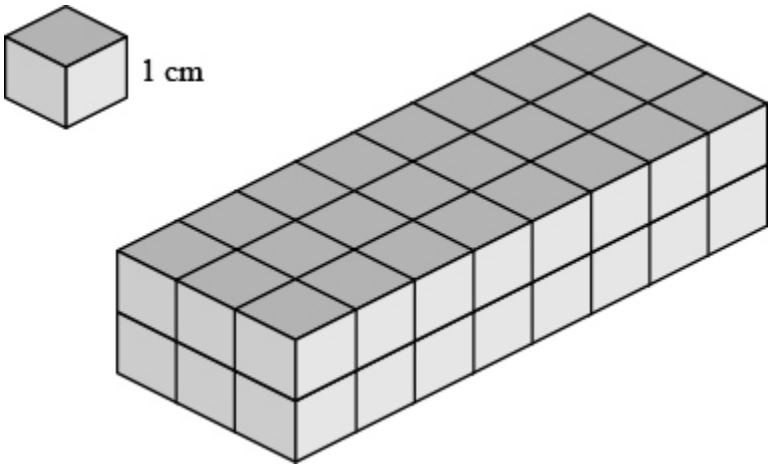
A. feet

B. square feet

C. cubic feet

D. quadratic feet

2. What is the volume of the rectangular prism shown?



A. 13 cubic centimeters

B. 19 cubic centimeters

C. 32 cubic centimeters

D. 48 cubic centimeters

3. Julio made a cake in a pan that is 9 inches long, 11 inches wide, and 3 inches deep. What unit of measurement would be used to report the volume of the cake pan?

A. inches

B. square inches

C. cubic inches

D. quadratic inches

4. Elliot and his family bought a new house. The inside dimensions of the house are 25 feet wide, 30 feet long, and 9 feet high. What is the volume of the house?

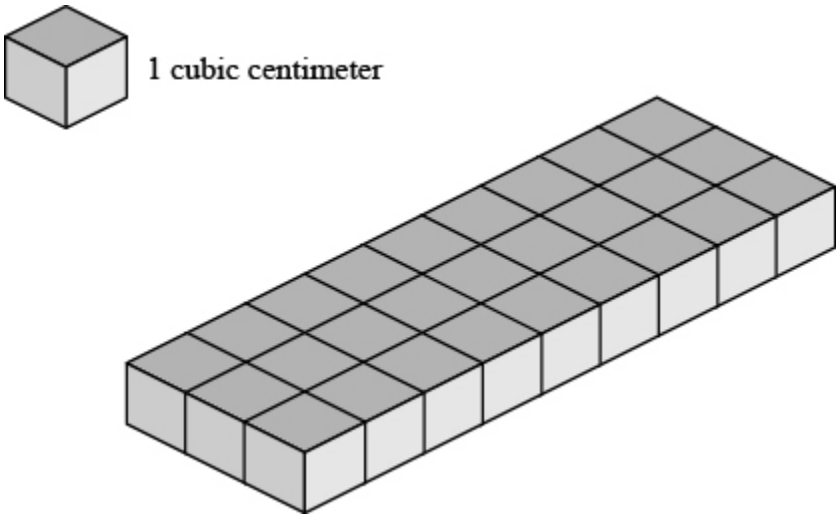
A. 64 cubic feet

B. 270 cubic feet

C. 750 cubic feet

D. 6,750 cubic feet

5. A rectangular prism is shown.



What is the volume of the prism in cubic centimeters?

A. 9

B. 18

C. 27

D. 36

6. Jacob has a toy dump truck that can hold 45 1-inch cubic blocks. Which of the following could be the dimensions of the back of the toy dump truck?

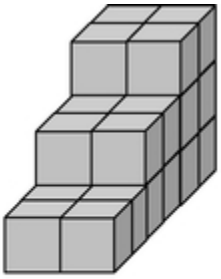
A. 3 inches long, 3 inches wide, 5 inches tall

B. 4 inches long, 5 inches wide, 2 inches tall

C. 5 inches long, 5 inches wide, 2 inches tall

D. 6 inches long, 2 inches wide, 3 inches tall

7. What is the volume of this shape?



 Represents 1 cubic unit

A. 12 cubic units

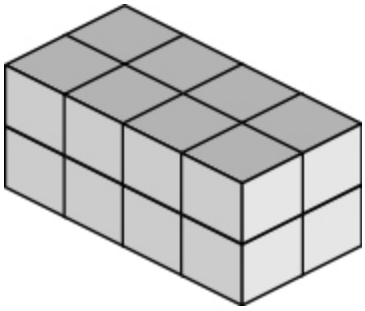
B. 16 cubic units

C. 24 cubic units

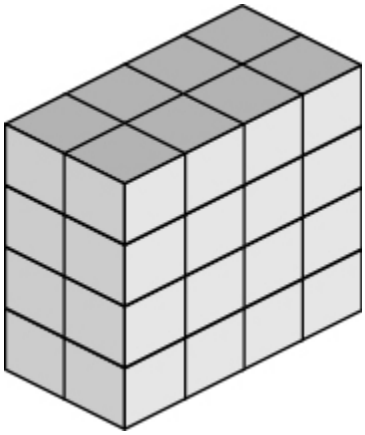
D. 36 cubic units

8. The models below are made with cubes with sides 1 unit in length. Which model has a volume of 36 cubic units?

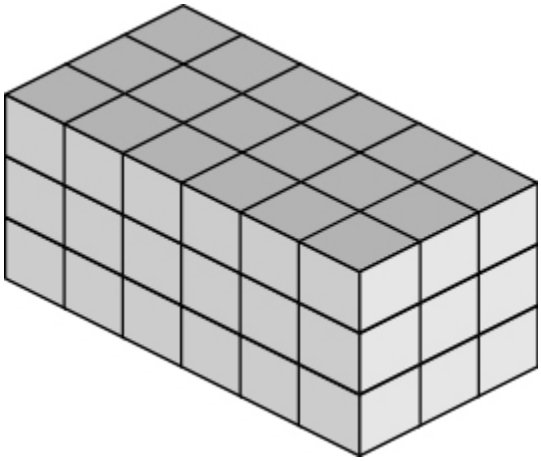
A.



