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Efficacy of a Summer Math Academy Program to Improve Student Motivation and Student Knowledge and Skills in a Rural Southeastern Community

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Efficacy of a Summer Math Academy Program to Improve Student Motivation and Student Knowledge and Skills in a Rural Southeastern Community

By
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Approval Page

This dissertation was submitted by Danielle M. Grier under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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"Let us run with endurance the race that is set before us, looking to Jesus, the founder and perfecter of our faith." Hebrews 12: 1-2

First and foremost, I must give honor to my heavenly father who has given me strength, determination, and grace to complete this project. Without doubt, it is only because of who God is that I am able to serve in the capacity that He requires of me. And yet, I am still a work in progress.

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Abstract

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The purpose of this mixed-methods study was to evaluate the effectiveness of a Community Math Academy (summer camp) in a southeastern school district in an effort to prevent the summer learning loss often experienced by students. The study intended to provide the Community Math Academy staff insight into the nature of the site, to assess the success of the 3-week implementation, to observe student interaction with program lessons and materials, and to provide feedback to the funding agencies, partner organizations, project team, participants, and stakeholders.

Data collection procedures included student journals examining student attitudes towards math, pre and posttest data, and survey data. Daniel Stufflebeam's CIPP model was used for this program evaluation (Fitzpatrick, Sanders, & Worthen, 2011). Three research questions were used to guide the study: (a) What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018; (b) What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of students journals; and (c) What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data?

The researcher found that students improved significantly from their pretest to posttest when they participated in the high quality summer program. These results correlated to the positive journal responses and stakeholder survey responses. Recommendations for future research include opening more sites or increasing the capacity at existing sites in order to serve more children. Also, there is a recommendation to redevelop the sixth-grade posttest, so it is a mastery-based assessment similar to the fifth-grade assessment. Last, the researcher recommends evaluating the other Math Academy sites in order to compare data between sites.

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Chapter 1: Introduction

Nature of the Problem

> The American ideal of lazy summers filled with fun has an unintended consequence: If students are not engaged in learning over the summer, they lose skills in math and reading. Summers off are one of the most important, yet least acknowledged, causes of underachievement in our schools. (Smink, 2011b, p. 29)

This could be due to the fact that caretakers "are responsible for structuring all their children's time. This structure can consist of leaving children to entertain themselves or arranging a [plethora] of activities that fill up each week of the summer" (Chin & Phillips, 2004, p. 186). This is a challenge that we must tackle with urgency using "wisdom of historical perspective and the scientific insight of research informing our approach" (Polluck, Ford, & Black, 2012, p. 10).

Dating back to the early part of the 20th century, the achievement gap and its contribution to summer learning loss has been a concern for educators. Barbara Heyns's study published in 1978 was one of the first to correlate "summer learning loss to the achievement gap" (Alexander, Entwisle, & Olson, 2007, p. 13). Results from the study indicated that a sample of Atlanta, Georgia middle school students experienced seasonal gaps: "relatively small during the school year and large during the summer months" (Alexander et al., 2007, p. 14). Therefore, "reducing the achievement gap [involves] changing the teaching and learning paradigm from one of remediation to a strength-based, child-centered methodology of enrichment teaching and learning" (Beecher & Sweeny, 2008, p. 506). As Polluck et al. (2012) noted, "[when] teachers consider an achievement gap as an opportunity to make an improvement, they find ways to shift the progress of improving learning for all students" (p. 11). For example, using the summer

months could “provide the ideal time for [communities] to pilot new approaches to [mathematics] teaching and learning” (Smink, 2011a, p. 65) as well as enhance academics with extracurricular activities (Alexander et al., 2007). Numerous studies have shown that quality summer programs can achieve many important goals such as “reverse summer learning loss, achieve learning gains, and give low-performing students the chance to master material they did not learn during the school year” (McCombs et al., 2011, p. 47). All in all, in order to begin this process of minding the achievement gap and summer learning loss, schools and communities must help students to “reframe their life narratives from damaged victim or school failure to resilient survivor and successful learner” (Williams, 2003, p. 120).

Achievement gap. As emphasized by Paige and Witty (2010), the achievement gap can be defined in several ways; therefore, it is important to clarify the meaning for this study. The achievement gap is the “disparity in academic achievement. An achievement gap occurs when one group of students continually disproportionately outperforms other students on achievement tests. [This] gap typically describes the disparity between white students’ achievement scores and black and Hispanic students’ achievement scores,” according to Blackford and Khojasteh (2013, p. 6). In fact, this gap exists “even when blacks and whites come from families with similar incomes” (Rothstein, 2004, p. 36). Additionally, this gap is “noticeable between students’ grades, students’ standardized achievement scores, and other measures of academic success” (Blackford & Khojasteh, 2013, p. 6). Therefore, as noted in *C.A.R.E.: Strategies for Closing the Achievement Gaps* (National Education Association [NEA], 2007), “closing the gaps involves not only improving achievement for all students, but taking the steps needed to significantly raise the achievement of traditionally underachieving groups to

that of mainstream groups of students" (p. 11).

> Conclusively, as Paige and Witty (2010) noted, the achievement gap is a complex problem. We can be assured that the achievement gap problem can be eliminated, but its resolution will require that we match its complexity with well-thought-out, energetic, and sustained efforts. For this, we need a [community effort which requires] involvement from all of us. (p. 182)

The time is now to acknowledge the lasting effects of school, home, and community on children's development (Epstein, 2011).

Summer learning loss. As emphasized by O'Sullivan (2013), "summer vacation is not a luxury that the United States' education system can afford" (p. 401). During this time, students experience academic losses (also known as summer learning losses) generally greater in math computations than in language arts (Alexander, 2007). These summer losses are defined as "situations where achievement plateaus or declines in the summer" (Jesson, McNaughton, & Kolose, 2014, p. 45). In fact, Alexander (2007) noted, "[the summer] interval of eleven weeks, or just under three months is ample time for children to forget some of what they had learned the previous years and slip into bad habits" (p. 12). Even more disturbing is the idea that summer learning loss can contribute to the achievement gap between low-income and high-income students over time (McCombs et al., 2011). Therefore, this study proposes that more districts and states began to implement high quality summer programs. Consequently, low-achieving students and districts can then ensure that learning is continuous during the summer months by actively monitoring student progress (O'Sullivan, 2013).

A focus on math. As noted by Cockcroft (1982), "it would be very difficult—perhaps impossible—to live a normal life in very many parts of the world without making

use of mathematics of some kind" (p. 1). For this reason, "the acquisition of at least basic mathematical skills—commonly referred to as numeracy—is vital to the life opportunities and achievements of individual citizens" (as cited in Sriraman, Greer, & Ernest, 2009, p. 458). It is no longer enough for learners to possess the basic math skills, but they must be able to use application of this knowledge in new and uncommon ways (Kroesbergen & van Luit, 2003). Therefore, summer programs must "engage students in active problem solving that encourage self-reflection, critical thinking, consciousness, and dialogue" (Williams, 1996, p. 122).

Purpose of the Study

The purpose of this study was to evaluate the effectiveness of a Community Math Academy (summer camp) in a southeastern school district in an effort to prevent the summer learning loss often experienced by students. The study concentrates on a summer math camp serving rising third through sixth graders. Additionally, the study intends to contribute research-based practices for mathematics instruction for at-risk learners.

The Community Math Academy. The Community Math Academy was developed in 2008 by the Close the Gap Committee as a nonprofit organization to help close the achievement gap for low-performing students in math. Three visionaries and founders wanted an academy culture and classroom climate that eliminated unnecessary barriers to learning, so these men along with a board of directors and an executive director developed a strategic plan to meet the community's needs. The academy was originally developed to target minority students. Since its inception 10 years ago, the program has expanded to reach any low-performing student in the local school district. The Community Math Academy provides instruction for rising third, fourth, fifth, and

sixth graders and operates during the last 3 weeks of July. See Appendix A for the Math Academy Enrollment form.

Instructional days consist of 3 hours of math instruction and 1 hour of enrichment activities. The hours of operation are from 7:00 am to 1:00 pm, Monday through Friday. The sites for the Community Math Academy include three local churches and one school site in the rural southeastern district. Each site partners with the school system and provides transportation and meals (breakfast and lunch) for students as well as full scholarships for students to attend (approximately $550 per student). Additionally, teachers are recruited locally to provide high-quality instruction. Classrooms are also provided student fellows who are either high school or college students who volunteer during the 3 weeks of operation. In addition to the aforementioned volunteers and staff, each operating site has a principal, law enforcement officer, site administrator, kitchen committee, secretary, and guidance counselor. An advantage to this program implementation is that board members can

> make their own choices about the design of their program, such as how to manage their program sites, which enrichment activities to offer, the timing of the program during the summer, and the specific math curriculum to use at the sites. (McCombs et al., 2015, p. xii).

The mission statement of the Community Math Academy is to educate children with sound mathematical principles which will advance their skills and empower them to be lifelong learners. The Community Math Academy exists to foster community partnerships with families and educators in which student success is paramount and each child is empowered to know, "I AM, I CAN, and I WILL achieve." *I AM* is the affirmation used in order to develop the belief within students that they are somebody. I

CAN is the affirmation used in order to establish the belief that students are capable of greatness. *I WILL* is the affirmation used in order to define what students will do to reach their potential.

The vision statement of the Community Math Academy is for all students to achieve maximum potential in an engaging, inspiring, and challenging learning environment which prepares them to thrive in a global economy. The Community Math Academy aspires for families, educators, and community stakeholders to work as a team in providing resources necessary to achieve an outstanding education. Additionally, the overall purpose is to help students develop positive feelings towards math, understand math concepts, and improve their math skills.

High-quality programs. Borman (2000) made recommendations for program developers to establish high quality summer programs to prevent summer losses. Borman suggested that these programs (a) begin in the early grades, (b) be offered over multiple summers, and (c) focus on prevention and development rather than remediation. Likewise, Terzian, Moore, Hamilton, Wallace, and Child (2009) noted that the "promising approaches" (p. 17) of high-quality programs include making learning fun, grounding learning in a real-world context, integrating hands-on activities, aligning content with curricular standards, hiring experienced and trained teachers to deliver lessons, and keeping class sizes no larger than 15 students.

The Community Math Academy aims to be a high quality enrichment program that helps students develop positive feelings towards math while improving their skills. In order to communicate the needs and expectations of the program, the following guidelines were developed:

1. We want an academy culture and classroom climate that eliminates

unnecessary barriers to learning. We want to create a culture that says "You can do this work and we will help you."

2. We will help all students to become confident and committed learners no matter their past experiences. The entire academy should believe that success in within reach for every student.
3. Students should not be allowed to fall behind in class work. The community, teachers, parents, volunteers, and classmates will support the students through our collective efforts and TEAMWORK.
4. The classroom environment should support students in understanding the daily lessons.
5. The classroom environment should teach the students problem-solving skills.
6. There should not be a "one size fits all approach" to learning math at the academy. Differences in problem-solving approaches and in learning styles should be recognized and embraced.
7. The classroom environment should allow students to explain their thinking, both in oral and written form.
8. The Math Academy and the classroom environment should celebrate successes (both minor and major) on a daily basis with as many students as possible.
9. The classroom environment should promote a work ethic for effort-based success. Students should understand that math requires daily effort. Effort, perseverance and risk taking (for problem-solving and higher order math) should all be recognized and appreciated.
10. We will create an academy and classroom environment or respect, mutual

support, and a love for learning.

11. We do not want to use any types of labels (at risk, disadvantaged, poverty, single parent home, etc.) to refer to students. For us they are simply "our students."
12. We want to ensure the entire academy understands that motivating academic effort for the Math Academy students is a massive task and teachers can't do this alone. The community, parents, volunteers, and students will work together.
13. Students should not be encouraged to say "I am done with my work" because there is always something more to learn or someone else to help.

Newhouse, Neely, Freese, Lo, and Willis (2012) suggested that "summer learning programs can have a strong positive impact on children's learning and development, leading to increased academic self-efficacy and motivation, which in turn contributes to higher academic performance" (p. 10). Therefore, "educators should develop math programs that are engaging, rigorous, and full of academic enriching resources that help maintain students' math performance during the summer months" (Lee, Robinson, & Sebastian, 2012, p. 36).

Figure 1 illustrates the Theory of Action which represents the positive outcomes summer learning programs can have when emphasizing high-quality academic and social components. This theory guided the Newhouse et al. (2012) *Summer Matters* case study.

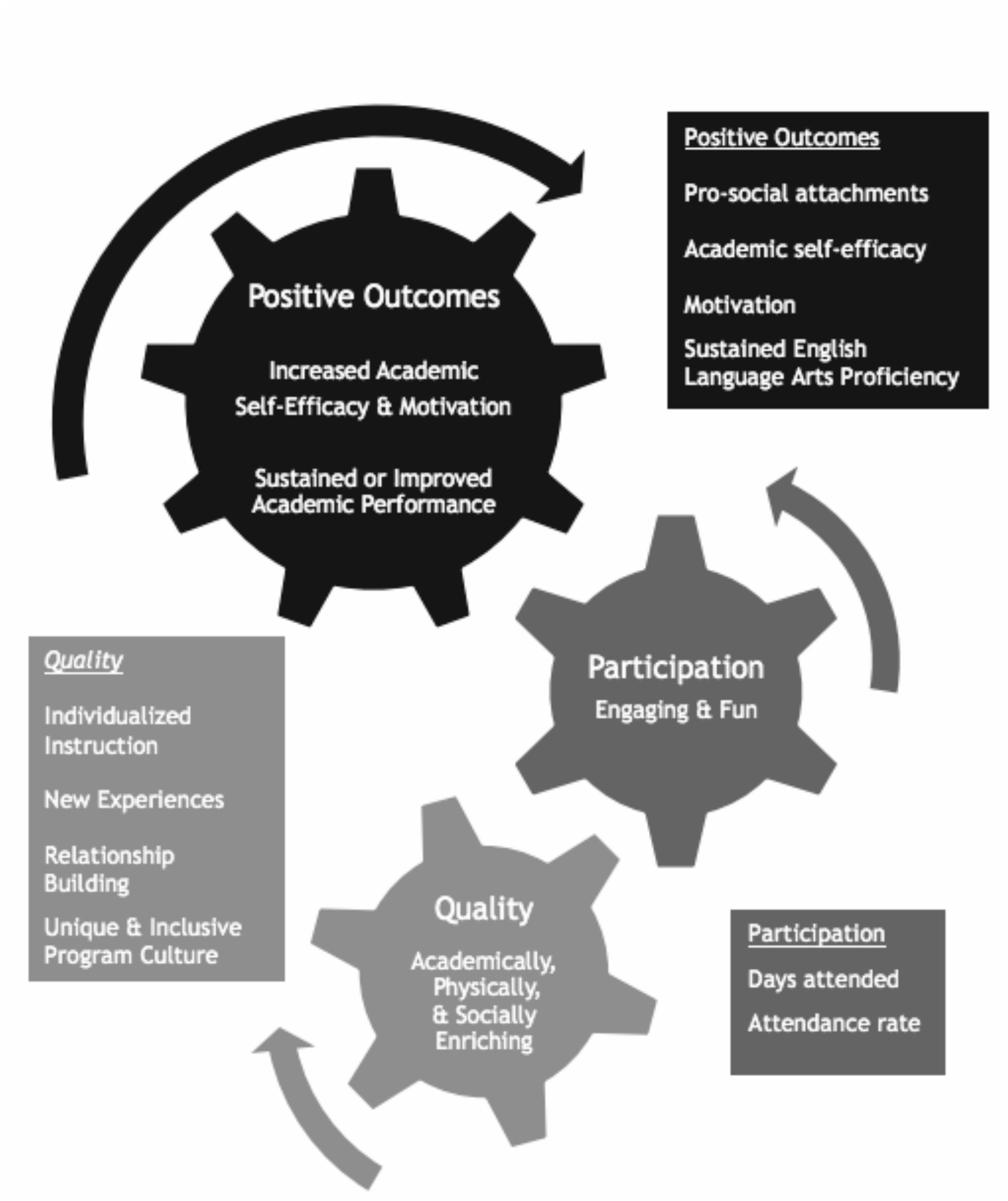

Figure 1. Theory of Action.

Background and Significance of the Problem

Mano Singham (2005), a professor at Case Western Reserve University, noted that math has "the lowest pass rates in proficiency tests for all ethnic groups" (p. 84). In Cleveland, Ohio, where he lives, only 20% of students pass the state math exam the first time they take it ((Singham, 2005), p. 15). Perhaps this is because

> mathematics is the most difficult content area material to read because there are more concepts per word, per sentence, and per paragraph than in any other subject; the mixture of words, numerals, letters, symbols, and graphics requires the reader to shift from one type of vocabulary to another. (Braselton & Decker, 1994, p. 276)

So again, it is worth noting that it is no longer enough for learners to possess the basic math skills, but they must be able to use application of this knowledge in new and uncommon ways (Kroesbergen & van Luit, 2003).

According to O'Sullivan (2013), underachieving and underprivileged children in the United States need access to summer programs in order to compete globally. Likewise, Polluck et al. (2012) echoed, "the persistent presence of underachieving students, students who graduate from high school ill-prepared for college and the workspace, and students who do not graduate at all confirm that we must continue to find new solutions" (p. 3). Among these solutions is the idea of a summer math program. "Ideally, these summer programs can provide the time for schools [and communities] to pilot new approaches to teaching and learning that look different from those offered in the regular school year" (Smink, 2011a, p. 65).