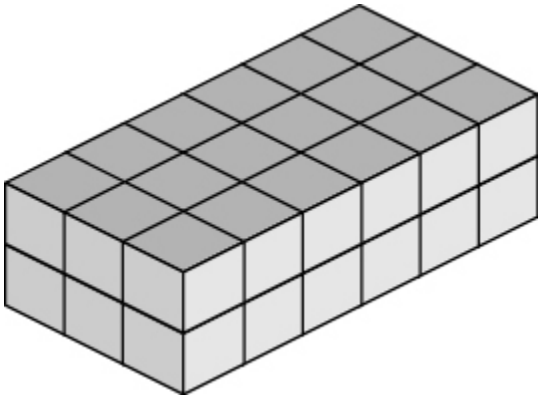
B.



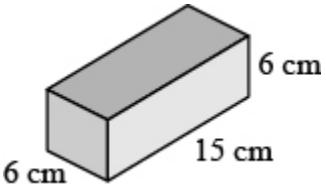
C.



D.



9. The box shown is a rectangular prism.



Chloe packed the box with 1-cubic-centimeter cubes. How many cubes fit inside the box?

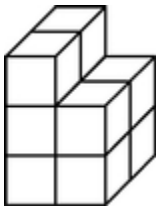
A. 27

B. 90

C. 270

D. 540

10. An irregular shape is shown below.



Which expression can be used to determine the volume of the shape?

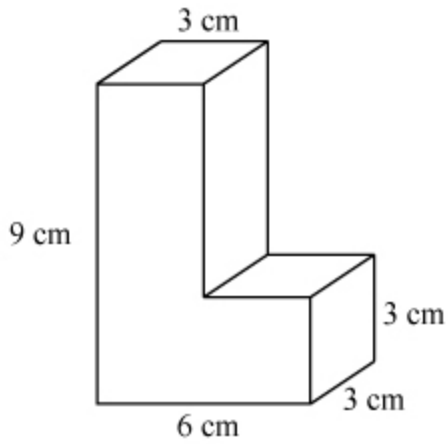
A. $(2 \times 2 \times 2) \times (1 \times 2 \times 1)$

B. $(2 \times 2) \times (1 \times 2)$

C. $(2 \times 2) + (1 \times 2)$

D. $(2 \times 2 \times 2) + (1 \times 2 \times 1)$

11. A wooden block is shaped like an "L," as shown.



What is the volume of the block?

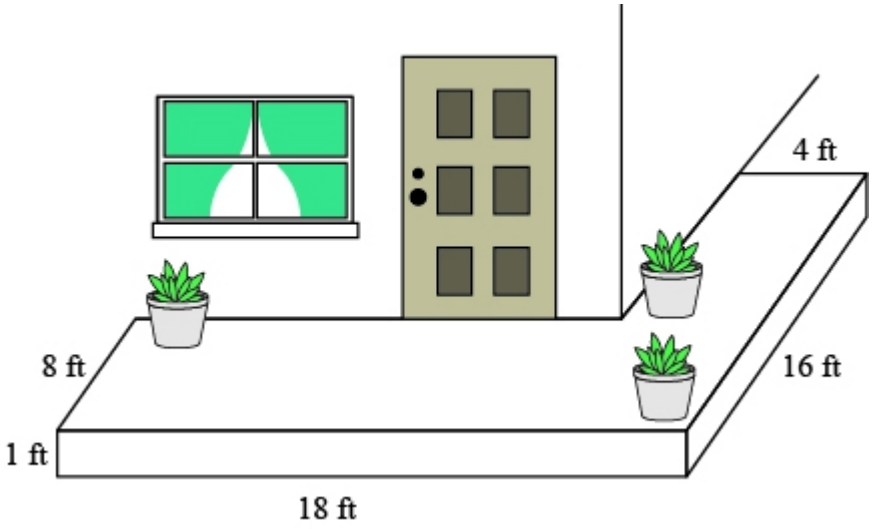
A. 81 cm^3

B. 108 cm^3

C. 135 cm^3

D. 162 cm^3

12. Trinity is planning a new concrete patio that wraps around the side of her house. The measurements of the new patio are shown below.



Select the expression that shows the volume of concrete needed to make the patio, in cubic feet.

A. (18 ft × 8 ft) + (4 ft × 16 ft)

B. (8 ft × 14 ft) + (4 ft × 16 ft)

C. (8 ft × 18 ft × 1 ft) + (4 ft × 16 ft × 1 ft)

D. (8 ft × 16 ft × 1 ft) + (4 ft × 18 ft × 1 ft)

13. A rectangular prism has a volume of 32 cubic centimeters. Which of the following could be the dimensions of this prism?

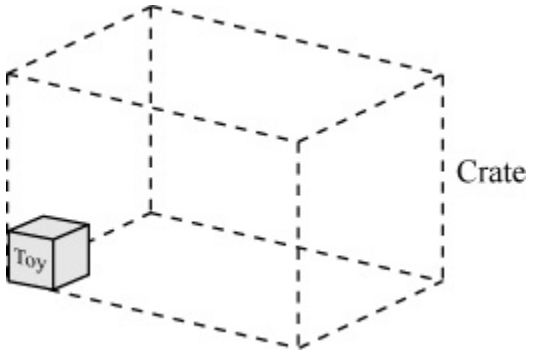
A. length: 1 cm, width: 2 cm, height: 16 cm

B. length: 4 cm, width: 2 cm, height: 8 cm

C. length: 2 cm, width: 4 cm, height: 8 cm

D. length: 2 cm, width: 2 cm, height: 16 cm

14. A manufacturing company makes toys that are packaged in cube-shaped boxes that measure 1 foot on all sides. They want to put the toy boxes in a crate to ship the toys to the store.



Which crate can hold the **most** toy boxes?

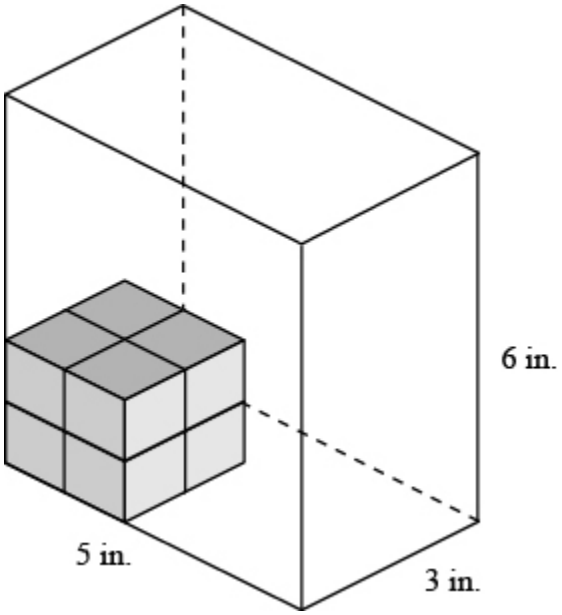
A. 3 feet wide, 2 feet long, and 7 feet high

B. 4 feet wide, 1 foot long, and 8 feet high

C. 5 feet wide, 2 feet long, and 2 feet high

D. 6 feet wide, 2 feet long, and 3 feet high

15. Miguel began filling the rectangular prism below with cubes. Each cube measures 1 cubic inch.



How many more cubes does Miguel need to fill the rectangular prism completely?

A. 90 cubes
B. 82 cubes
C. 14 cubes
D. 83 cubes

APPENDIX B:

Unit 2 Pretest Blueprint (For Teachers)

Unit 2 Pretest Blueprint (For Teachers)

Question	Standard	DOK Level	Answer/Rubric
1.	MGSE.5.MD.3a	1	C
2.	GSE NBT.7	2	D
3.	MGSE.5.MD.3a	1	C
4.	MGSE.5.MD.3a	2	D
5.	MGSE.5.MD.4	1	C
6.	MGSE.5.MD.3b	2	A
7.	MGSE.5.MD.3b	3	C
8.	MGSE.5.MD.4	2	D
9.	MGSE.5.MD.5a	2	C
10.	MGSE.5.MD.5b	3	D
11.	MGSE.5.MD.5c	2	B
12.	MGSE.5.MD.5c	3	B
13.	MGSE.5.MD.5b	2	A
14.	MGSE.5.MD.5a	2	A
15.	MGSE.5.MD.5a	3	B

APPENDIX C:

Unit 2 Posttest

Unit 2 Posttest

1. The neighborhood pool requires chemical on a regular basis. The amount of chemicals used in the pool are based on the volume. The pool is 5 meters wide, 8 meters long, and 2 meters deep. What unit of measurement would be used to report the volume of the pool?

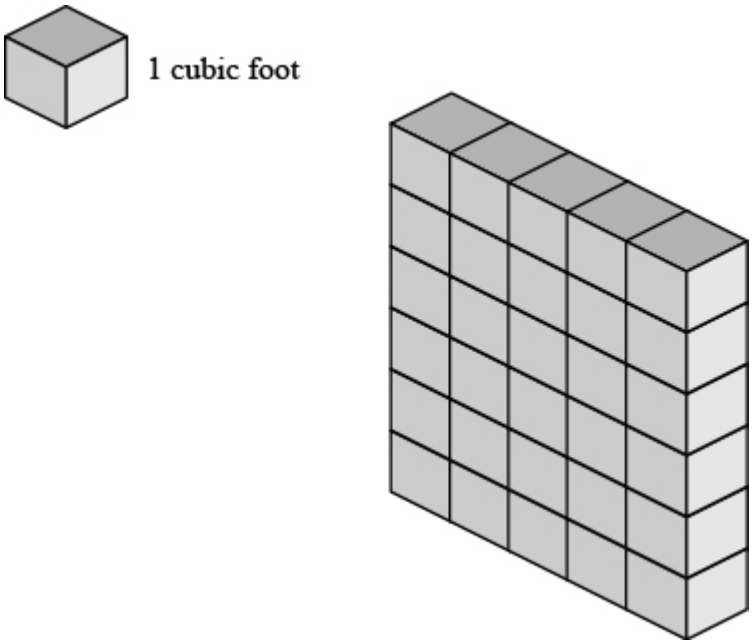
A. meters

B. square meters

C. cubic meters

D. quadratic meters

2. A rectangular prism is shown.



What is the volume of the prism in cubic feet?

A. 5

B. 12

C. 30

D. 41

3. Elliot and his family bought a new house. The inside dimensions of the house are 25 feet wide, 30 feet long, and 9 feet high. What unit of measurement would be used to report the volume of the house?

A. cubic feet

B. feet

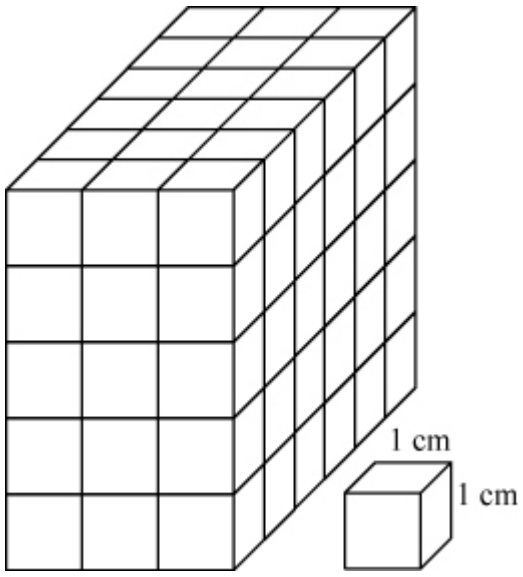
C. Square feet

D. Quadratic feet

4. Hannah's little brother likes to build with his wooden blocks. Each block is a 1-inch cube. He built a tower of blocks that is 8 blocks high, 2 blocks wide, and 4 blocks wide. What is the volume, in cubic inches, of the tower they built?