Research Questions

To evaluate the impact of the Community Math Academy, data were collected using a mixed-methods approach. Mixed methods helped triangulate the data from the surveys, student journals, and pre and posttests in order to gain a deeper understanding of the relationship between student perceptions of and performance in the summer math program. This concept of triangulation also helped to "increase the validity [and] accuracy of [data] measures of the construct as a whole" (Fitzpatrick, Sanders, &

Worthen, 2011, p. 385). The following research questions were developed in order to conduct an evaluation of the program:

1. What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018?
2. What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals?
3. What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data?

These research questions were developed based on Daniel Stufflebeam's process and product components of the CIPP (context-input-process-product) evaluation model (Fitzpatrick et al., 2011). This model is discussed at length later in Chapter 3.

Definition of Terms

The researcher defines the following terms (or themes) as relevant for the study: achievement gap, Common Core standards, differentiation, mathematics applications, and summer learning loss. These terms are defined in the following table.

Table 1

Key Terms

Term	Definition
Achievement Gap	Refers to the observed, persistent disparity noticeable between student grades, standardized achievement scores, and other measures of academic success (Blackford & Khojasteh, 2013).
Common Core Standards	An educational initiative that seeks to establish consistent educational standards across the states to ensure students are prepared for college or the workforce.
Differentiation	A framework for effective teaching that involves different avenues to learning so all students can learn, regardless of ability level.
Mathematics Applications	In the study of mathematics, students participate in a wide variety of problem-solving activities. They learn how to approach new challenges by investigating, modeling, reasoning, visualizing, and problem solving.
Summer Learning Loss	Describes the situation where achievement plateaus or declines in the summer; also known as summer learning effect (Jesson et al., 2014).

Summary

Combating summer learning loss and closing the achievement gap is a complex problem that "mandates accountability across the education community" (Williams, 1996, p. 36). Jeynes (2014) stated,

> Over the last 45 years, there has been a considerable amount of research undertaken to reduce the achievement gap. In spite of all this research, there is a patent lack of consensus about what strategies Americans at various levels should undertake to see the gap abate. (p. 527)

Therefore, as aforementioned, this study proposes the idea of implementing a high quality

summer learning program. After all, as Rothstein (2004) noted, it would play an "essential part in narrowing the achievement gap" (p. 36) by giving lower-class children the same opportunities as middle-class children through after-school and summer programs.

This chapter describes the background and significance of the problem. Additionally, the research questions and key terms were explained in order to frame and guide the study. In Chapter 2, a review of related literature is analyzed in order to present research, history, and background from past studies. Certainly, education is at a crossroads; however, "we can use the knowledge of historical trends and perceived gaps in learning combined with the firm directions where research can point us in order to effectively educate all students" (Polluck et al., 2012, p. 17).

Chapter 2: Review of Literature

Overview

Each year, educators grapple with the challenge of teaching mathematics to diverse learners with various strengths and weaknesses. This daunting task becomes more difficult when summer vacation interrupts classroom studies, causing some students to stand still or regress in their progress (Kerry & Davies, 1998). This is particularly true for low-income students, because “they do not have as many resources and opportunities in their home and neighborhoods to cushion the lack of school structure, learning and support” (Terzian et al., 2009, p. 5) during the summer months. As a matter of fact, researchers refer to this as the “faucet theory.” This is when “public schooling creates a flow of resources to all students during the school year- books, meals, teachers, and organized activities, among others – that keep all students learning and growing” (Pitcock, 2018, p. 5); but this “faucet runs dry for lower-income students, who lose access to critical services altogether when the schools doors close” for summer (Knopf et al., 2015, p. 595; Pitcock, 2018, p. 5). Unfortunately, some parents are then faced with hardships of trying to construct daily engaging activities. “Constructing these summers [requires] a combination of financial resources, parental time, parental knowledge, and a relatively safe environment [for outdoor learning activities]” (Chin & Phillips, 2004, p. 193). On the other hand, “finding stimulating solutions to boredom is typically easier for children who can spend time playing outside in their neighborhoods, who have ample books, and functioning computers at home, and whose parents actively supervise and facilitate their activities at home” (Chin & Phillips, 2004, p. 198). Therefore, this review of the literature examines the effects of summer learning loss. In addition, there is analysis of mathematics education reform, the achievement gap, summer programs, and

educating the whole child. Finally, the chapter concludes with a summary of how the literature connects with the presented study.

Math Matters

Mathematics is an important part of a child's education; however, "mathematics functions as a feared and revered subject in our culture" (Ladson-Billings, 1997, p. 698), because of the stigma that it is too difficult to figure out. Number sense is the foundation for developing and building math connections for children at all grade levels (Naylor, 2007). Unfortunately, the percentage of students in the United States who are highly proficient in math is well below that of most countries. Based on International Ranks in 2009, 12 other countries ranked higher than the U.S. in math excellence (Hanushek et al., 2011; see Table 2). Switzerland, Belgium, the Netherlands, Liechtenstein, New Zealand, the Czech Republic, Japan, Canada, China, Australia, Germany, and Austria all rank higher than the U.S. (Hanushek et al., 2011). Without a doubt, this widespread concern deserves immediate attention and an action plan; therefore, this study focuses on a summer community math enrichment program to improve student math confidence and performance. "America cannot afford to have substantial numbers of low-income and minority group students functioning at the educational margins" (LaPoint, Ellison, & Boykin, 2006, p. 373). After all, the future "is directly tied to our children's ability to make the most of their education – to use it not merely for their own economic gain and personal aggrandizement, but rather for a restructuring of society" (Ladson-Billings, 1997, p. 703).

Table 2 represents the 12 nations in 2009 that had more than twice the percentage of advanced students than the United States. These nations are ranked in order of math excellence.

Table 2

International Ranks in 2009

Rank	Nation
1	Switzerland
2	Belgium
3	Neverlands
4	Liechtenstein
5	New Zealand
6	Czech Republic
7	Japan
8	China
9	Australia
10	Germany
11	Austria
12	United States

Mathematics Education Reform

In the mid-1980s, the mathematics education reform movement began in response to the failure of traditional methods of teaching mathematics (Battista, 1999; Woodward, 2004). Likewise, in the 1990s, developments in research and education were more significant in the 1990s than at any point since the new math era 30 years prior (Woodward, 2004). This reform of mathematics has remained a central part of education. According to Battista (1994), "a major [push] of the reform movement has been to replace the computational curriculum with a curriculum that embraces conceptual understanding" (p. 425). In other words, "teaching mathematics for understanding has been one of the [major elements] of reform efforts" (Eisenhart et al., 1993, p. 8) in mathematics education. As noted in Hansen-Powell (2007), the objectives of the National Mathematics Standards are to teach students to

> build new mathematical knowledge through problem solving; make and investigate mathematical conjectures; develop and evaluate mathematical

> arguments and proofs; communicate mathematical thinking coherently and clearly to others; recognize and apply mathematics in [other] contexts; and create and use representation to organize, record, and communicate ideas. (p. 1)

Lack of knowledge and the fear of reform. Despite education reform, new textbook adoptions, and revised state standards, many educators continuously teach math the only way they know how – by memorizing rules and procedures. Some teachers lack proper training to change their instructional practice to be more effective for students, while others simply do not see the benefits of changing "tradition." As Battista (1994) noted,

> Accepted views about what and how mathematics should be taught have changed drastically since most teachers were in school. In fact, one of the most serious obstacles to reform is that the current mathematics curriculum is self-perpetuating. Teachers who are asked to teach the reformed mathematics curricula are products of the old curriculum. (p. 462)

To aid in solving this problem of mathematics teaching, educators must study not only the essence of mathematics but also current research on how students learn mathematical skills (Battista, 1999). Research has proved that the importance of attending to individual learning needs in America's classrooms has reached a critical level (Brimijoin, 2005). As Balls, Eury, and King (2011) explained, involving students in their learning is more than having them comply with rules and procedures. "The teacher's role is to connect students with their education by enabling them to influence and affect their own learning, and allowing them to become enwrapped and engrossed in their educational experiences" (Balls et al., 2011, p. 141).

Achievement Gap and Summer Learning Loss

Since the late 19th and 20th centuries, student needs have changed drastically; however, the history of America's traditional public school calendar in the educational system has continued to rely on a schedule whose roots can be traced back to about 150 years ago (Johnson & Spradlin, 2007). This is a problem, especially since "the amount of information children have to absorb has increased since the nine-month, 180-day school year was instituted" (Hopkins, 2009, p. 1). Therefore, there is a profound need for summer learning programs. Additionally, this need is driven by "changes in American families and by calls for an educational system that is competitive globally and embodies higher academic standards" (Cooper, Charlton, Valentine, & Muhlenbruck, 2000, p. 1).

Researchers note that in the United States, nearly 80% of the achievement gap (during the elementary years) is due to *summer slide* (Alexander et al., 2007). This summer slide is also referred to as the *summer learning effect*. This term is used interchangeably with summer slide and learning loss to describe the decline in student achievement during the summer months (Jesson et al., 2014). In 1996, Harris Cooper measured this summer learning effect in "terms of months of grade level skills" (Pitcock, 2018, p. 5), after conducting an analysis of 39 summer school program evaluations. Interestingly, his study revealed that students lost an average of 2.6 months of math skills during the summer. Researchers noted that this decline is due in large part to the fact that "schools play little or no role in children's learning during the summer months, especially when summer school is out of the picture—as is the case for the vast majority of children in the United States" (Alexander et al., 2007, p. 14). Ironically, "reading and math scores have improved for all race/ethnic groups since 1992 and for all income levels since 2003, [however] gaps in educational achievement persist" (Knopf et al., 2015, p. 595).

Therefore, “summer deserves attention because, when the season begins, learning ends for many children” (Miller, 2007, p. 14). Additionally, over time, children suffer from “losses in health and well-being, college and career opportunity, and the support needed to break cycles of intergenerational poverty [to] move young people and their families forward” (Pitcock, 2018, p. 6).

“By the time poor and minority youth reach 8^{th} grade, they are, on average, about three grade levels behind other students” (Williams, 2003, p. 29).

> A 15-year longitudinal study found that as much as two-thirds of the difference between low-income and middle-income youth in key academic success measures, such as participation in advanced coursework, high school drop-out, and college completion rates, can be traced back to summer learning loss that occurred during elementary school. (Newhouse et al., 2012, p. 8)

Research suggests that this loss is cumulative and detrimental. After all, “the longer a child is at risk, the less likely that the child will recover and become a highly component high school graduate ready for college or the workplace” (Green et al., 2011, p. 88).

Figure 2 illustrates the gap between disadvantaged students with no summer school, disadvantaged students with summer school, and middle-SES students with no summer school (Gorman, 2000, p. 124).

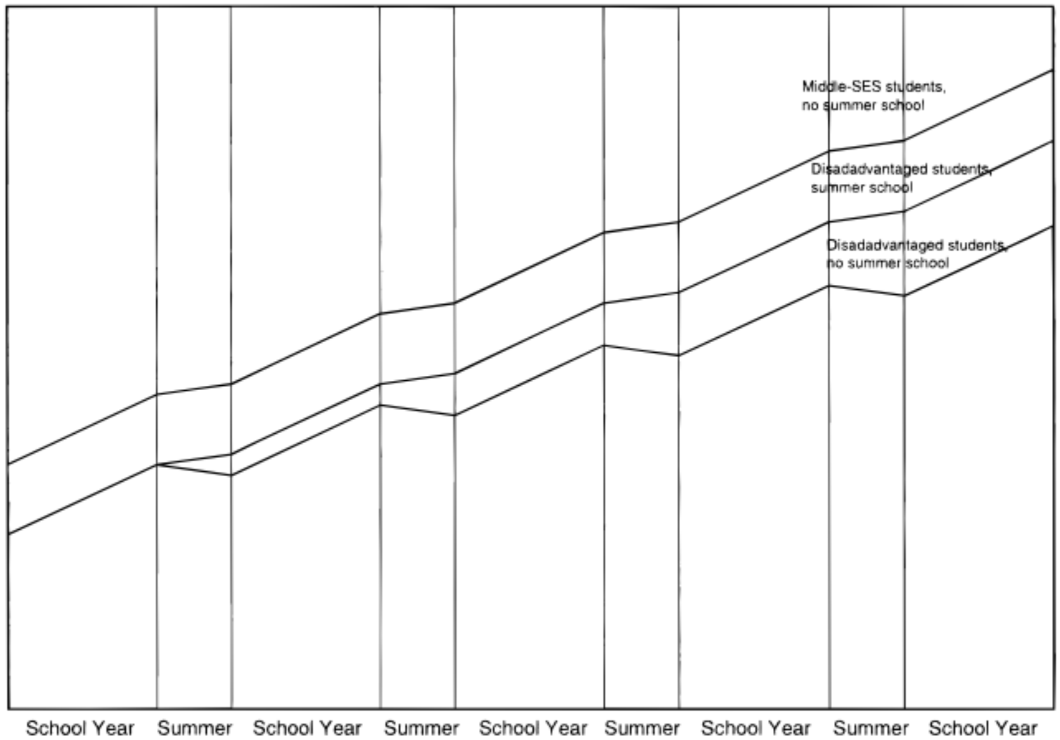

Figure 2. Model of Seasonal Learning.

As noted by Quintana et al. (2012),

> Historically underperforming students' achievement levels must be raised more steeply so that all U.S. students are performing at higher levels of academic functioning and these higher levels of academic functioning have to reflect the rigor required to be successful in the 21st century. (p. 20)

Interestingly, research suggests that

> there are two achievement gaps that must be confronted simultaneously: the one between those racial groups faring well and those who are underperforming in the U.S. educational system and the gap between U.S. students in general and students in other parts of the world. (Quintana et al., 2012, p. 20)

"A picture of these gaps emerges when federal and state laws require schools to break

down the data and identify groups of students who are not achieving at high levels" (NEA, 2007, p. 11). In an effort to address these achievement gaps, research suggests using C.A.R.E. (culture, abilities, resilience, and effort) themes to support students and their diverse needs (NEA, 2007). Below is a diagram of this framework as outlined by NEA consultant Belinda Williams.

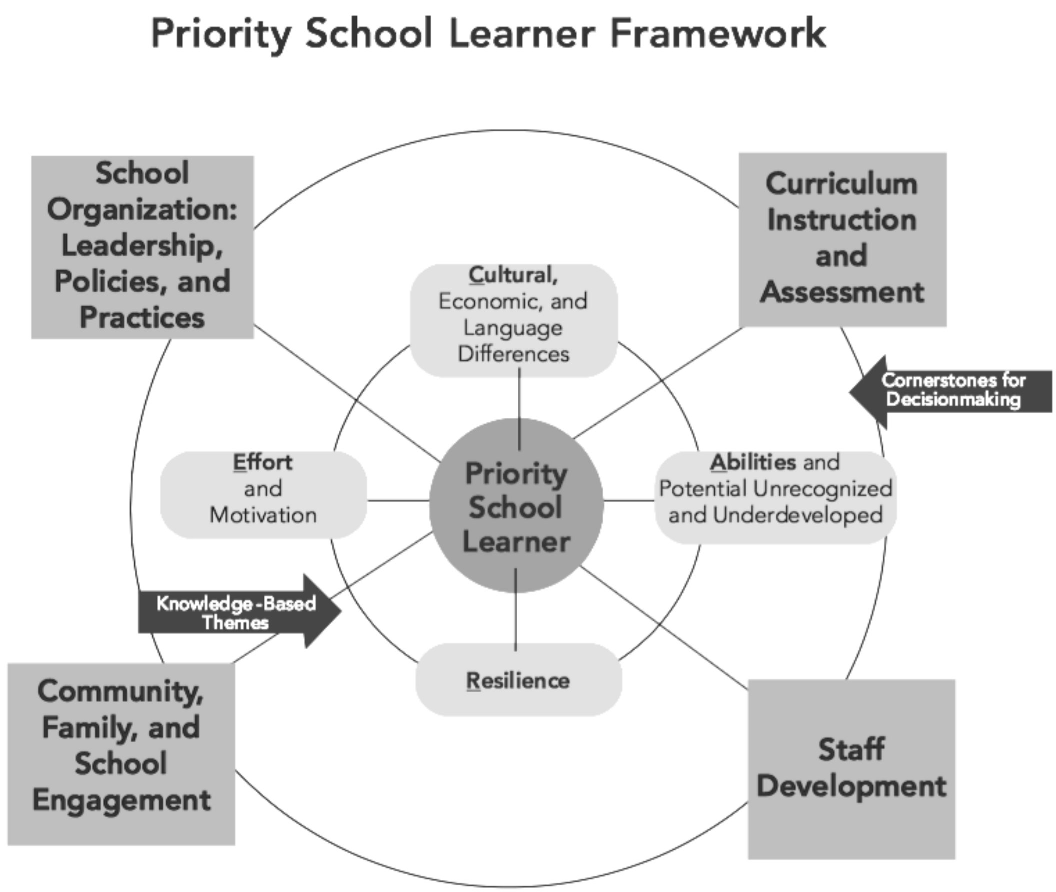

Figure 3. Priority School Learner Framework.

The four cornerstones on the outside wheel of the diagram represent areas for improvement. Namely, they are curriculum, instruction, and assessment; staff development; community, family, and school engagement; and school organization practices and policies. The inside wheel of the diagram includes C.A.R.E. themes which

educators should consider and support when making school- and district-level decisions.

Conclusively, the "success in closing the student achievement gap grows when we [consider] the importance of family and community partnerships, looking at them through the lens of culture, abilities, resilience and effort" (NEA, 2007, p. 123). Therefore, throughout this study, there is an emphasis on community partnerships. "Partnerships recognize the shared responsibilities of home, school, and community for children's learning and development. Students are central to successful partnerships. They are active learners in all three contexts- at home, at school, and in the community" (Epstein, 2011, p. 43).

Summer Programs

"Summer learning and enrichment programs (including educational camps and summer reading programs) originated in the late 1880s" (Fiore, 2005, p. 5). For example, *Trailblazers*, developed in 1887 to assist impoverished students in New York City, "helped pave the way for summer camps and many other youth serving organizations" (Terzian et al., 2009, p. 5). "The summer learning program helps children develop a love of learning; build interpersonal skills; and increase self-confidence, self-esteem, and self-reliance" (Bell & Carrillo, 2007, p. 62). Over the years, heightened attention has grown for disadvantaged youth. This attention "may relate to the impetus of the *No Child Left Behind*[1] legislation and by studies on summer learning loss which find that low-income youth regress more in skills over the summer than their higher income peers" (Terzian et al., 2009, p. 5). Therefore, summer programs have been established to address various student needs and interests. "Examples include outdoor adventure camps, arts and music

[1] The No Child Left Behind Act of 2001 (NCLB) was a U.S. Act of Congress that reauthorized the Elementary and Secondary Education Act; in included Title I provisions applying to disadvantaged students.

camps, sports camps, summer school, summer reading programs, high school transition programs, college preparatory programs, apprenticeships, and paid internship programs" (Terzian et al., 2009, p. 10). These programs are typically held at worship centers, school locations, cultural arts centers, or other child-centered nonprofit organizations (Terzian et al., 2009, p. 10). These partnerships between community organizations and summer learning camps "reinforce the idea that learning can take place outside of school, and that the entire community is behind the idea of learning over the summer" (Johnson, 2000, p. 8). As noted by Alexander et al. (2007), a well-organized summer program can help to develop potential of economically disadvantaged parents and their neighborhoods in support of children's academic success. Additionally, research points to several practices associated with program quality, including individualized instruction, parental involvement, and small class sizes (McCombs et al., 2011). McCombs et al. (2011) made the following recommendations for districts and providers to develop quality summer programs:

1. Invest in highly qualified staff and early planning.
2. Embed promising practices into summer learning programs.
3. Consider partnerships when developing summer learning programs.
4. Think creatively about funding.

In like manner, McCombs et al. (2015) recommended that leaders consider the following research supported guidelines:

1. Combine academics and enrichment for 5 days per week.
2. Provide language arts and math instruction daily taught by certified staff.
3. Limit classes to no more than 15 students per room.
4. Do not charge families for participation.

5. Offer free transportation and meals daily.

To repeat some of these critical aspects, Pitcock (2018) emphasized that programs should offer small class sizes and individualize instruction, engage students in fun enrichment activities, provide transportation to and from the program, offer full day program options, and notify parents early about the summer opportunity. Additionally, these structured programs should replicate the school's social aspects (Heyns, 1978). Afterall, many theorists have noted that the role of school is to instill social behaviors as well as academic skills (Heyns, 1978).

As noted in Terzian et al. (2009, p. 12), the chart included outlines the common outcomes summer learning programs seek to achieve based on program objectives.

Child and Youth Outcomes	
Educational/ Cognitive • Grades and test scores • Motivation to learn • Attachment and belonging to school • Academic self-efficacy • Reading and math achievement/skills • Science and technology • Graduation/high school completion • College enrollment	**Youth Development** • Life skills (conflict resolution, negotiation, decision-making) • Character development (positive values, respect for others) • Social/emotional (self concept, peer relations, teacher relations) • Behavior problems (school attendance, aggression) • Civic engagement • Reproductive health • Substance use
Career Development • Career decision-making skills • Job skills • Vocational skills • Employment	**Health and Fitness** • Nutrition • Physical activity • Weight loss

Figure 4. Child and Youth Outcomes.

Based on past research and results from an extensive evaluation of 11 summer school programs in Atlanta, summer school is a unique time for differentiation and out-

of-the-box instructional strategies (Heyns, 1978). For example, many programs in this Atlanta study included arts and crafts, music, drama, theatre, and other attractive activities such as puppet shows. These recreation and enrichment opportunities, in addition to smaller class sizes and the informal atmosphere, allowed teachers to give more individual student attention and bring new talent to the classroom. Comparatively, a 2013 study involving 3,192 students from five school districts (in Boston, Dallas, Florida, Pittsburgh, and New York) combined academic lessons with enrichment opportunities (Pitcock, 2018). These enrichment offerings included dance, theater, martial arts, swimming, woodworking, cooking, and kayaking. The results of this study indicated that students performed well on state math assessments compared to similar students who did not attend the program. As a matter of fact, participants outperformed nonparticipants in math and English language arts on state assessments in the fall and spring (Pitcock, 2018).

Another example of a summer program that works "to accelerate learning and [maintain] a commitment to youth development" (Newhouse et al., 2012, p. 8) is the Better Educated Leaders for Life (BELL) summer program. The BELL program was named in honor of Dr. Derrick Bell, Jr. (Harvard Law's first Black tenured professor). In 2006, this program was recognized with the Excellence in Summer Learning Award (Bell & Carrillo, 2007, p. 49). Four major goals for participants in the BELL Program include improving academic performance; enhancing self-concept and attitude towards learning; developing social skills, leadership abilities, and ideas of themselves as contributing community members; and involving their parents as educational advocates (Bell & Carrillo, 2007, p. 50). Since its inception in 1992, the BELL summer program has served over 150,000 students and "demonstrated that children participating over one summer not

only develop a better attitude towards learning and gain 3 months or more in literacy and math skills, but also develop an improved self-concept" (Newhouse et al., 2012, p. 8). Specifically, in 2004, after 6 weeks of involvement, BELL scholars "moved closer to their peers nationally, performing at the 50th and 42nd percentiles in reading and math compared with the 43rd and 31st percentiles when the program began" (Bell & Carrillo, 2007, p. 51). Figure 5 illustrates the academic growth in the BELL summer program and the summer learning loss of disadvantaged students not engaged in summer learning opportunities according to the BELL 2017 summer impact report.

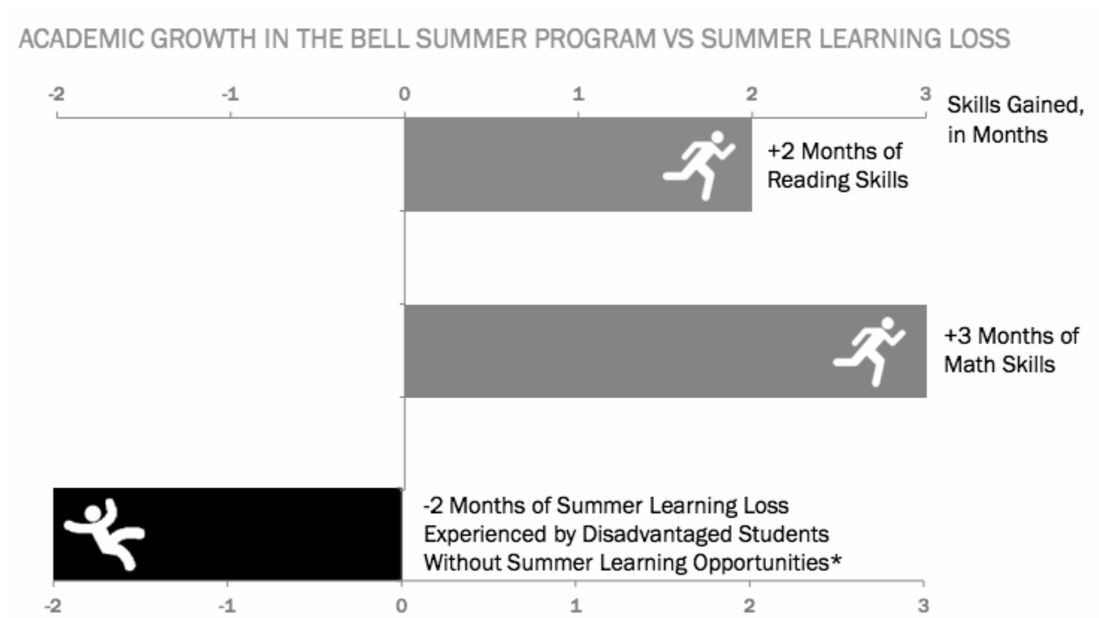

Figure 5. Academic Growth in the Bell Summer Program vs. Summer Learning Loss.

Comparatively, students participating in the Summer Advantage Learn and Earn program in Chicago acquire 3 months on average in reading skills and 7 months on average in math skills according to STAR pre and posttest data (National Summer Learning Association, 2015). Summer Advantage has served over 15,000 students since 2009 with an emphasis on improving student academics while bridging "pathways to

their future careers" (National Summer Learning Association, 2015, p. 19).

Another summer camp which focuses on youth academic and character development is the Reading and Enrichment Academy for Learning (REAL Kids) program in Harlem. The REAL Kids program, developed in 1999 as a "community-based youth development organization, uses baseball, softball, and the power of teams to provide inner-city youth with opportunities to play, learn, and grow" (Bell & Carrillo, 2007, p. 56) while reaching their dreams. This summer camp, similar to the aforementioned BELL program, earned the Excellence in Summer Learning Award in 2006. Since its inception, the camp serves over 1,000 students each summer from Grades K-5. Key programs include workshop (literacy), clubhouse (team building), and baseball/softball events where participants celebrate their success and enjoy authentic experiences (National Summer Learning Association, 2018).

Most importantly, as explained in Newhouse et al. (2012),

> In contrast with the traditional remedial summer school model, summer programs emphasizing both academic and social components lead to positive outcomes for students: higher school-year attendance and achievement, increased motivation to learn, increased feelings of belonging, and reduced participation in risky behavior. (p. 9)

Educating the Whole Child

"Initiatives are needed that appreciate the educational value of cultural diversity and that strive to build upon the cultural assets that children from minority, low-income communities bring with them to school" (LaPoint et al., 2006, p. 373). Indeed, a need exists for a team of researchers and educators to take a school reform approach similar to Howard University's CRESPAR/Capstone Institute. CRESPAR stands for the Center for

Research on the Education of Students Placed at Risk. Established in 1994, CRESPAR is a federally funded educational research and development center at Howard University. The Talent Development Model has served as a guiding force for the CRESPAR/ Capstone Institute.

> CRESPAR practitioners participate in co-constructive working relationships among school staff, parents, and community members. These efforts are to improve communications between schools and home, increase parent and community partner involvement in school-based activities, and increase parental and community support for enhanced academic achievement for children. (LaPoint et al., 2006, p. 380)

This parental involvement inspires students to earn higher grades and test scores; enroll in higher level programs; pass their classes and earn credits; attend school regularly; have better social skills, show improved behavior, and adapt well to school; and graduate and go on to postsecondary education (Boethel, 2003). "Research and exemplary practice reveal that it is all but impossible to separate the interests and influences of educators, parents, and other educational partners on student achievement, attitudes, and behaviors" (Epstein, 2011, p. 42). Therefore, the model shown (see Figure 6) includes overlapping spheres to depict this relationship which often overlaps at varying degrees of a child's life.

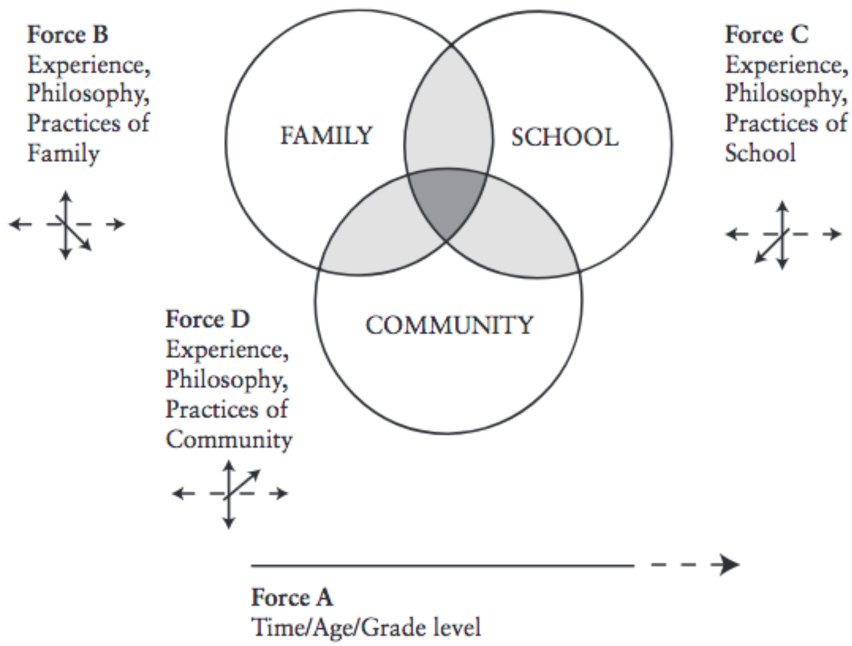

Figure 6. Overlapping Spheres of Influence on Children's Learning (Epstein, 2011).

As evidenced in the diagram, "forces [such as experience, philosophy, and practices] push together or pull apart the spheres to produce more or less overlap of family, [community], and school actions, interactions and influence all along the timeline [of a child's development]" (Epstein, 2011, p. 33). Additionally, the time students spend out of school as well as in school determines their motivation, attention, and learning.

Conclusively, decision makers must be mindful of these partnerships and remember that the "goal of educational reform is [to place students] at promise for academic success and not at risk for academic failure" (LaPoint et al., 2006, p. 384).

Figure 7 represents the talent development context which is "designed to enable student learners and educators to develop talent, reach high standards, and have constructive, growth-oriented experiences" (LaPoint et al., 2006, p. 376).

Figure 7. Talent Development Context (LaPoint et al., 2006).

Summary

As evidenced earlier in the chapter, mathematics education reform continues to be a central part of education. Recent reform that involves the Common Core State Standards focuses on developing critical and mathematical analysis rather than students worrying mostly about getting to the right answer (Schwartz, 2000). The latter "seriously handicaps our nation in a competitive and increasingly technological global marketplace" (Battista, 1999, p. 426). Therefore, the new mathematics education focus is to "engage students in problem posing and problem solving rather than expecting rote memorization and convergent thinking" (Ladson-Billings, 1997, p. 697).

Given these points, the "National Education Association is placing an expanding emphasis on building support systems and providing resources to NEA affiliates and members to help close the achievement gaps" (NEA, 2007, p. 10). Partnerships between the NEA and community businesses and local and national leaders have formed in an effort to close the achievement gaps and improve struggling schools. Because of these efforts, the NEA Priority Schools Initiative in 2001 was developed to assist with products and services in schools (NEA, 2007).

This chapter highlights the related literature to achievement gaps, summer learning loss, and summer programs. Throughout the research, connections to reducing the achievement gap by involving low-performing students in quality summer programs were addressed in regard to improving student achievement and avoiding summer learning loss. All in all, "what is most important about this collection of programs is their shared commitment to quality programming and to meeting the needs of young people, families, and their communities during the critical summer months" (Bell & Carrillo, 2007, p. 50).

Through examination of the related literature, research supports the idea that there is a connection between achievement gaps and summer learning loss; however, "an intent on accelerating learning and a commitment to youth development can [aid in] preventing summer learning loss and narrowing the expansion of the achievement gap" (Bell & Carrillo, 2007, p. 47). In addition, establishing "caring relationships, high expectations, and opportunities for [student] participation" (NEA, 2007, p. 74) will contribute to student academic success. Chapter 3 describes the design of the research to determine the effectiveness of the Community Math Academy on student achievement.

Chapter 3: Methodology

Why Evaluate?

The Community Math Academy is committed to demonstrating a measurable impact on teaching and learning and on providing the highest quality of programming to its stakeholders. For this reason, a program evaluation is critical in order for the program to work towards continuous improvement. This summer camp program is now in its 10th year of operation and is looking to expand its operation. This evaluation will be of great benefit to the evaluation coordinator (the researcher), executive director, members of the steering committee, and assistant superintendent for the school district.

An internal evaluator was ideal because “internal evaluators know the history of the organization; its clients, funders, and other stakeholders; the environment in which it operates; and the typical dynamics involved in decision making” (Fitzpatrick et al., 2011, p. 274). Most importantly, an internal evaluator would more than likely remain with the organization after the evaluation is complete and could continue to advocate for use of its findings (Fitzpatrick et al., 2011); however, the researcher acknowledged that there was an inherent bias as an internal evaluator. Therefore, the researcher (also the evaluator) maintained this role “as someone who [was] interested in the program, but also curious, objective, and questioning” (Fitzpatrick et al., 2011, p. 100). See Appendix B for the research request letter and Appendix C for the superintendent letter.

Description and Rationale for the Evaluation Model

Of the many approaches to program evaluation, the decision-oriented approach seemed the most appropriate to use for the Community Math Academy. The focus of the decision-oriented evaluation was on specifying goals and objectives and determining the extent to which those goals and objectives have been attained by the program in question

(Fitzpatrick, Sanders, & Worthen, 1997). By using this approach, the researcher sought to determine if modifications needed to be made to the program operation. The model used was Daniel Stufflebeam's CIPP approach (Fitzpatrick et al., 2011). The CIPP acronym stands for context, input, process, and product. The context evaluation component is used to make planning decisions, while the input evaluation component is used to make structuring decisions. Additionally, the process evaluation component is used to make implementation decisions, while the product evaluation component is used to make recycling decisions. For the scope of this research, the evaluation focused on the process and product components (see Figure 8). As noted by Fitzpatrick et al. (2011), the CIPP model is "instrumental in showing evaluators and program managers that they need not wait until a program has run its course before evaluating it" (p. 178). Another advantage of this model is that it encourages evaluators to think of evaluation as cyclical (Fitzpatrick et al., 2011). This ensures that programs are continually working towards improvement and offering the best service.