A. 64 cubic inches
B. 16 cubic inches
C. 60 cubic inches
D. 64 square inches

5. A rectangular prism is shown below.



What is the volume of the prism in cubic centimeters?

A. 90 cubic cm
B. 85 cubic cm
C. 18 cubic cm
D. 24 cubic cm

6. Ryan's little brother built a rectangular prism made of cube-shaped blocks. Ryan counts 360 blocks in the rectangular prism. Select the way that Ryan's brother could have stacked the blocks.

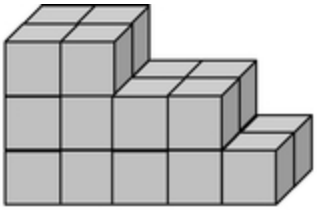
A. 7 blocks wide, 6 blocks high, and 9 blocks long

B. 8 blocks wide, 5 blocks high, and 10 blocks long

C. 12 blocks wide, 7 blocks high, and 4 blocks long

D. 15 blocks wide, 4 blocks high, and 6 blocks long

7. What is the volume of this shape, in cubic units?

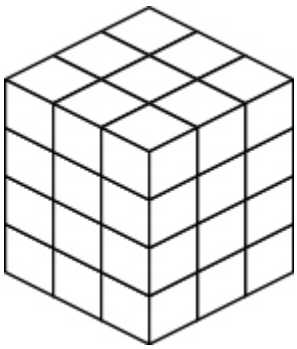



Represents 1 cubic unit

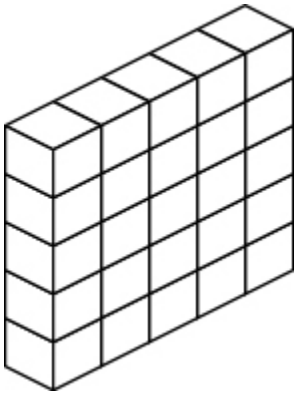
A. 24 cubic units
B. 20 cubic units
C. 16 cubic units
D. 22 cubic units

8. Each figure below made up unit cubes that have a volume of 1 cm^3. Which figure has a volume of 25 cm^3.

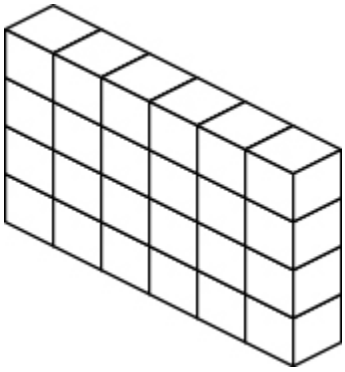
A.



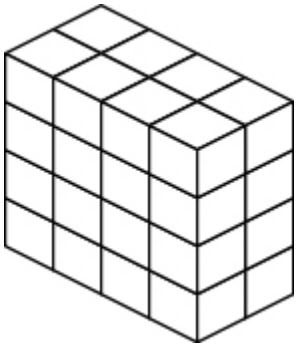
B.



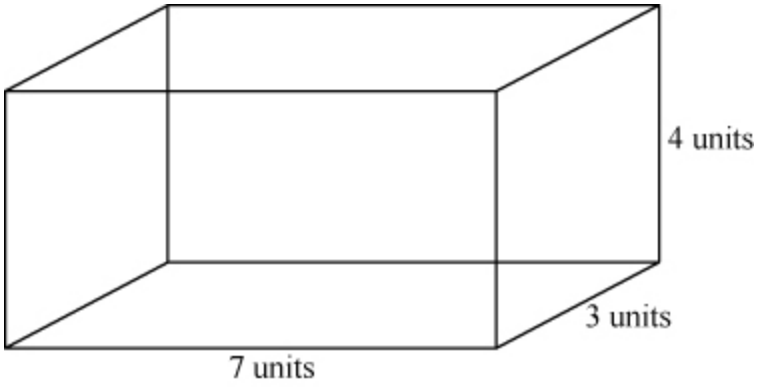
C.



D.



9. While packing to move, Denise decided she would pack her blocks inside an empty aquarium to save space in the moving truck. The dimensions of her aquarium is shown below.

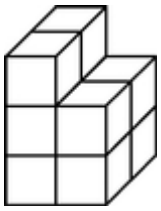


If the volume of each of Denise's blocks is 1 cubic unit, what is the **greatest** number of blocks she can pack inside the empty aquarium?

A. 80 blocks
B. 21 blocks
C. 28 blocks
D. 84 blocks

10 An irregular shape is shown below.

.



Which expression can be used to determine the volume of the shape?