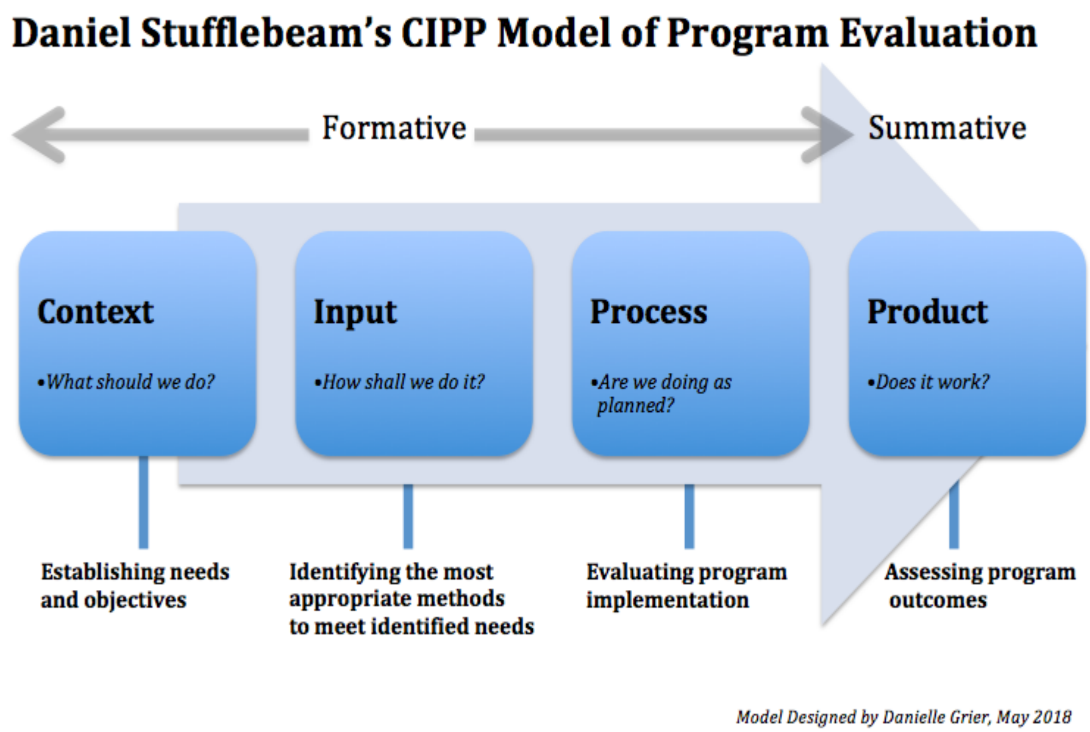

Figure 8. Daniel Stufflebeam's CIPP Model of Program Evaluation.

Limitations

One limitation of the study is the population size; therefore, generalizations to larger populations are limited, even in similar summer camp environments. Also, this study only involves the mathematics subject area to measure student achievement, but to study other subjects would have been beyond the scope of the research.

Purpose of the Program Evaluation

The purpose of the evaluation is to provide the Community Math Academy staff insight into the nature of a site; to assess the success of the 3-week program implementation; to observe student interaction with program lessons and materials; and to provide feedback to the funding agencies, partner organizations, the project team

(Close the Gap Committee), participants, and stakeholders. To evaluate the impact of the Community Math Academy, data were collected from the original Math Academy site (the largest site and the only site open since inception in 2008). Data collection procedures included (a) student journals examining student attitudes towards math, (b) pre and posttest data, and (c) survey data. A total of approximately 200 students were served during the 3-week program in July, taught by local certified teachers and junior teacher assistants; however, for the scope of this research, only participants from the Bright Light (pseudonym) site where included in this study to serve as a representative sample of the population and the school district. This site served roughly 50 students.

Participants

Participants in this study were rising fifth-grade and rising sixth-grade students from elementary and intermediate schools within the district. Students were selected by their classroom teachers based on their historical EOG math scale scores, classroom grades, and summer availability. Program enrollment letters were sent home for students in January in order for students to sign up and participate in the 3-week summer camp in July. Once site capacity was reached, student names were included on a “wait list” and their enrollment form was marked as a wait list student. Forms were prioritized by greatest need.

For this study, 45 students were served at the Bright Light Math Academy site. The male and female students involved ranged in age from 10 to 12 years old. The student population for this research consisted of 24 males and 21 females. This was 53% male and 47% female participation, respectively. Also, the student demographics included 84% African-American (n=38), 11% White (n=5), and 4% Hispanic (n=2). There were no incentives or risks involved for student participation. Additionally, all

information in the study was strictly confidential.

Eleven total schools (10 elementary schools and 1 intermediate school) were represented in this study by the 45 student participants. See Table 3 for the represented schools and the extent of their economically disadvantaged population (percent qualifying for free or reduced lunch).

Table 3

Economically Disadvantaged Students and Math EOG Proficiency at Represented Schools

School Represented	Economically Disadvantaged	EOG Math Proficiency
Elementary 1	56.3%	71%
Elementary 2	80.6%	43%
Elementary 3	66.7%	57%
Elementary 4	72.%	52%
Elementary 5	61.2%	51%
Elementary 6	55.5%	59%
Elementary 7	56.9%	64%
Elementary 8	71%	76%
Elementary 9	54.5%	81%
Elementary 10	61.7%	70%
Intermediate	58.9%	56%

Community Math Academy Historical Data

One of the major successes of the Community Math Academy since beginning in 2008 is the parent involvement aspect. Because the summer program works to promote and strengthen ties between school leaders, caregivers, and the community, weekly parent involvement sessions have become impactful for the program. Figure 9 includes the percentage of parent involvement from years 2009-2014. These data were compiled by the district testing coordinator. As evidenced by these data, parent support at weekly meetings improved greatly over 6 years. The improvement from 48% in 2009 to 70% in 2014 indicates this progression. Parent sessions were held each Tuesday during the

weeks the camp was in operation.

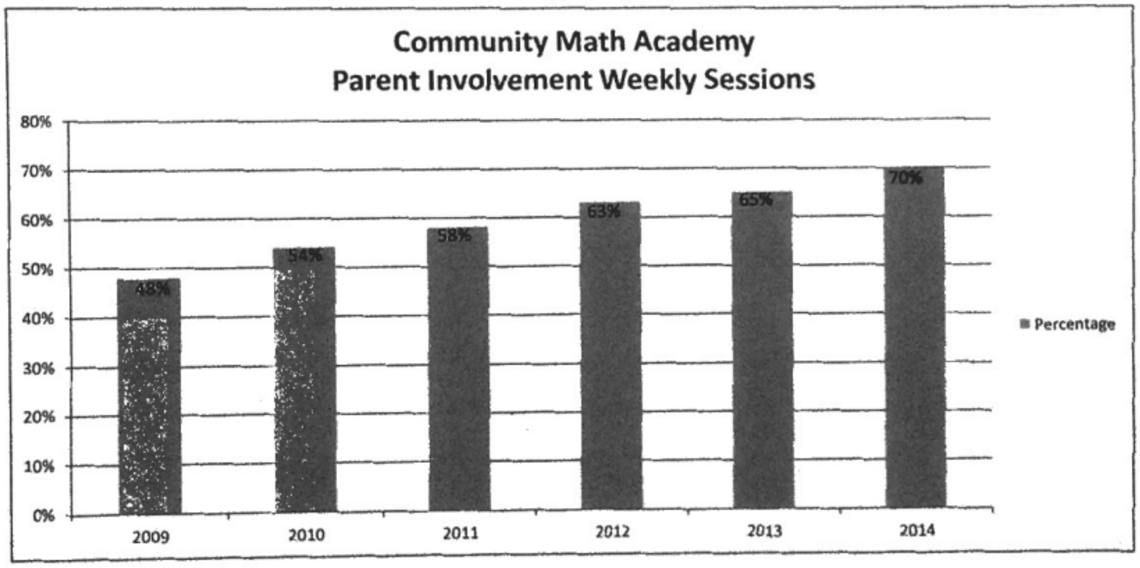

Figure 9. Community Math Academy Parent Involvement Weekly Sessions.

In addition to improving parent involvement, the Community Math Academy aims to improve student mathematics performance and overall motivation towards mathematical problem-solving. Figure 10 gives a visual representation of program participants from summer 2008 who were "on track" to graduate. These data were initially compiled by the district testing coordinator. Those who were on track passed their math EOG with a proficient score at the end of the academic school year. The percentage of third-grade students who participated in the math program who were on track was 84.6%, while fourth grade had a percentage of 83.3% and fifth grade had a percentage of 57.1%.

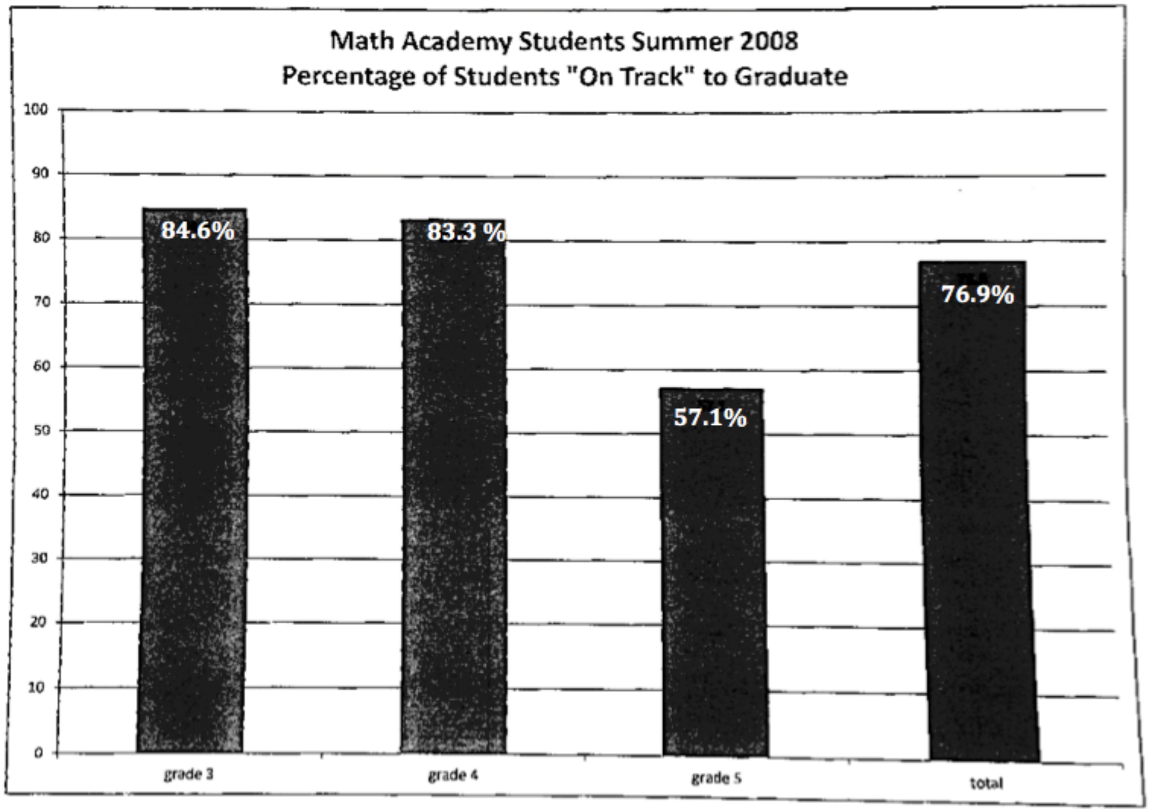

Figure 10. Math Academy Students on Track to Graduate.

Another significant aspect of the Community Math Academy is that stakeholders and board members maintain a vested interest in student participants even after the summer camp is complete. In 2014, board members were able to track student classroom performance at their elementary schools in order to stay informed about student math performance at their home schools. Figure 11 displays student math grades from the first quarter and second quarter of school. These students were Math Academy participants during the 2014 summer program.

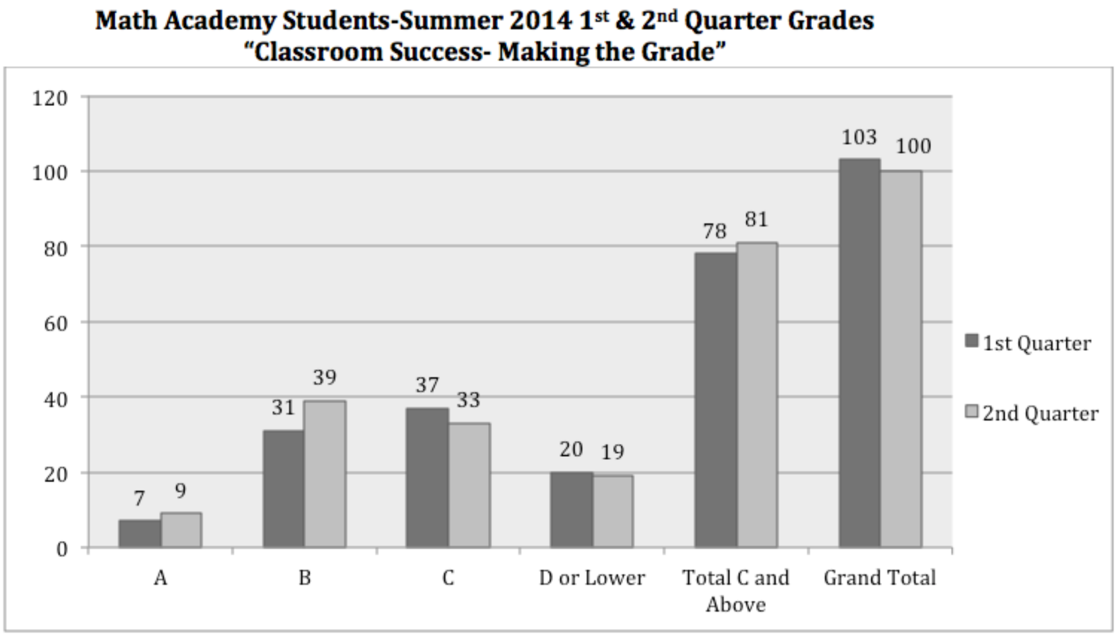

Figure 11. Math Academy Student Quarter Grades.

Pre and posttest data have been used by the Community Math Academy in order to help determine the effectiveness of the 3-week program each summer. Figure 12 is the graph from the third-grade cohort during the summer of 2014. This model indicates the average growth increase of 12.8 points from the pretest to the posttest during the summer of 2014. Figure 12 also indicates that third-grade students performed with an average score of 19.7 correct responses on the pretest in 2014. That same cohort performed with an average score of 32.5 correct responses on the posttest in 2014.

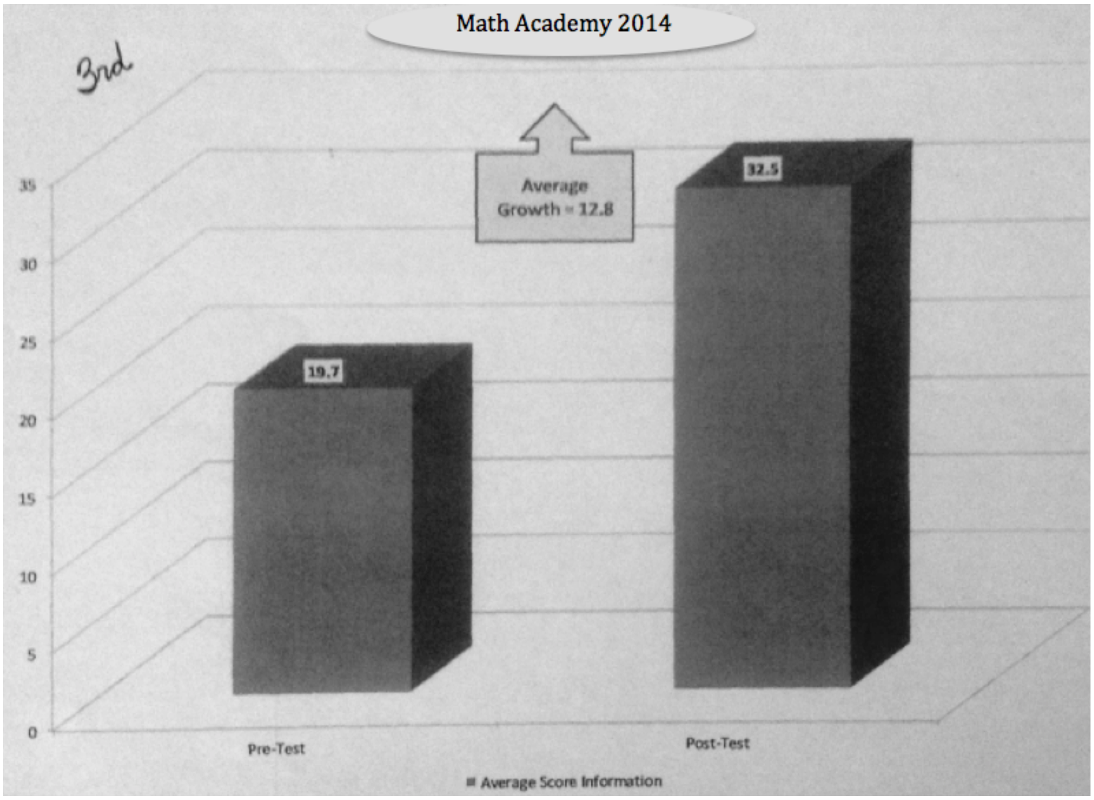

Figure 12. Third-Grade Growth During July 2014.

Based on the trends of the historical data, the summer math program is perceived to be effective and relevant for the community it serves. Likewise, there is still a wait list each summer as participants are enrolled for the 3-week learning and enrichment experience.

Program Evaluation Questions

Research Question 1: What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018?

Research Question 2: What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals?

Research Question 3: What are educator, parent, and community member

perceptions of the effectiveness of the Community Math Academy based on survey data?

These questions focus on the process and product components of Stufflebeam's CIPP (context-input-process-product) evaluation model (Fitzpatrick et al., 2011). In addition, these questions were developed based on the logic model for the study (see Appendix D).

Description of the Data Collection Procedures and Data Analysis Procedures

Data were collected from a variety of sources to answer the research questions previously stated. These data sources include student journals, pre and posttests, and surveys. According to Creswell (2014), "early thoughts about the value of multiple methods-called mixed methods-resided in the idea that all methods had bias and weaknesses, and the collection of both quantitative and qualitative data neutralized the weaknesses of each form of data" (p. 14).

Table 4

Research Questions and Data Collection Methods

Questions	Instruments	Timeline	Who
1.What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018?	Pre and Posttest Aligned with Common Core Standards	Beginning and End of the Program (Week 1 & Week 3)	Given by Classroom Teachers; monitored by site administrator
2. What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals?	Student Journals	Ongoing during the 3-week period	Classroom Teachers
3. What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data?	Surveys	Ongoing during the 3-week period	Program Evaluator

Surveys. Surveys were given to reflect the perceptions of parents, educators, and

community members concerning the effectiveness of the Community Math Academy. This questionnaire (see Appendix E) was examined by the board of directors and executive director in order to validate the survey. Questions on this instrument include seven statements with Likert scale responses and two open-ended responses to gather detailed insights. These questions were developed based on the objectives/guidelines of the Community Math Academy explained at length in Chapter 1.

An advantage to using this survey method was the "economy of the design and the rapid turnaround in data collection" (Creswell, 2014, p. 157). A group administration method was used in order to collect data at one time from teachers; however, parents and community members completed the questionnaire during parent involvement nights during the 3-week program.

Journals. In addition to the abovementioned qualitative techniques, student journals were included in the data collection in order to obtain the perspective of the participants. Students were provided sentence starters in order to write about their experience. Sentence starters included, but were not limited to the following: "The most difficult thing about math is…"; "The easiest thing about math is…"; "What I learned today was…"; and "What I would like to know more about is…." This document analysis served as a private, unobtrusive method to gather student reflections. An advantage of this form of data collection is that information is already transcribed.

Because journaling was an ongoing process during the 3-week program, the evaluator collected journals at the end of each week. As noted by Fitzpatrick et al. (2011), these documents were reviewed in order to "formulate categories and revise categories until different perspectives begin to be revealed" (p. 445).

Pre and posttests. Pre and posttests were given in order to measure student

growth during the 3-week program. The tests, designed by school district curriculum coordinators, were shared with administrators, teachers, and other district office staff in order to establish validity of the instruments. This is also known as peer checking. All items on the pre and posttests were aligned with the current North Carolina Common Core standards for math. Once validity and reliability were confirmed, the pre and posttests were prepared for students.

During the first week of Math Academy, each teacher gave the pretest to students. All tests were scored by site principals, and the scores were entered into a shared Google docs file. Students were assigned a numeric code to maintain confidentiality. Posttests were given during the last week of the Math Academy. The researcher used pre and posttest data in order to calculate gains and losses in scores. More specifically, the researcher summarized the data using descriptive statistics of central tendency such as mean, median, mode, standard deviation, and range. Likewise, comparisons across groups based on ethnicity and gender were determined using a one-way ANOVA.

Analysis Procedures

Once all of the data were organized and ready for analysis, the evaluator read and coded all information. Coding aided in identifying themes or categories for the research study. Interpretations were based on bringing together the different data sources, methods, and analyses to answer the evaluation questions. Analysis was broken down by each research question as shown below.

Research Question 1: What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018? By administering pre and posttests to participants, the evaluator looked for student improvement at the end of the 3-week period to determine whether or

not student knowledge and skills have improved. The evaluator used a paired *t* test to analyze data from the pretest and posttest. Because different teachers have different instructional styles, this was a variable that could not be controlled; however, the pretest and posttest were the exact same tests to maintain reliability of the results.

Research Question 2: What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals? By reading and coding the math journals of student participants, the evaluator determined if the Community Math Academy influences student interest, involvement, and perseverance with mathematics. As suggested by Creswell (2014), the evaluator used one word codes or short descriptions to chunk phrases from student journals. As noted by research, this "traditional approach allows the codes to emerge during the data analysis" (Creswell, 2014, p. 199).

In a similar manner, findings from the surveys were chunked so patterns could be identified. The researcher used the "cross-checking" method in order to be sure that there was a consistency of coding (Creswell, 2014).

Research Question 3: What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data? By administering surveys to stakeholders, the evaluator was able to analyze perceptions based on the extremities of agreement or disagreement for each item on the questionnaire.

Logic Model

As noted by Fitzpatrick et al. (2011), "logic models provide a way for [researchers] to begin to describe the program, its components, and sequences" (p. 296). Therefore, a logic model (Appendix D) was used to develop research questions and goals

for the mixed-methods study of the Community Math Academy (see Figure 13). This model depicts the inputs, outputs, short-term and long-term intended outcomes, assumptions, and external factors in order to "describe why the program is intended to achieve its outcomes" (Fitzpatrick et al., 2011, p. 161).

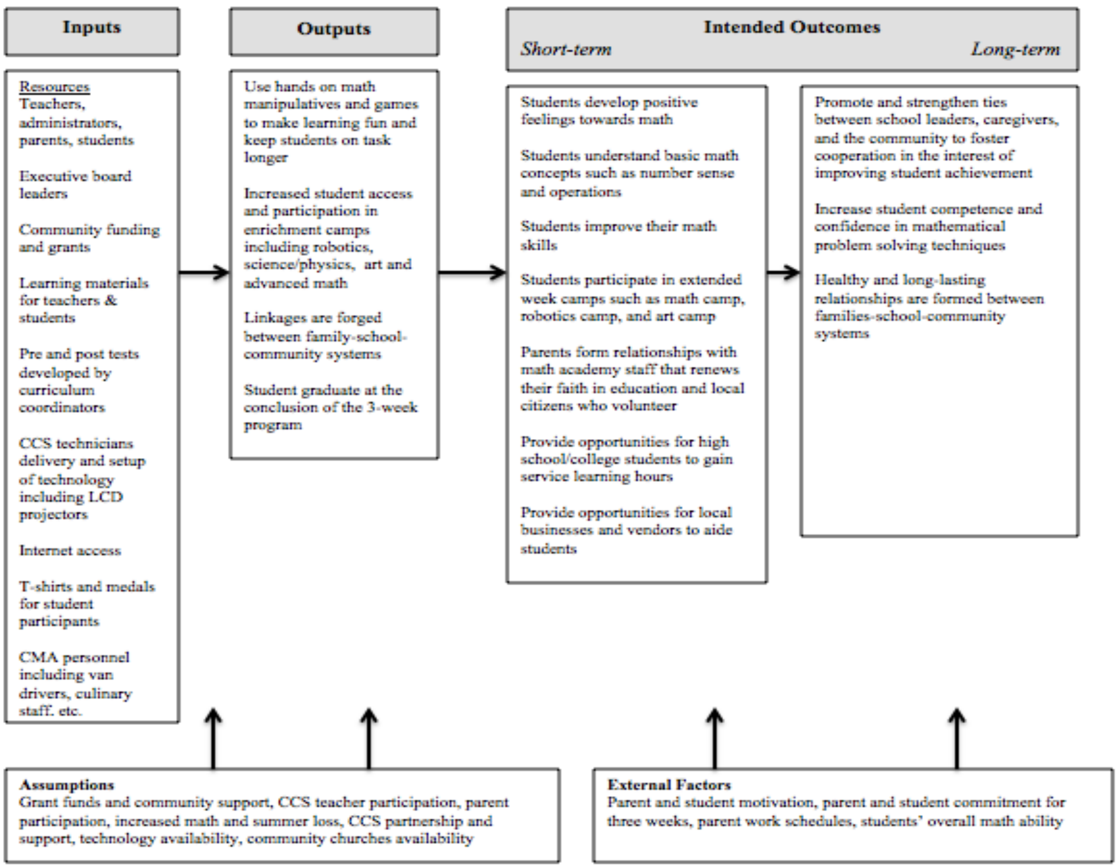

Figure 13. Logic Model Created by the Researcher in Order to Guide the Program Evaluation of the Community Math Academy.

This study utilized the mixed-methods approach in order to determine the efficacy of the summer math program to improve student motivation, knowledge, and skills. This research approach originated "around the late 1980s and early 1990s based on work from individuals in diverse fields such as evaluation, education, management, sociology, and health sciences" (Creswell, 2014, p. 217).

Summary

In summary, as noted by Fitzpatrick et al. (2011), the CIPP model is “instrumental in showing evaluators and program managers that they need not wait until a program has run its course before evaluating it” (p. 178). Another advantage of this model is that it encourages evaluators to think of evaluation as cyclical (Fitzpatrick et al., 2011). This ensures that programs are continually working towards improvement and offering the best service. Additionally, “stakeholder involvement in interpreting results can [help] build evaluative capacity in the organization” (Fitzpatrick et al., 2011, p. 222).

Chapter 4: Results

Introduction

It is no surprise each year that educators feel burdened to teach mathematics to diverse learners with multiple strengths and weaknesses. This becomes even more challenging with the summer learning slide often experienced by many students; therefore, this study evaluated the effectiveness of a Community Math Academy (summer program) in a southeastern school district that operates in an effort to target the summer slide. Data collection tools for the study were pretests/posttests, student journals, and surveys. Results from qualitative and quantitative analyses are included in graphs and supported by narratives.

Research Questions

The following research questions were developed in order to conduct the program evaluation:

1. What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018?
2. What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals?
3. What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data?

Participants

From July 9-27, 2018, the Bright Light Math Academy site served 45 students from Grades 5 and 6. Of these students, 93% (n=42) participated in the pretests and posttests. Each participant returned a signed consent form in order to participate in the

study with an understanding that there were no risks or incentives offered and all data was strictly confidential. The male and female students involved ranged in age from 10 to 12 years old. The student population for this research consisted of 22 males and 20 females. This was 52% male and 48% female participation, respectively.

Though attempts were made to get 100% participation from the Bright Light population, three students did not return their permission slip forms to participate in the study. Their data are not included in this study. Also, the student demographics included 83% African-American (n=35), 12% White (n=5), and 5% Hispanic (n=2).

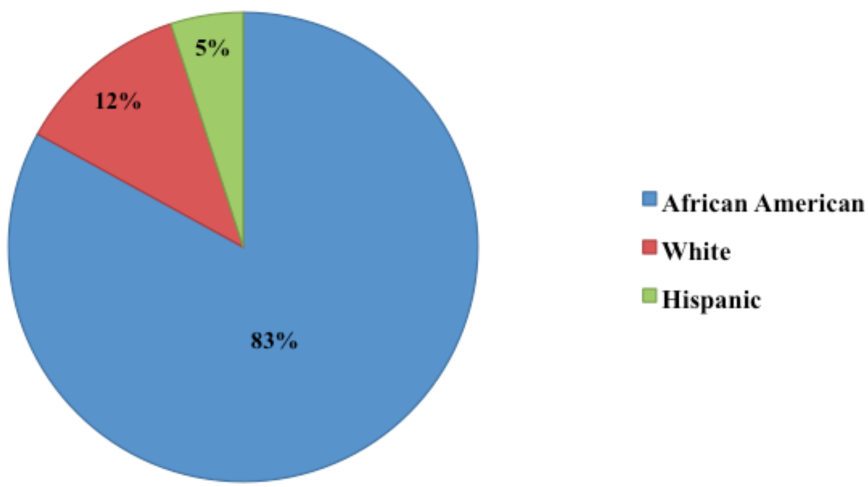

Figure 14. Student Demographics.

Pretests and Posttests Data

Pretests and posttests were given to students in order to measure their growth from the start of the program to the conclusion of the camp. The preassessment was given during the first week of the program, and the postassessment was given the last week. All tests were scored afterwards by the site administrator and entered into a Google docs form. The test items were the exact same in order to maintain reliability of

the results; therefore, Item 1 of the pretest was identical to Item 1 of the posttest for fifth and sixth grade.

The fifth-grade assessment (see Appendix F) was a fill in the blank mastery test made up of six performance tasks that included multiple parts per questions. Task 1 included four parts (a-d), Task 2 included six parts (a-f), Task 3 included eight parts (a-h), Task 4 included three parts (a-c), Task 5 included six parts (a-f), and Task 6 included six parts (a-f); therefore, the scoring key was a rubric which was based on student progression towards mastery. On the other hand, the sixth-grade assessment (see Appendix G) was a multiple choice test which consisted of 32 questions.

In order to maintain student confidentiality while reporting the test results, the researcher coded student participants in a chart with the grade level and assigned each participant a number: 1, 2, 3, and so on; therefore, codes for fifth graders were S1, S2, S3, and continuing. Codes for sixth graders were included in a similar manner. The tables and figures below detail student performance from the preassessments and postassessments. Fifth-grade data are shown first, followed by sixth-grade data. In addition, a paired samples *t* test was used in order to compare the pre and posttest data. Also, NVivo software was used in order to identify themes and code journal entry data for data analysis.

Table 5 represents fifth grade students comparative data results for the pretest and posttest. The findings indicated that the class average on the pretest was 40% and it improved to 64% on the posttest. Likewise, data indicated that 96% (n=23) of the fifth-grade students improved from their pre to posttest during the 3-week program. This is a notable change that all but one student improved from the pre to posttest. A growth of 25 points was the mode and was true for five participants. Additionally, 18 students had

double-digit gains in their score from their pre to posttest. The highest gain was 46 points, and the most extreme occurrence (also the only decrease) was -4 points.

Table 5

Fifth-Grade Data Participants Pretest/Posttest Scores, Differences

Student Code	Pretest	Posttest	Difference
S1	42	83	41
S2	67	83	16
S3	63	71	8
S4	50	79	29
S5	58	67	9
S6	54	58	4
S7	33	58	25
S8	33	29	-4
S9	25	33	8
S10	33	38	5
S11	42	67	25
S12	17	33	16
S13	42	67	25
S14	38	54	16
S15	38	63	25
S16	21	63	42
S17	38	71	33
S18	29	67	38
S19	33	79	46
S20	38	83	45
S21	29	58	29
S22	58	75	17
S23	25	50	25
S24	63	96	33

As evidenced by Figure 15, fifth-grade scores are included to give a visual illustration of student gains and losses. These data reflect the exact data included in Table 5. Each student is coded as S1, S2, S3, and so on. Also, each pre and posttest score is graphed and noted numerically under the student code. The darker bar graphs represent the pretest scores, and the lighter bar graphs note the posttest scores.

The highest score on the pretest was 67% earned by S2, and the lowest score on

the pretest was 17% earned by S12. Likewise, the highest score on the posttest was 96% earned by S24, and the lowest score on the posttest was 29% earned by S8. Data indicate that most students did improve from pre to posttest. The greatest gain was 46 points from pre to posttest by S19. This student had a pretest score of 33 and a posttest score of 79. On the contrary, the greatest loss was -4 points from pre to posttest by S8. This student had a pretest score of 33 and a posttest score of 29.

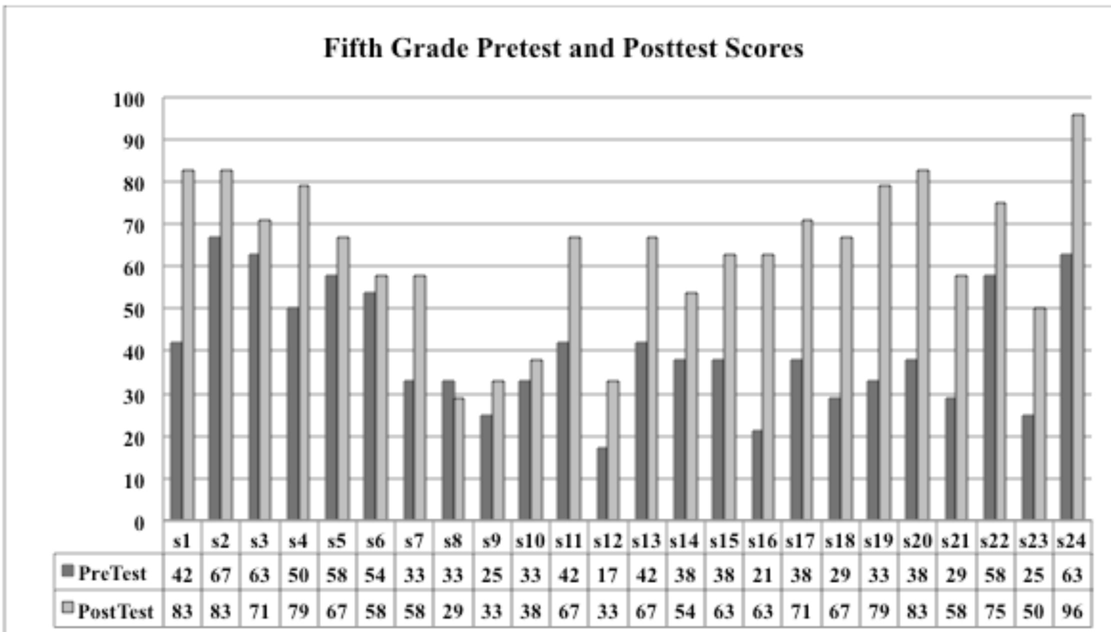

Figure 15. Fifth Grade Comparative Data.