A. $(2 \times 2 \times 2) \times (1 \times 2 \times 1)$

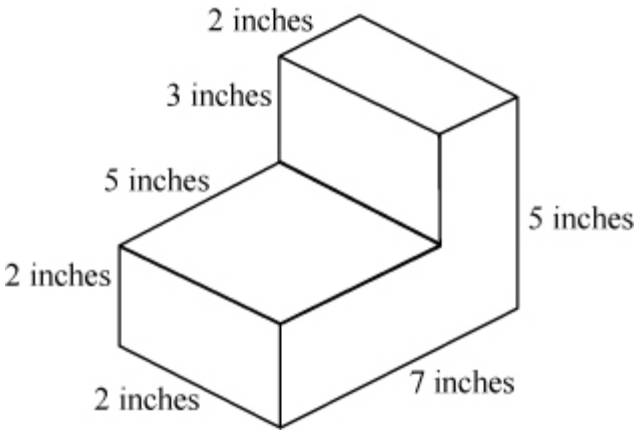
B. $(2 \times 2) \times (1 \times 2)$

C. $(2 \times 2) + (1 \times 2)$

D. $(2 \times 2 \times 2) + (1 \times 2 \times 1)$

11 The figure below is composed of two rectangular prisms.

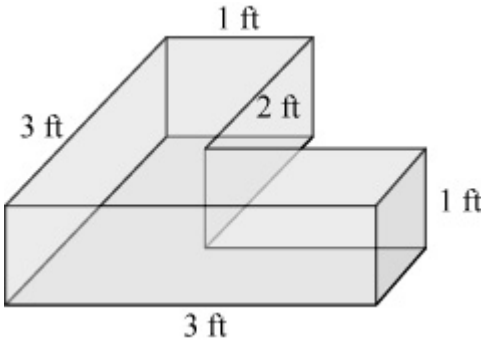
.



11. If the figure is decomposed into a bottom prism and a top prism, what is the total volume of the figure?

A. 45 cubic inches
B. 40 cubic inches
C. 20 cubic inches
D. 14 cubic inches

12. The diagram below represents Charlie and Megan's L-shaped toy chest.



What is the volume of the chest in cubic feet?

A. 7 cubic feet
B. 3 cubic feet
C. 9 cubic feet
D. 12 cubic feet

13. A rectangular prism has a volume of 72 cubic centimeters. Which of the follow the dimensions of this prism?

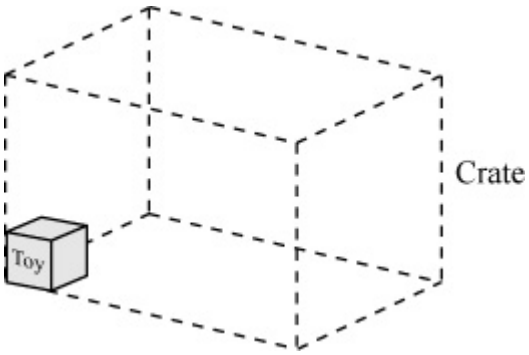
A. length: 2 cm, width: 4 cm, height: 18 cm

B. length: 2 cm, width: 8 cm, height: 9 cm

C. length: 1 cm, width: 4 cm, height: 18 cm

D. length: 2 cm, width: 4 cm, height: 11 cm

14. A manufacturing company makes toys that are packaged in cube-shaped boxes that measure 1 foot on all sides. They want to put the toy boxes in a crate to ship the toys to the store.



Which crate can hold the **most** toy boxes?

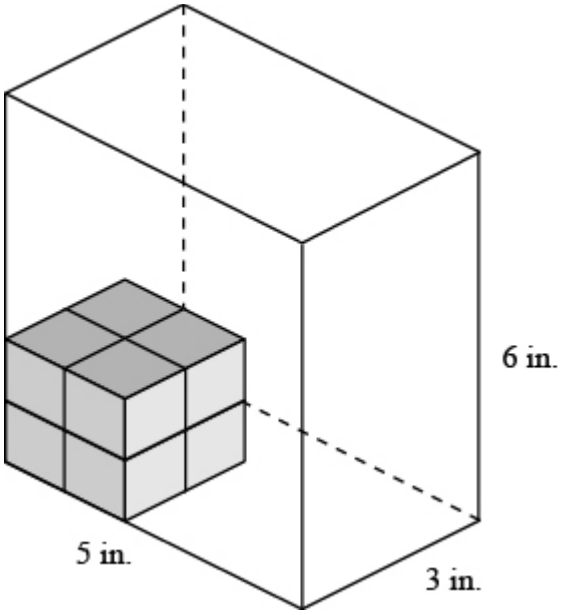
A. 3 feet wide, 2 feet long, and 7 feet high

B. 4 feet wide, 1 foot long, and 8 feet high

C. 5 feet wide, 2 feet long, and 2 feet high

D. 6 feet wide, 2 feet long, and 3 feet high

15. Miguel began filling the rectangular prism below with cubes. Each cube measures 1 cubic inch.



How many more cubes does Miguel need to fill the rectangular prism completely?

E. 90 cubes
F. 82 cubes
G. 14 cubes
H. 83 cubes

APPENDIX D:

Unit 2 Posttest Blueprint (For Teachers)

Unit 2 Posttest Blueprint (For Teachers)

Question	Standard	DOK Level	Answer/Rubric
1.	MGSE.5.MD.3a	1	C
2.	GSE NBT.7	2	C
3.	MGSE.5.MD.3a	1	A
4.	MGSE.5.MD.3a	2	A
5.	MGSE.5.MD.4	1	A
6.	MGSE.5.MD.3b	2	D
7.	MGSE.5.MD.3b	3	D
8.	MGSE.5.MD.4	2	B
9.	MGSE.5.MD.5a	2	D
10.	MGSE.5.MD.5b	3	D
11.	MGSE.5.MD.5c	2	B
12.	MGSE.5.MD.5c	3	C
13.	MGSE.5.MD.5b	2	C
14.	MGSE.5.MD.5a	2	A
15.	MGSE.5.MD.5a	3	B

APPENDIX E:

Math and Me Survey

Math and Me Survey

Assigned ID: _____

Question	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I am really good at math.	☐	☐	☐	☐	☐
2. I love math.	☐	☐	☐	☐	☐
3. I understand math.	☐	☐	☐	☐	☐
4. Math is boring.	☐	☐	☐	☐	☐
5. I can solve difficult math problems.	☐	☐	☐	☐	☐
6. I enjoy doing math puzzles.	☐	☐	☐	☐	☐
7. Math is very hard for me.	☐	☐	☐	☐	☐
8. I do math problems on my own “just for fun”.	☐	☐	☐	☐	☐
9. Math is confusing to me.	☐	☐	☐	☐	☐
10. Math is fun.	☐	☐	☐	☐	☐
11. I look forward to learning new math.	☐	☐	☐	☐	☐
12. Math comes easily to me.	☐	☐	☐	☐	☐
13. I hate math.	☐	☐	☐	☐	☐
14. I enjoy playing math games.	☐	☐	☐	☐	☐
15. I can tell if my answers in math make sense.	☐	☐	☐	☐	☐
16. I enjoy studying math.	☐	☐	☐	☐	☐
17. Doing math is easy for me.	☐	☐	☐	☐	☐
18. Solving math problems is fun.	☐	☐	☐	☐	☐

Appendix F:

Math and Me Survey Table

Math and Me Survey Table

Question	Self-Perceptions	Enjoyment
1. I am really good at math.	X	
2. I love math.		X
3. I understand math.	X	
4. Math is boring.		X
5. I can solve difficult math problems.	X	
6. I enjoy doing math puzzles.		X
7. Math is very hard for me.	X	
8. I do math problems on my own "just for fun".		X
9. Math is confusing to me.	X	
10. Math is fun.		X
11. I look forward to learning new math.		X
12. Math comes easily to me.	X	
13. I hate math.		X
14. I enjoy playing math games.		X
15. I can tell if my answers in math make sense.	X	
16. I enjoy studying math.		X
17. Doing math is easy for me.	X	
18. Solving math problems is fun.		X

Appendix G:

Math and Me Survey Permission Emails

Math and Me Survey Permission Emails

The Math and Me Survey
Mccoach, D. Betsy <betsy.mccoach@uconn.edu>
Mon 3/12, 11:09 AM Amity C Lutes

You can certainly use the survey (we have made it freely available for research and educational purposes), but if you have any questions about the survey, then Jill is the best person to ask.
Good luck with your research!

Betsy

D. Betsy McCoach
Professor, Measurement, Evaluation, and Assessment program
Department of Educational Psychology
University of Connecticut
249 Glenbrook Road, Unit 3064
Storrs, CT 06269-3064
860-486-0183
betsy@uconn.edu

Adelson, Jill Lynn <jill.adelson@louisville.edu>
Mon 3/12, 11:51 AM Amity C Lutes

Hi Amy,

I've attached a copy of the survey. Please be sure to cite the Development & Validation article and the survey in any manuscripts, presentations, reports, dissertation, etc. I would love to see your results when you are done!

Let me know if you have any questions!

Best of luck,
Jill

Jill L. Adelson, Ph.D.
Associate Professor
Educational Psychology, Measurement, and Evaluation Program at University of Louisville
Vice Chair, UofL Commission on the Status of Women
Editor, *Gifted Child Quarterly*

Appendix H:

Weekly Student Perceptions Essay Questions

Weekly Student Perceptions Essay Questions

1. How do you feel about the HHBE lessons that your teacher used to teach you math for the past week?
2. What activities from this week's HHBE lessons were your favorite? Why?
3. What activities from this week's HHBE lessons were your least favorite? Why?
4. Do you think that your math scores changed during this week's HHBE lessons? If so, how?
5. Dou you think that your attitudes toward math changed during this week's HHBE lessons? If so, how?

APPENDIX I:

Interview Guide for Teachers of HHBE Unit

Interview Guide for Teachers of HHBE Unit

1. What are your perceptions about implementing the HHBE unit during the four weeks?
2. In general, how did the students respond to the HHBE unit?
3. Which activities did the students like more than others? Why do you think they liked them?
4. Which activities did the students dislike more than others did? Why do you think they disliked them?
5. How did different genders (male/female) respond to the HHBE unit?
6. What changes, if any, did you notice in student achievement during the HHBE unit?
7. What changes, if any, did you notice in student attitudes toward math during the HHBE unit?
8. What changes would you make to the HHBE unit if you used it again in the future?
9. Do you think that HHBE could be a useful strategy for students in high-minority, low-income school districts?

APPENDIX J:

HHBE Unit Timeline

HHBE Unit Timeline

Week/Day	AKS Standard(s)	HHBE Strategies Used	Overview of Lesson
Week 1, Day 1	5MA.D.27 5MA.D.28 5MA.D.29	Sampling, Rap Song, Dancing	• TTW introduce standard and learning target. • TSW use sampling to predict rules for finding volume using cubic units. • TTW introduce Volume (Part 1) rap song with dance moves. • TSW practice the rap song and dance moves. • TSW use the song/dance moves to practice finding the volume of various cubes and prisms.
Week 1, Day 2	5MA.D.27 5MA.D.28 5MA.D.29	Rap Song, Dancing, Hip-Hop Word Problem	• TTW review standard and learning target. • TSW practice the rap song and dance moves. • TTW model solving a word problem using volume. • TSW solve Hip-Hop based word problems using the rap song/dance moves.
Week 1, Day 3	5MA.D.27 5MA.D.28 5MA.D.29	Rap Song, Dancing, Cypher	• TTW review standard and learning target. • TSW practice the rap song and dance moves. • TTW model how to rap an answer during the class cypher. • TSW create their cypher rap to answer their problem. • TSW recite their cypher raps in a circle.
Week 1, Day 4	5MA.D.27 5MA.D.28 5MA.D.29	Rap Song, Dancing, Rap Battle	• TTW review standard and learning target. • TSW practice the rap song and dance moves.