Based on the results from the paired samples *t* test using pre and posttest data, the differences in pretest and posttest scores were statistically significant ($p<0.0001$). In addition, the mean of the pretest ($M=40.38$) and the mean of the posttest ($M=63.54$) indicated an increase of 23.16 points. Also, the standard error mean of the posttest was 3.57, and the standard error mean of the pretest was 2.87. Table 6 indicates these data.

Table 6

Fifth-Grade Paired Samples Test

	Paired Samples Statistics			
	Mean	N	Std. Deviation	Std. Error Mean
Posttest	63.54	24	17.49	3.57
Pretest	40.38	24	14.04	2.87

As evidenced by Table 7, 89% (n=16) of the sixth-grade students improved from their pretest to posttest based on percentage points. Meanwhile, 11% (n=2) of the students maintained their score (indicating no change) from pretest to posttest. A growth of 16 points was the mode and was true for four participants. Additionally, 13 of the students had double-digit gains in their scores from pre to posttest. The highest point increase was 38, while the lowest difference was 0 (no change in score). Overall, the results indicated that the class average score was 30% on the pretest and improved to an average of 47% on the posttest.

Table 7

Sixth Grade Participant Pretest/Posttest Scores, Differences

Student Code	Pretest	Posttest	Difference
S1	38	57	19
S2	27	65	38
S3	54	54	0
S4	27	43	16
S5	19	30	11
S6	16	41	25
S7	19	38	19
S8	14	30	16
S9	27	62	35
S10	30	46	16
S11	32	41	9
S12	22	54	32
S13	35	54	19
S14	51	57	6
S15	35	35	0
S16	16	24	8
S17	22	49	27
S18	49	65	16

In the same fashion as fifth grade, sixth-grade scores are also represented in a bar graph illustration (Figure 16). These data reflect the exact data included in Table 7. Each student code is maintained as S1, S2, and so on. For clarity, the darker bars on the graph represent the pretest scores, and the lighter bars represent the posttest scores.

The highest score on the pretest was 54% earned by S3, and the lowest score on the pretest was 14% earned by S8. Likewise, the highest score on the posttest was 65% earned by S2 and S18; and the lowest score on the posttest was 24% earned by S16. Data indicate that all students improved from pre to posttest or maintained their score. The greatest gain was 38 points from pre to posttest by S2. This student had a pretest score of 27 and a posttest score of 65. On the contrary, the greatest loss was 0 points from pre to posttest by S3 and S15.

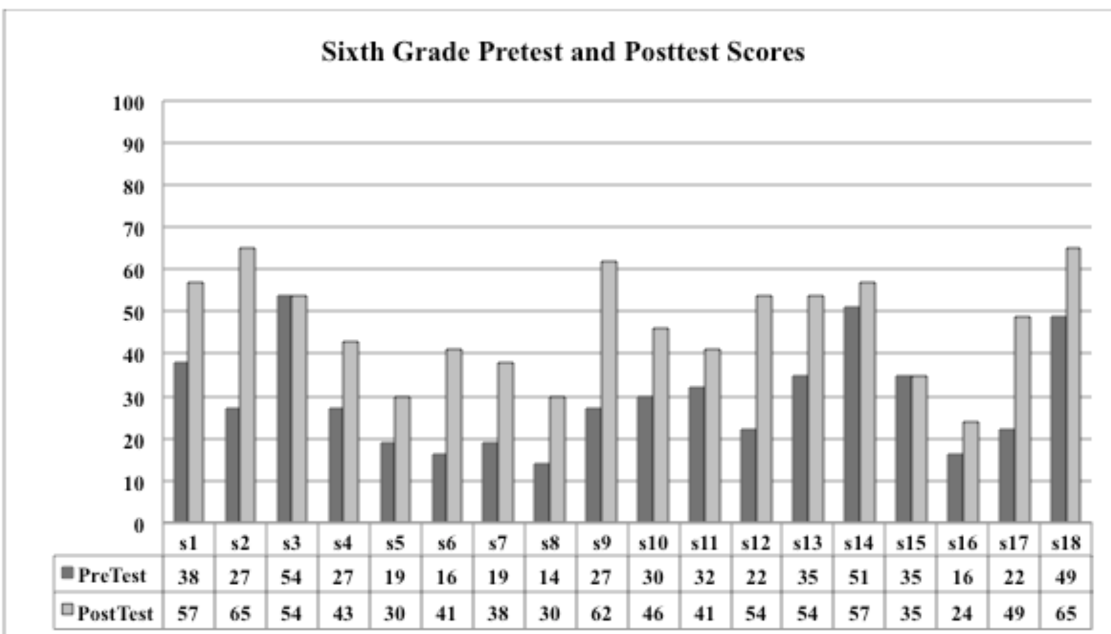

Figure 16. Sixth Grade Comparative Data.

Based on the results from the paired samples *t* test (see Table 8) using sixth grade

pre and posttest data, the differences in pretest and posttest scores were statistically significant at the 95% confidence interval ($p<0.0001$). In addition, the mean of the pretest ($M=29.61$) and the mean of the posttest ($M=46.94$) indicated an increase of 17.33 points. Also, the standard error mean of the posttest was 2.94, and the standard error mean of the pretest was 2.88.

Table 8

Sixth Grade Paired Samples Test

	Paired Samples Statistics			
	Mean	N	Std. Deviation	Std. Error Mean
Posttest	46.94	18	12.47	2.94
Pretest	29.61	18	12.22	2.88

Student Journals

By reading and coding the math journals of student participants, the evaluator was able to determine if the Community Math Academy influenced student interest, involvement, and perseverance with mathematics. As suggested by Creswell (2014), the evaluator used one word codes or short descriptions to chunk phrases from student journals. As noted by research, this “traditional approach [allowed] the codes to emerge during the data analysis” (Creswell, 2014, p. 199).

Themes were evident after running a word cloud query (Figure 17) using NVivo software using words such as math, fun, academy, learned, good, centers, teachers, favorite, great, helping, better, breakfast, and play. These words correspond with student journal responses. The major themes evident from these responses were Math Academy is fun, students learned a lot, and hot breakfast is a favorite.

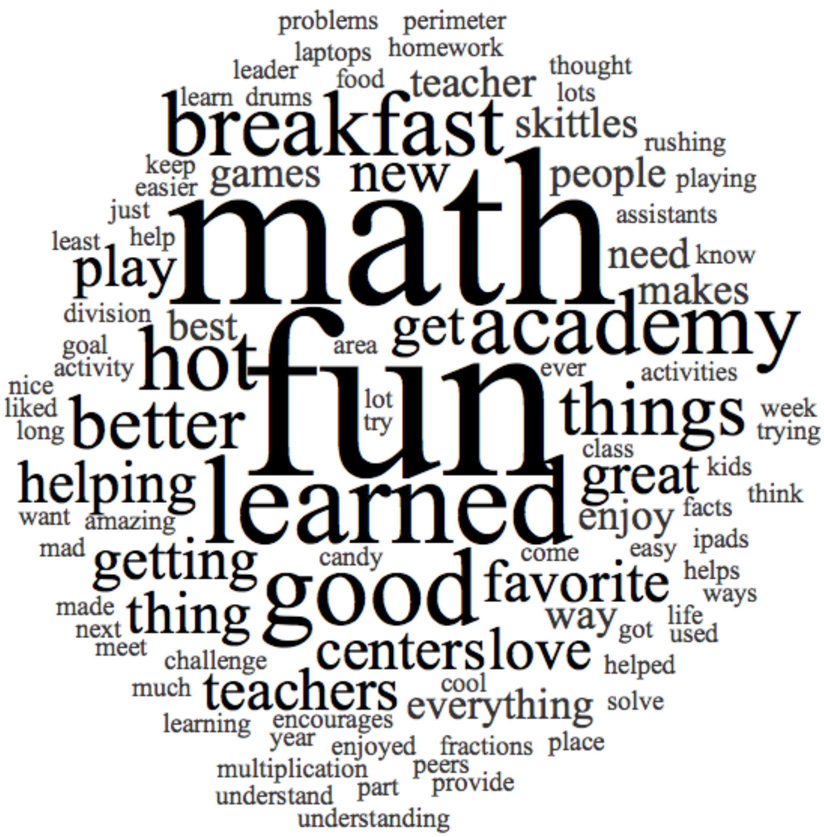

Figure 17. Word Cloud of Student Journal Responses.

Table 9 indicates the word frequency of the top 20 frequently used terms based on student journal responses. This analysis was limited to words that included at least three letters in order to exclude words such as it, is, I, am, and so on. As indicated by the data, the word fun was most used and appeared 28 times after analyzing journal entries. The following terms were also highly used (at least 10 times): math, learned, good, academy, hot, and breakfast.

Table 9

Word Frequency of Frequently Used Terms

Word	Word Count
Fun	28
Math	26
Learned	14
Good	12
Academy	10
Breakfast	10
Hot	10
Better	8
Things	8
Centers	6
Favorite	6
Get	6
Getting	6
Great	6
Helping	6
Love	6
New	6
Play	6
Teachers	6
Thing	6

Survey Data

Surveys were given to reflect the perceptions of parents, educators, and community members concerning the effectiveness of the Community Math Academy. This questionnaire was examined and validated by the Community Math Academy board of directors, the Community Math Academy executive director, and Gardner-Webb University professors. Questions on this instrument included seven statements with Likert scale responses and two open-ended responses to gather detailed insights. These questions were developed based on the objectives/guidelines of the Community Math Academy explained at length in Chapter 1. The guidelines are summarized below as follows:

1. We want an academy culture and climate that eliminates barriers to learning.
2. We want an academy that believes success is within reach for every student.
3. Students should not be allowed to fall behind in classwork.
4. The classroom environment should be conducive for learning.
5. The classroom environment should enhance student problem-solving skills.
6. There should not be a “one size fits all approach” to learning math.
7. The classroom environment should permit oral and written explanations.
8. The Math Academy should celebrate successes on a daily basis.
9. The classroom environment should promote effort-based success.
10. We will create an academy that promotes respect, support, and a love for learning.
11. We will not use labels to refer to students. They are simply “scholars.”
12. The community, parents, volunteers, and students will work together.
13. Students should be encouraged to give 100% and lend a helping hand to others.

Parents and community members completed the questionnaire during parent involvement nights during the 3-week program. In total, 17 surveys were completed and returned for the Bright Light academy site.

The questionnaire statements were as follows:

1. Math Academy builds positive feelings in students.
2. Math Academy builds students math knowledge.
3. Math Academy improves students’ problem-solving skills and math ability.
4. Math Academy creates a love of learning in students.
5. Math Academy provides opportunities for students to be successful in math.

6. Math Academy motivates students to persevere in math.
7. Math Academy encourages students to take risks while problem solving.

Each of these statements had a Likert scale rating, ranging from strongly disagree to strongly agree. The Likert scale ratings for each item were 1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree. The higher scores indicated a more positive agreeability for the response and therefore a more positive level of perceived impact on Math Academy effectiveness. In addition, there were two open-ended questions included that asked the following: (Item 8) In your opinion is Math Academy effective in helping students perform well in math; and (Item 9) What are some suggestions or recommendations to improve the Math Academy?

Table 10 indicates that 82% of participants strongly agreed with Statement 1, 76% strongly agreed with Statement 2, 71% strongly agreed with Statements 3 and 4, 88% strongly agreed with Statement 5, 76% strongly agreed with Statement 6, and 53% strongly agreed with Statement 7. Other responses were either in agreement or neutral to the statements on the survey. There were no responses of disagree or strongly disagree.

Table 10

Percentage of Responses for Community Math Academy Questionnaire

	Questionnaire Statements	Participants' % Responses				
		SD	D	N	A	SA
1	Math Academy builds positive feelings in students.	0.0	0.0	0.0	18.0	82.0
2	Math Academy builds students math knowledge.	0.0	0.0	0.0	24.0	76.0
3	Math Academy improves students problem solving skills and math ability.	0.0	0.0	0.0	29.0	71.0
4	Math Academy creates a love of learning in students.	0.0	0.0	5.0	24.0	71.0
5	Math Academy provides opportunities for students to be successful in math.	0.0	0.0	0.0	12.0	88.0
6	Math Academy motivates students to persevere in math.	0.0	0.0	0.0	24.0	76.0
7	Math Academy encourages students to take risks while problem solving.	0.0	0.0	12.0	35.0	53.0

Note. SD- Strongly Disagree, D- Disagree, N- Neutral, A- Agree, and SA- Strongly Agree.

An item frequency was also done in order to analyze the significance of the survey data. This figure shows the number of times each option (strongly disagree, disagree, neutral, agree, or strongly agree) was selected by all of the respondents.

As noted in Figure 18, strongly agree was marked 88 times, agree was chosen 28 times, and neutral was selected three times. There were no responses indicated for strongly disagree or disagree.

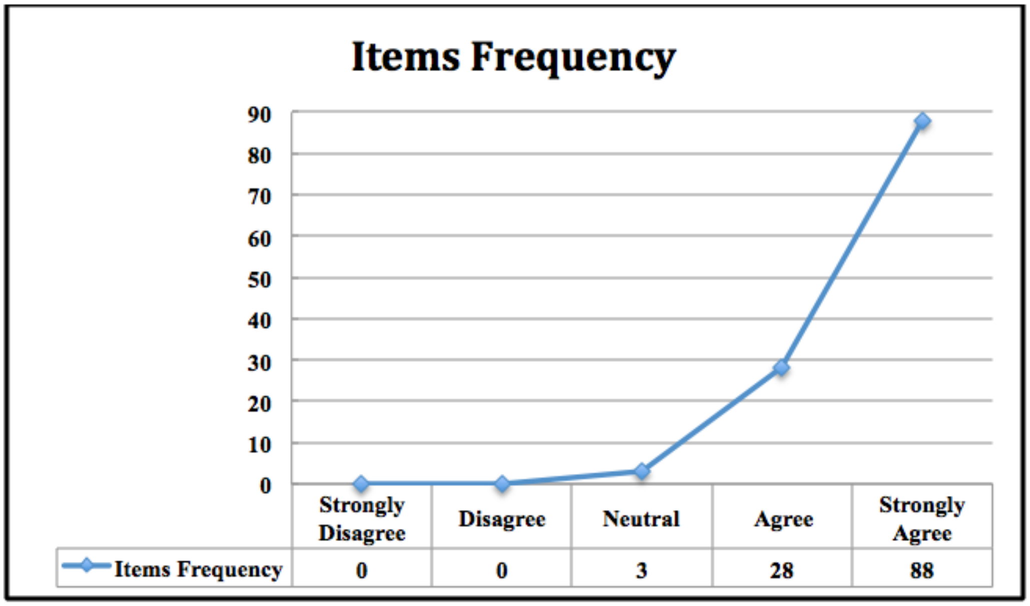

Figure 18. Summary of Likert Scale Item Frequency.

To help ascertain further effectiveness of the Community Math Academy and possible suggestions for improvements, participants were asked to respond to two open-ended questions: “In your opinion is Math Academy effective in helping students perform well in math”; and “What are some suggestions or recommendations to improve the Math Academy?” All responses recorded for the first question (related to Math Academy effectiveness) were perceived as positive with 15 yes responses. Other recorded responses in relation to effectiveness were “my son went to Math Academy for two years and then went on to middle school and did exceptionally well”; “I think it is very effective because Math Academy keeps the children’s minds open and helps create confidence within our children”; “thank you and God bless all”; “Math Academy really helps my daughter out”; “Math Academy helps the students be more confident in their abilities to do well”; “Math Academy provides needed help with math through qualified teachers and staff who genuinely care about the students”; “the staff want all the children

to be successful and know that they can, they will, and they are great"; and "I believe it gives them more confidence in math." The themes of improving student confidence and caring staff were the main themes that arose from the comments to this open-ended question. The overwhelming feedback of respondents that related to the caring dispositions of teachers and the ability of teachers to instill confidence in students demonstrated that there could be a link to the positive growth shown from student pretests to posttests.

Table 11 summarizes the written responses and their correlation to the Community Math Academy expectations. Based on these data, the summer program is perceived as motivational for students and beneficial to boosting student confidence in problem-solving.

Table 11

Written Response Analysis

Correlation Between Survey Responses and Math Academy Expectations	
Written Response	Community Math Academy Expectation
WR: Math Academy helps the students be more confident in their abilities to do well.	We want to create a culture that says "You can do this and we will help you."
WR: Math Academy provides needed help with math through qualified teachers and staff who genuinely care.	We will create an academy based on respect, mutual support, and a love for learning.
WR: The staff want all the children to be successful and know that they can, they will, and they are great.	We will help all students to become confident and committed learners.
WR: I believe it gives them more confidence in math.	We want to create a culture that says "You can do this and we will help you.

Conclusion

In summary, the last survey question allowed respondents to share suggestions and improvements for the summer learning program. Participant comments included "make it bigger"; "expand so more children will have an opportunity to be helped"; "I can't think of any"; "everyone does an amazing job all the way around"; "every year I see a big difference in my child after Math Academy"; "I thank God for this program and I think it is a great program like it is"; "continue to open more sites if possible so more children can have this great opportunity to become better math students"; and "seems to be great; from what I see things are going fine." Regarding these comments related to suggestions and improvements, the researcher identified one theme: expansion to open more Math Academy sites. This request noted repeatedly by respondents emphasizes community support of the program and satisfaction with its operations. Table 12 displays the written responses collected and transcribed from the survey instruments. Each response is coded as WR1, WR2, and so on. If the respondent answered both questions (8 and 9), the response has the same code for both questions. There were only two surveys without a response at all to Questions 8 and 9. Therefore, 88% of the surveys were completely filled out.

Table 12

Written Responses from Questionnaires

Question Number	Responses
Q8: In your opinion is the Math Academy effective in helping students perform well in mat?	"Yes, I believe it gives them more confidence in math." (WR1) "Math Academy helps the students to be more confident in their abilities to do math. It is a great program." (WR2) "Yes, I strongly agree." (WR3) "I think it is very effective. Math Academy keeps the childrens minds open and helps create confidence within our children." (WR4) "Yes, thank you. God Bless all." (WR5) "Yes it is." (WR6) "Yes, this program really helps my daughter out." (WR7) "Yes it is. My son went to Math Academy for 2 years and then went on to middle school and did exceptionally well. Jordyn will be successful too." (WR8) "Yes the Math Academy provides needed help with math through qualified teachers and staff who generally care about the students. The staff want all the children to be successful and know that they can, they will, and they are great." (WR9) "Yes." (WR10) "Yes." (WR11) "Yes." (WR12) "Yes." (WR13) "Yes." (WR14) "Yes." (WR15)
Q9: What are some suggestions or recommendations to improve the Math Academy?	"Right now I don't have any things seems to be great." (WR1) "I can't think of any. Everyone does amazing job all way around. Every year I see a big difference in my child after Math Academy. I thank God for this amazing program." (WR3) "From what I see things are going fine." (WR6) "Make it bigger. Expand so more children will have an opportunity to be helped." (WR8) "Continue to open more sites if possible so more children can have this great opportunity to become better math students." (WR9) "None, I think it is a great program like it is." (WR10) "None at this time." (WR11) "None." (WR12) "None." (WR13) "N/A." (WR14)

“These findings suggest that urban districts around the country are likely to find strong community interest in full-day, voluntary, district-provided summer learning programs that provide both academic and enrichment experiences for elementary school students at no cost to families” (McCombs et al., 2015, p. 45). Additionally, as aforementioned, “the summer learning program [will] help children develop a love of learning; build interpersonal skills; and increase self-confidence, self-esteem, and self-reliance” (Bell & Carrillo, 2007, p. 62).

Overall, data collected in this study suggest that the Community Math Academy is effective at meeting its goals and objectives. Student journals, pre and posttests scores, and stakeholder survey responses indicate more positive than negative results. Therefore, the researcher discusses the significance of these findings in Chapter 5 and elaborates on recommendations for future research.

Chapter 5: Conclusions, Discussions, and Recommendations

Introduction

Research suggests that a well-organized summer program can help to develop potential of economically disadvantaged youth and families in support of children's academic success (Alexander et al., 2007); therefore, this program evaluation of the Community Math Academy contributes to research, policy, and best practice. It is the first study to measure the effectiveness of the Community Math Academy in the district. The program highlights core characteristics to be effective: "at least three hours of instruction per day taught by certified teachers; small class sizes of no more than 15 students per class; and no fee to families for participation that includes transportation and meals" (McCombs et al., 2015, p. 7).

Purpose

The purpose of this study was to evaluate the effectiveness of a community Math Academy (summer camp) in a southeastern school district in an effort to prevent the summer learning loss often experienced by students. The study intended to provide the Community Math Academy staff insight into the nature of the site and to assess the success of the 3-week implementation.

Research Questions

To evaluate the effectiveness of the Community Math Academy, data were collected using a mixed-methods approach. Mixed methods helped to triangulate the data from the surveys, student journals, and pre and posttests in order to gain a deeper understanding of the relationship between student perceptions of and performance in the Community Math Academy. The following research questions were used to conduct an evaluation of the program:

1. What impact does the Community Math Academy have on student math performance after 3 weeks of participation based on pre and posttest data in 2018?
2. What are fifth- and sixth-grade student perceptions of the Community Math Academy based on common themes and coding of student journals?
3. What are educator, parent, and community member perceptions of the effectiveness of the Community Math Academy based on survey data?

Participants

For this study, 45 students were served at the Bright Light Math Academy site. The male and female students involved ranged in age from 10 to 12 years old. The student population for this research consisted of 24 males and 21 females. This was 53% male and 47% female participation, respectively. Also, the student demographics included 84% African-American (n=38), 11% White (n=5), and 4% Hispanic (n=2). There were no incentives or risks involved for student participation. Additionally, all information in the study was strictly confidential.

Discussion of Findings

Pretests and posttests. In order to measure the impact of the 3-week math program, pre and posttest assessments were used to indicate growth (positive, negative, or neutral). Findings indicate that 96% (n=23) of fifth-grade participants improved from their pre to posttest during the program. These data were statistically significant as evidenced by a paired samples t test ($p<0.0001$). In like manner, 89% (n=16) of sixth-grade participants grew from their pretest to posttest based on percentage points. These data were also statistically significant according to a paired samples t test ($p<0.0001$). The researcher contributes much of this growth to the critical aspects and structure of the

Community Math Academy. These aspects include, but are not limited to, small class sizes of no more than 15 students, learning activities that were motivating and engaging, and individualized instruction taught by certified staff. Undoubtedly, smaller class sizes and the flexibility in schedule also allowed teachers to give more individualized attention in an effort to improve student mathematical competence and confidence. These findings align with previous research concerning summer learning programs. For instance, since its inception in 1992, the BELL summer program has served many students and "demonstrated that children participating over one summer not only develop a better attitude towards learning and gain 3 months or more in literacy and math skills, but also develop an improved self [image]" (Newhouse et al., 2012, p. 8). Therefore, this study adds to the body of research that suggests that students can benefit from quality summer learning programs.

Student journals. For the purpose of assessing student perceptions of the Community Math Academy, student journals were evaluated and coded for major themes. As suggested by Creswell (2014), the evaluator used one word codes or short descriptions to chunk phrases from student journals. NVivo software aided in the analysis as well to create a word cloud query and word frequency list. Findings indicate that the major themes were Math Academy was fun, students learned a lot, and hot breakfast was favored. These data suggest that the summer learning program may have increased student self-confidence and love of learning. These results, additionally, support the positive growth indicated from the pre to posttest assessments. Students were able to apply their learning throughout the program when they were motivated by "fun" classroom activities and involved with meaningful learning activities.

As has been noted, hot breakfast was also a bonus contributing factor to program

quality. Students anticipated this breakfast once per week and indulged in eggs, bacon, livermush, sausage, toast, and grits. On the other days of the week, students were served a cold breakfast such as poptarts, muffins, and cereal. This recurring theme about hot breakfast in student journals demonstrates Maslow's hierarchy[2] of needs theory (the basic needs). It also suggests that this aspect of the program promotes positive perceptions among students and ultimately helps to avoid the faucet theory referenced earlier in Chapter 2. This is the theory that students lose access to critical resources such as food and structured activities during the summer months when school is out.

Surveys. Using survey data, the researcher was able to measure stakeholder perceptions of the effectiveness of a Math Academy. Questions on this instrument included seven statements with Likert scale ratings and two open-ended responses to gather detailed insights. The ratings for each item were 1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree. In total, 17 surveys were completed.

Results indicate that 82% of participants strongly agreed with Statement 1, 76% strongly agreed with Statement 2, 71% strongly agreed with Statements 3 and 4, 88% strongly agreed with Statement 5, 76% strongly agreed with Statement 6, and 53% strongly agreed with Statement 7. Other responses were either in agreement or neutral. There were no responses of disagree or strongly disagree. See Table 13 for detailed results.

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[2] Maslow's hierarchy of needs is a theory proposed by Abraham Maslow that suggests that human basic needs (food, clothing, shelter) must be met first in order to achieve one's greatest potential.

Table 13

P*ercentage of Responses for Community Math Academy Questionnaire*

	Questionnaire Statements	Participants' % Responses				
		SD	D	N	A	SA
1	Math Academy builds positive feelings in students.	0.0	0.0	0.0	18.0	82.0
2	Math Academy builds students math knowledge.	0.0	0.0	0.0	24.0	76.0
3	Math Academy improves students problem solving skills and math ability.	0.0	0.0	0.0	29.0	71.0
4	Math Academy creates a love of learning in students.	0.0	0.0	5.0	24.0	71.0
5	Math Academy provides opportunities for students to be successful in math.	0.0	0.0	0.0	12.0	88.0
6	Math Academy motivates students to persevere in math.	0.0	0.0	0.0	24.0	76.0
7	Math Academy encourages students to take risks while problem solving.	0.0	0.0	12.0	35.0	53.0

Note. SD- Strongly Disagree, D- Disagree, N- Neutral, A- Agree, and SA- Strongly Agree.

These findings indicate that stakeholders largely agree that the Math Academy builds positive feelings in students, builds student math knowledge, improves student problem-solving skills and ability, creates a love of learning in students, provides opportunities for students to be successful, motivates students to persevere in math, and encourages students to take risks while problem solving. This is significant because one of the expectations of the academy is to support students through collective efforts (the community, teachers, parents, and volunteers) to help students become confident and committed learners.

Limitations

One limitation of this program evaluation was the population size; therefore, generalizations to larger populations are limited, even in similar summer camp environments. Also, this study only involved the mathematics subject area to measure student achievement, but to study other subjects would have been beyond the scope of the research. Finally, there was a possibility of researcher bias due to the researcher being the program evaluator; however, as research noted, "internal evaluators know the history of the organization; its clients, funders, and other stakeholders; the environment in which it operates; and the typical dynamics involved in decision making" (Fitzpatrick et al., 2011, p. 178).

Recommendations

Based on the data results in this study and the limitations that were identified, the researcher recommends suggestions for future research. One suggestion is to include the other Math Academy sites. This would increase the study participants and allow the researcher to compare results between multiple sites. In addition, the study could then be generalized to larger population sizes. Additionally, the high-quality structure and expectations maintained at Bright Light could be evaluated at the other sites.

Another suggestion is to make revisions to the pretest and posttest for sixth grade. With revisions to the structure of the test, the researcher could develop a deeper understanding of student mathematical reasoning. The recommendation is to develop a test format that is similar to the fifth-grade test which is a mastery test. This would allow both assessments to be graded according to a detailed rubric. This also eliminates the possibility of students guessing, which happens more often than not with multiple choice assessments.

A third recommendation is to increase enrollment slots at the existing Math Academy sites. This was a popular demand from stakeholders based on survey results in this study. As aforementioned, stakeholder comments included “make it bigger”; “expand so more children will have an opportunity to be helped”; “I can’t think of any”; “everyone does an amazing job all the way around”; “every year I see a big difference in my child after Math Academy”; “I thank God for this program and I think it is a great program like it is”; “continue to open more sites if possible so more children can have this great opportunity to become better math students”; and “seems to be great; from what I see things are going fine.” These were the comments transcribed from the survey data.

Ultimately, increasing the enrollment capacity would allow more students to be served during the summer months. This would also help combat the summer learning effect, and more students could participate in a high quality summer learning program to improve their “self-confidence, self-esteem and self-reliance” (Bell & Carrillo, 2007, p. 62).

Conclusion

In summary, the purpose of this study was to evaluate the effectiveness of a Community Math Academy (summer camp) in a southeastern school district. The goal of the study was to evaluate how well the 3-week program helped students develop positive feelings towards math while improving their problem-solving skills. To conduct the program evaluation, the researcher used Daniel Stufflebeam’s CIPP model (Fitzpatrick et al., 2011) to determine the degree to which the Math Academy was meeting its program goals and objectives. For the scope of this study, the evaluation focused on the process and product components (see Figure 19).

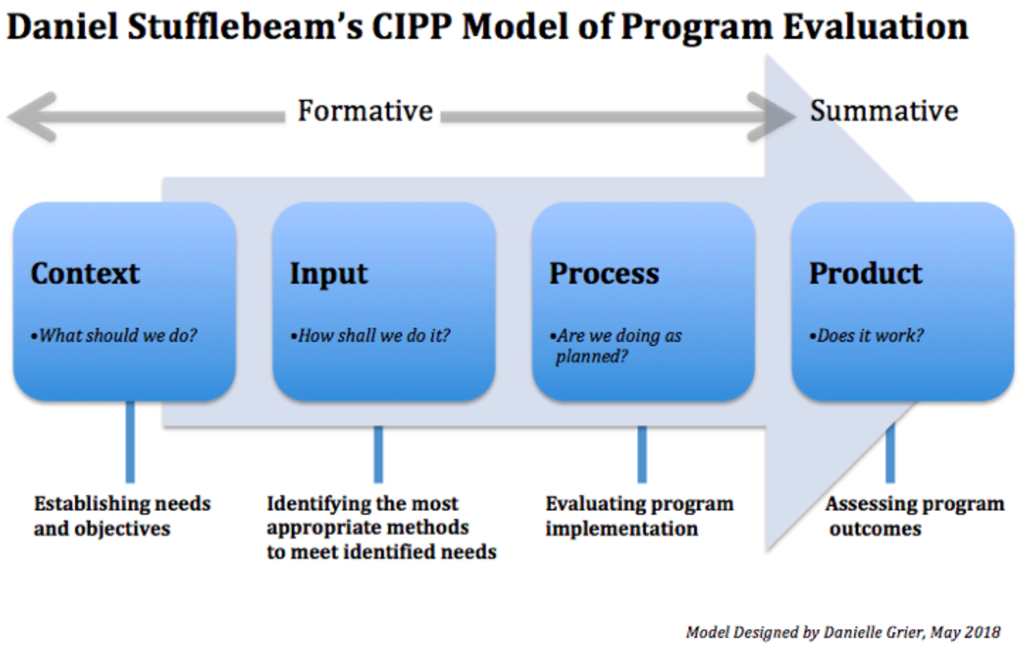

Figure 19. Daniel Stufflebeam's CIPP Model of Program Evaluation.

The data collection techniques included pretests, posttests, student journals, and surveys. Fifth-grade data indicated that 96% (n=23) of students improved from their pre to posttest by the end of the program. Sixth-grade results were also significant with 89% (n=16) of students improving from their pretest to posttest. Gains for both grade levels are shown in Figure 20.

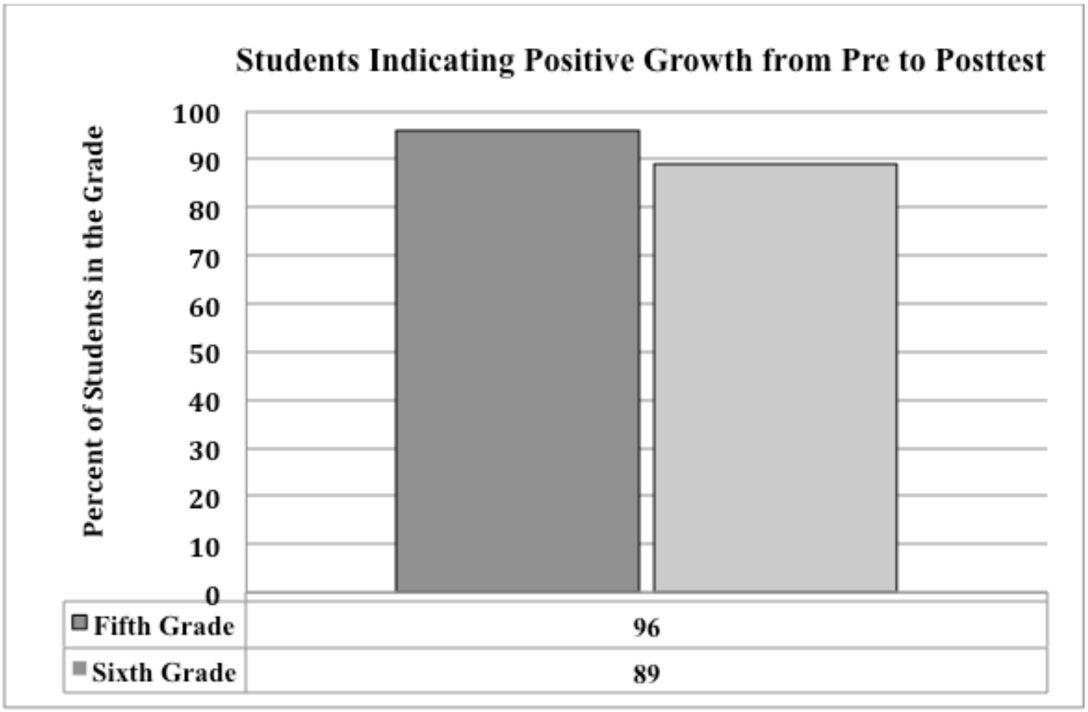

Figure 20. Students Indicating Positive Growth from Pre to Posttest.

Based on responses from student journal entries, the engagement and motivation maintained in classrooms could help justify these positive test results. For instance, students reported that they enjoyed the Math Academy with descriptive terms such as fun, better, favorite, great, love and good. See Figure 21 for the frequency of each of these words.