			• TTW model how to participate in a rap battle against a partner. • TSW participate in rap battles with several partners to argue whose solution to the same problem is better.
Week 2, Day 1	5MA.D.30 5MA.D.31 5MA.D.32	Sampling, Rap Song, Dancing	• TTW review standard and learning target. • TSW use sampling to predict the formulas used to find volume (LxWxH or BxH). • TTW introduce the additional lyrics/dance moves to Volume Song (Part 2) • TSW practice the rap song/dance moves. • TSW use the rap song/dance moves to practice finding the volume of rectangular prisms.
Week 2, Day 2	5MA.D.30 5MA.D.31 5MA.D.32	Rap Song, Dancing, Cypher	• TTW review standard and learning target. • TSW practice the rap song/dance moves. • TSW create their cypher rap to answer their question. • TSW recite their cypher raps in a circle.
Week 2, Day 3	5MA.D.30 5MA.D.31 5MA.D.32	Rap Song, Dancing, Word Problems	• TTW review standard and learning target. • TSW practice the rap song and dance moves. • TTW model solving a word problem using the volume formula. • TSW solve Hip-Hop based word problems using the rap song/dance moves.
Week 2, Day 4	5MA.D.30 5MA.D.31 5MA.D.32	Rap Song, Dancing, Rap Battle	• TTW review standard and learning target. • TSW practice the rap song/dance moves. • TSW participate in rap battles with several partners to argue

			whose solution to the same problem is correct.
Week 3, Day 1	5MA.D.33	Sampling, Rap Song, Dancing	• TTW review standard and learning target. • TSW use sampling to predict how to find the volume of compound shapes. • TTW introduce the Volume (part 3) rap song/dance moves. • TSW practice the rap song/dance moves. • TSW practice finding volume of compound shapes using the rap song/dance moves.
Week 3, Day 2	5MA.D.33	Rap Song, Dancing, Rap Battle	• TTW review standard and learning target. • TSW practice the rap song/dance moves. • TSW participate in rap battles with several partners to argue whose solution to the same problem is correct.
Week 3, Day 3	5MA.D.33	Rap Song, Dancing, Word Problems	• TTW review standard and learning target. • TSW practice the rap song and dance moves. • TTW model solving a word problem involving compound shapes. • TSW solve Hip-Hop based word problems using the rap song/dance moves.
Week 3, Day 4	5MA.D.33	Rap Song, Dancing, Cypher	• TTW review standard, learning target, vocabulary. • TSW practice the rap song/dance moves. • TSW create their cypher rap to answer their question. • TSW recite their cypher raps in a circle.
Week 4, Day 1	5MA.D.27 5MA.D.28 5MA.D.29	Rap Song, Dancing	• TTW review standard and learning target.

	5MA.D.30 5MA.D.31 5MA.D.32 5MA.D.33		• TTW review the entire Volume (parts 1, 2, and 3) rap song/dance moves. • TSW practice the rap song/dance moves. • TSW answer review questions using the rap song/dance moves.
Week 4, Day 2	5MA.D.27 5MA.D.28 5MA.D.29 5MA.D.30 5MA.D.31 5MA.D.32 5MA.D.33	Rap Song, Dancing, Cypher	• TTW review standard and learning target. • TSW practice the rap song/dance moves. • TSW create their cypher rap to answer their review question. • TSW recite their cypher raps in a circle.
Week 4, Day 3	5MA.D.27 5MA.D.28 5MA.D.29 5MA.D.30 5MA.D.31 5MA.D.32 5MA.D.33	Rap Song, Dancing, Rap Battle	• TTW review standard and learning target. • TSW practice the rap song/dance moves. • TSW participate in rap battles with several partners to argue whose solution to the same review problem is correct.
Week 4, Day 4	5MA.D.27 5MA.D.28 5MA.D.29 5MA.D.30 5MA.D.31 5MA.D.32 5MA.D.33	Rap Songs, Dancing	• TTW review standard and learning target. • TSW practice the entire volume rap song/dance moves. • TSW answer review questions using the rap songs/dancing from the HHBE unit.

APPENDIX K:

Sample HHBE Lesson PowerPoint (Week1, Day1)

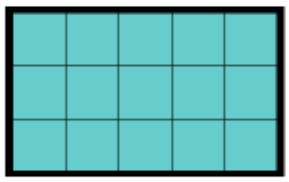
Day 1 – Standards/Learning Target

- Standards
  - 5MA.D.27 - use words, pictures, or numbers to show a cubic unit is represented by a cube in which each edge has a length of one unit.
  - 5MA.D.28 - apply concepts of volume measurement to explain volume as an attribute of solid figures packed without gaps or overlaps using "n" unit cubes.
  - 5MA.D.29 - measure volume as cubic centimeters, cubic meters, cubic inches, cubic feet and improvised units.

- Learning Targets
  - I can show that a cubic unit is a cube in which each edge has a length of 1 unit.
  - I can find volume by filling solid figures with cubic units.

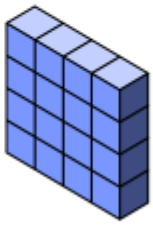
Sampling - Volume

- Using your previous knowledge about finding the area of a rectangle, try to determine how to find the volume of a rectangular prism.



Area = 15 square units

What is the volume of this object?



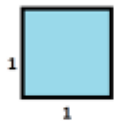
cubic units

Original: Lauryn Hill – Ex-Factor

Sample: Drake – Nice for What

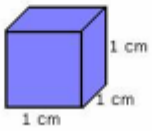
Area Versus Volume

- **Area** – Covering up a 2-dimensional shape (square/rectangle) with square units.



area = 1 square unit

- **Volume** – Filling up a 3-dimensional shape (cube/rectangular prism) with cubic units.



Volume – Song (Part 1)

- We're just gonna fill it, fill it
- Fill it, fill it, fill it up
- We are finding volume
- Cubes and prisms we are filling up

- We put cubic units inside
- They measure 1 on every side
- Cubic inches, meters
- Feet, that's how we ride

Cubic Units – I Do!

- What is the volume of the rectangular prism?
  - Use the volume song to help you remember how to find volume using cubic units!

Cubic Units – We Do!

- What is the volume of the rectangular prism?
  - Use the volume song to help you remember how to find volume using cubic units!

Cubic Units – You Do!

- What is the volume of the rectangular prism?
  - Use the volume song to help you remember how to find volume using cubic units!

Appendix L:

Sample HHBE Unit Lesson Plan (Week 1, Day 1)

Sample HHBE Unit Lesson Plan (Week 1, Day 1)

Lesson Standards	**Standards** • 5MA.D.27 - use words, pictures, or numbers to show a cubic unit is represented by a cube in which each edge has a length of one unit. • 5MA.D.28 - apply concepts of volume measurement to explain volume as an attribute of solid figures packed without gaps or overlaps using "n" unit cubes. • 5MA.D.29 - measure volume as cubic centimeters, cubic meters, cubic inches, cubic feet and improvised units. **Learning Targets** • I can show that a cubic unit is a cube in which each edge has a length of 1 unit. • I can find volume by filling solid figures with cubic units.
Direct Explanation (5 minutes)	• TTW review the standards, learning target, and vocabulary (volume, cubic unit) • TTW access prior knowledge by completing the sampling activity. • TSW use prior knowledge and current information to create new knowledge.
Modeling the Lesson's Concepts (I do) (10 minutes)	• TTW introduce the rap song and dance moves for Volume Song 1. • TSW practice the rap song and dance moves. • TTW model finding the volume of a rectangular prism using cubic units and using the song and dance moves.
Guided Practice (We do) (10 minutes)	• TSW work together in their groups to find the volume of a rectangular prism using unit cubes. • TSW use the volume part 1 rap song and dance moves as they work.

Independent Practice (You do) (10 minutes)	• TSW find the volume of a rectangular prism using unit cubes independently. • TSW use the volume part 1 rap song and dance moves as they work.
Review/Assessment of Standards (5 minutes)	• TSW discuss ways that the HHBE activities (sampling, rap song, dancing) helped them understand finding volume of rectangular prisms using unit cubes.

Appendix M:

VSU IRB Approval

Institutional Review Board (IRB)
for the Protection of Human Research Participants

EXPEDITED PROTOCOL APPROVAL

Protocol Number: IRB-03658-2018 **Responsible Researcher:** Amity Lutes

Supervising Faculty: Dr. E-Ling Hsiao

Project Title: *The Rose that Grew from Concrete: A Study of Hip-Hop Based Education in Urban Fifth-Grade Math.*

Level of Risk: ☒ Minimal ☐ More than Minimal

Type of Review: ☒ Expedited ☐ Convened (Full Board)

Approval Category: **7**

Approval Date: **01.22.2019**

Expiration Date: **01.22.2022**

Consent Requirements:

- ☒ Adult Participants – Written informed consent with documentation (signature)
- ☐ Adult Participants – Written informed consent with waiver of documentation (signature)
- ☐ Adult Participants – Verbal informed consent
- ☐ Adult Participants – Waiver of informed consent
- ☒ Minor Participants – Written parent/guardian permission with documentation (signature)
- ☐ Minor Participants – Written parent/guardian permission with waiver of documentation (signature)
- ☐ Minor Participants – Verbal parent/guardian permission
- ☐ Minor Participants – Waiver of parent/guardian permission
- ☐ Minor Participants – Written assent with documentation (signature)
- ☒ Minor Participants – Written assent with waiver of documentation (signature)
- ☐ Minor Participants – Verbal assent
- ☐ Minor Participants – Waiver of assent
- ☐ Waiver of some elements of consent/permission/assent

Approval: This research protocol is **approved as presented**. Your approved consent form(s), with IRB approval stamp are attached. If you prefer the original stamped consent, please email tmwright@valdosta.edu and the form will be sent via inter-office mail, or you may come by the OSPRA office to obtain the original. Please see page 2 for additional important information for researchers.

Comments:

Elizabeth Ann Olphie 01.23.2019

Elizabeth Ann Olphie, IRB Administrator Date

Thank you for submitting an IRB application.
Please direct questions to irb@valdosta.edu or 229-253-2947.

Form Revised: 06.02.16

EXPEDITED PROTOCOL APPROVAL REPORT

Attachment 1

ADDITIONAL INFORMATION FOR RESEARCHERS:

If your protocol received expedited approval, it was reviewed by a two-member team, or, in extraordinary circumstances, the Chair or the Vice-Chair of the IRB. Although the expediters may approve protocols, they are required by federal regulation to report expedited approvals at the next IRB meeting. At that time, other IRB members may express any concerns and may occasionally request minor modifications to the protocol. In rare instances, the IRB may request that research activities involving participants be halted until such modifications are implemented. Should this situation arise, you will receive an explanatory communiqué from the IRB.

Protocol approvals are generally valid for one year. In rare instances, when a protocol is determined to place participants at more than minimal risk, the IRB may shorten the approval period so that protocols are reviewed more frequently, allowing the IRB to reassess the potential risks and benefits to participants. The expiration date of your protocol approval is noted on the approval form. You will be contacted no less than one month before this expiration date and will be asked to either submit a final report if the research is concluded or to apply for a continuation of approval. It is your responsibility to submit a continuation request in sufficient time for IRB review before the expiration date. If you do not secure a protocol approval extension prior to the expiration date, you must stop all activities involving participants (including interaction, intervention, data collection, and data analysis) until approval is reinstated.

Please be reminded that you are required to seek approval of the IRB before amending or altering the scope of the project or the research protocol or implementing changes in the approved consent process/forms. You are also required to report to the IRB, through the Office of Sponsored Programs & Research Administration, any unanticipated problems or adverse events that become apparent during the course or as a result of the research and the actions you have taken.

Please refer to the IRB website (http://www.valdosta.edu/ospra/HumanResearchParticipants.shtml) for additional information about Valdosta State University's human protection program and your responsibilities as a researcher.