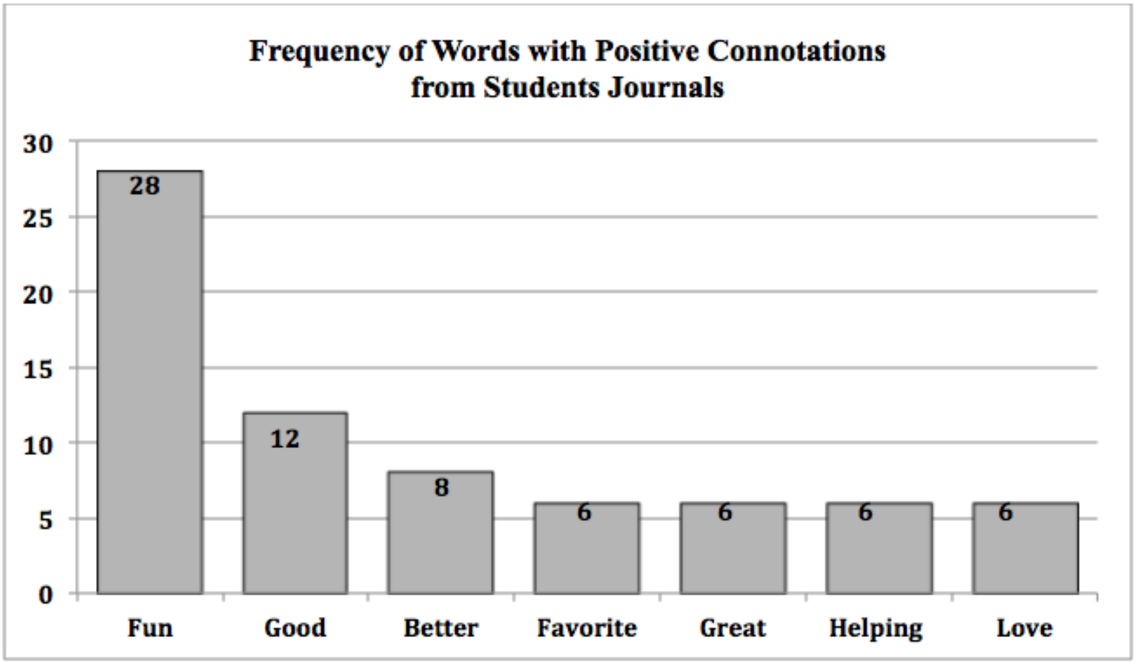

Figure 21. Frequency of Words with Positive Connotations from Students Journals.

Additionally, stakeholder survey results indicated community satisfaction with program operations, particularly as it relates to the short-term intended outcomes for students. These outcomes include, but are not limited to, developing positive feelings towards math and understanding basic math concepts. After tabulating survey data, results included 88 marks for strongly agree, 28 marks for agree, and three marks for neutral. There was no indication of disagreement. Figure 22 displays these data.

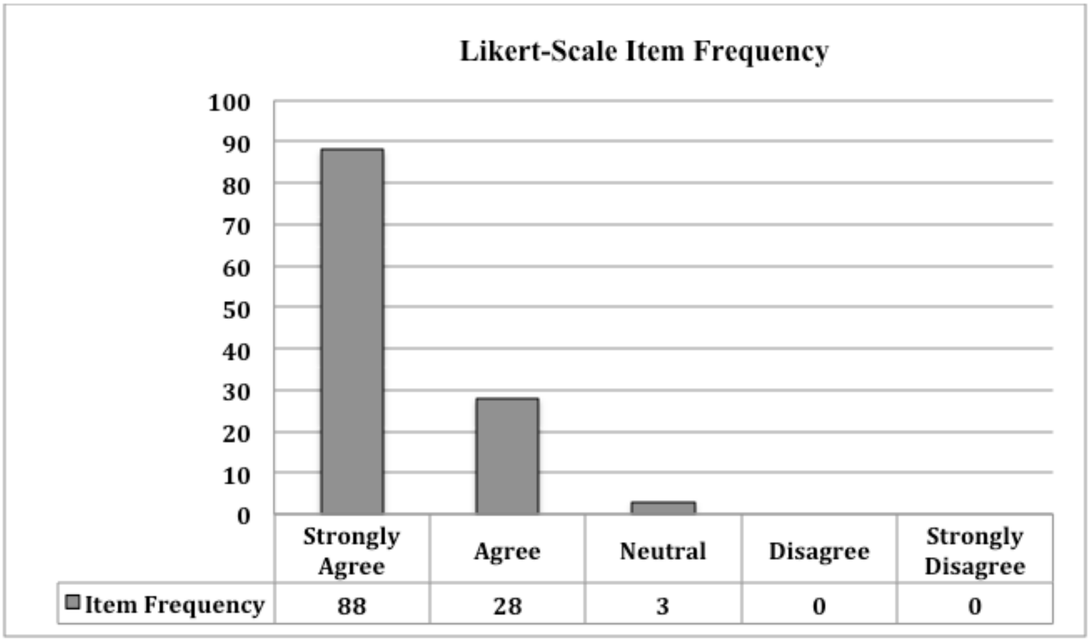

Figure 22. Likert Scale Item Frequency.

Overall, findings indicated that there was a significantly positive impact when students were involved in the high quality summer program. By the end of the study, more than half of the fifth- and sixth-grade participants improved on their posttest. Likewise, student journals and stakeholder surveys indicated that Math Academy is invaluable to the community it serves. The findings of this study are impactful because they align with past research that suggests that "a well-organized summer program can help to develop potential of economically disadvantaged [families] in support of children's academic success" (Alexander et al., 2007, p. 26).

With its first program evaluation complete after 10 years of operation, it is inspiring and motivating to share that Math Academy is continuously improving and functioning effectively for the community. The summer program does meet the following highly qualified characteristics: partnerships between the schools and

community, merging academics with enrichment, developing promising practices, offering instruction led by certified staff, limiting class sizes to no more than 15 students, offering free meals and transportation, and maintaining creative funding. The findings presented remind board members and other community partners to be cognizant of the critical aspects of the program that deem it a high quality summer resource for disadvantaged families; therefore, the researcher strongly recommends that other communities model programs similar to the Math Academy in order to place students "at promise for academic success; [rather than] at risk for academic failure" (LaPoint et al., 2006, p. 384).

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Appendix A

Community Math Academy Enrollment Form

Office Use Only:
Academy Teacher:
____

Transportation: Car / Van___________

Community Summer Math Academy

Permission/Information Sheet

School Use ONLY:
Student Id #
____

Student Name: ____

Birth date: ______________________________ Female __________ Male _________

Grade Next Year: __________ Current School: ____________________________________

Student Home Address: ____

Mailing Address (if different): ____

Brief directions to home (from church): ____
____

Mother/Guardian(s) Name: ______________________________ Phone # ________________

Cell # _________________

Father/Guardian(s) Name: _______________________________ Phone # _______________

Cell # _________________

Emergency Contact (other than parent): ____

Relationship to Child: ______________________________ Phone # ________________

Emergency Medical Information (Please note medications your child takes, allergies, diabetes, physical conditions, etc.): ____
____
____

***Please list any food allergies: ____
____

****

Transportation Information:

If transportation to and from the Math Academy is needed, please list AM and PM addresses below.

AM Address ____

PM Address ____

________ My child will have transportation to and from Math Academy.

Parent Signature ____

Appendix B

Research Request Letter

GARDNER-WEBB
UNIVERSITY

July 3, 2014

Research Request Letter

To the Math Academy Executive Board:

Hello! My name is Danielle Grier and I am entering my second year of study for my Doctor of Education in Curriculum and Instruction degree at Gardner-Webb University. In this program, I am required to complete a program evaluation in order to fulfill the requirements of the degree. I would very much like to complete my program evaluation by studying the Community Math Academy. I have thoroughly enjoyed working for the academy for the past five years and I want to thank you personally for allowing me the opportunity to be a part of such an awesome community effort.

The purpose of my study is to research the impact of the Community Math Academy on students' performance, specifically looking at the impact it has on low-performing students. For my study, I would analyze data that is already being collected such as pre- and posttest data for the program. I intend to use methods such as observations, interviews, and reflections to develop an analysis of the perceptual data. Additionally, I would need access to the budget information, board meeting notes, and any other data that reflects the implementation of the program. To protect subjects in the study, I would not use any student names, teacher names, or other information that you would like me to withhold from the written analysis, and I assure you that you will be able to review and approve anything that I complete if you would like to do so.

Again, I would very much like the opportunity to research the program and I wanted to make sure that I have your approval before I start working heavily on my analysis. Please feel free to call me at [redacted] or email me at [redacted] if you have any questions about this process or my [redacted].

Sincerely,

Danielle Grier

Danielle Grier
Doctoral Candidate
Gardner-Webb University

✓ I DO give permission to the candidate to conduct the research study as a program evaluation of the Community Math Academy.

___ I DO NOT give permission to the candidate to conduct the research study as a program evaluation of the Community Math Academy.

Signature [redacted] Title: Vice Chairman - Board of Directors

Signature: [redacted] Title: Chairman Board of Directors

Signature [redacted] Title: Executive Director

Appendix C

Superintendent Letter

[redacted]
County
SCHOOLS

[redacted]

July 27, 2014

To Whom It May Concern:

Th[redacted]County Community Math Academy started six years ago as an intervention program to reach students that struggled in school with deficiencies in their math ability. In six short years, the Community Math Academy has become an unbelievable partnership that is changing the lives of students. Starting with approximately 60 students, the Math Academy is currently serving almost 140 students in the areas of math, science, robotics, art education, and enrichment activities. In addition to the 140+ students, the Community Math Academy has a waiting list every year.

Currently, not only do students that are struggling in the area of mathematics receive high quality instruction in that area; these students have the opportunity to participate in art camp at th[redacted]County Arts Council, be involved in a robotics program or science enrichment a[redacted]Community College, and are engaged in focused daily enrichment. These opport[redacted]only meet the educational needs of students, a focus on success in engrained in the students on a daily basis. At the Math Academy, students and parents are encouraged to become more involved in the school community and the importance of good communication between the school and parents is stressed.

One of many benefits of the Math Academy is the reliance on high quality people to work with students. The best of the best professionals are recruited and selected to work the Math Academy. Ensuring that our students receive high quality instruction, guidance and support from the very best our county has to offer has helped to ensure success for the present and future of the [redacted]County Community Math Academy.

In conclusion, the Community Math Academy o[redacted] County is a model exemplar of what community and school partnerships are all about. There is no question about the positive impact our Math Academy has had on our students, parents, schools and community. The Math Academy serves as a model for all others to follow.

Sincerely,

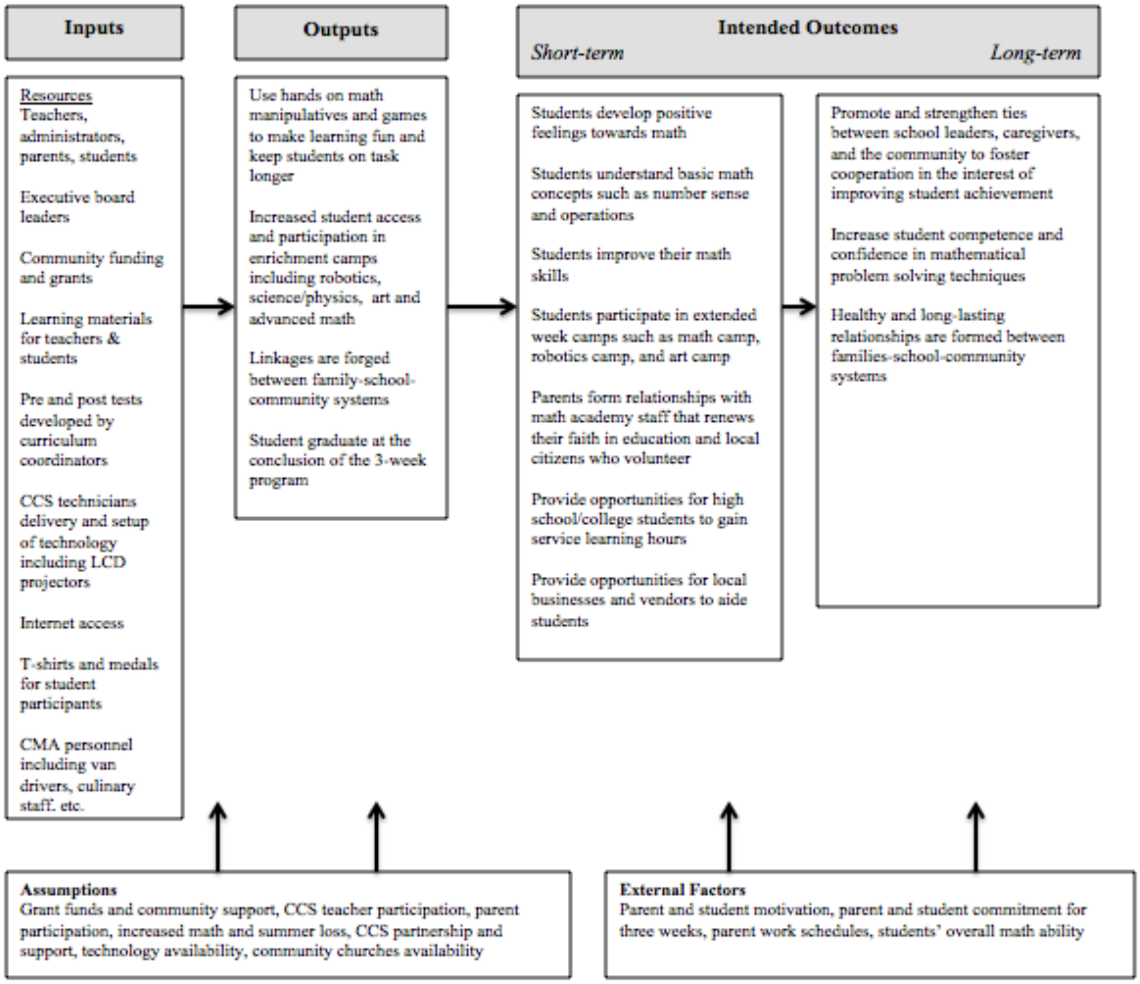
[redacted]

Superintendent

[redacted]

Appendix D

A Logic Model


Inputs
Outputs
Intended Outcomes
Short-term
Long-term
Resources
Teachers, administrators, parents, students
Executive board leaders
Community funding and grants
Learning materials for teachers & students
Pre and post tests developed by curriculum coordinators
CCS technicians delivery and setup of technology including LCD projectors
Internet access
T-shirts and medals for student participants
CMA personnel including van drivers, culinary staff. etc.
Use hands on math manipulatives and games to make learning fun and keep students on task longer
Increased student access and participation in enrichment camps including robotics, science/physics, art and advanced math
Linkages are forged between family-school-community systems
Student graduate at the conclusion of the 3-week program
Students develop positive feelings towards math
Students understand basic math concepts such as number sense and operations
Students improve their math skills
Students participate in extended week camps such as math camp, robotics camp, and art camp
Parents form relationships with math academy staff that renews their faith in education and local citizens who volunteer
Provide opportunities for high school/college students to gain service learning hours
Provide opportunities for local businesses and vendors to aide students
Promote and strengthen ties between school leaders, caregivers, and the community to foster cooperation in the interest of improving student achievement
Increase student competence and confidence in mathematical problem solving techniques
Healthy and long-lasting relationships are formed between families-school-community systems
Assumptions
Grant funds and community support, CCS teacher participation, parent participation, increased math and summer loss, CCS partnership and support, technology availability, community churches availability
External Factors
Parent and student motivation, parent and student commitment for three weeks, parent work schedules, students' overall math ability

Appendix E

Community Math Academy Questionnaire

Community Math Academy Questionnaire

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Math Academy builds positive feelings in students.	1	2	3	4	5
2. Math Academy builds students' math knowledge.	1	2	3	4	5
3. Math Academy improves students' problem solving skills and math ability.	1	2	3	4	5
4. Math Academy creates a love of learning in students.	1	2	3	4	5
5. Math Academy provides opportunities for students to be successful in math.	1	2	3	4	5
6. Math Academy motivates students to persevere in math.	1	2	3	4	5
7. Math Academy encourages students to take risks while problem solving.	1	2	3	4	5

8. In your opinion is the Math Academy effective in helping students perform well in math?

____

____

Community Math Academy Questionnaire

9. What are some suggestions or recommendations to improve the Math Academy?

____

____

Appendix F

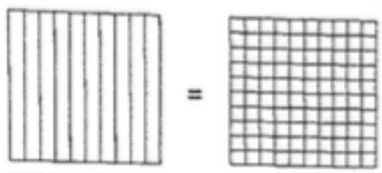
Fifth-Grade Assessment

Name ______________________________ Date ______________

1. Decompose each fraction into hundredths using area models. Then, write the equivalent number sentence using decimals. *Shade the area models.*

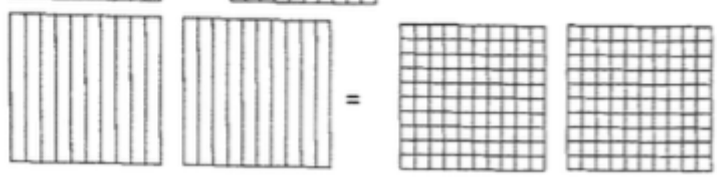
a. $\frac{8}{10} = \frac{}{}$

___ = ___



b. $\frac{18}{10} = \frac{}{}$

___ = ___

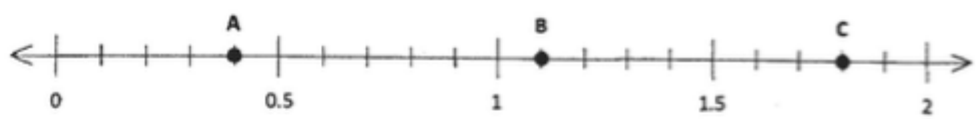


Decompose each fraction into hundredths. Then, write the equivalent number sentence for each part using decimals.

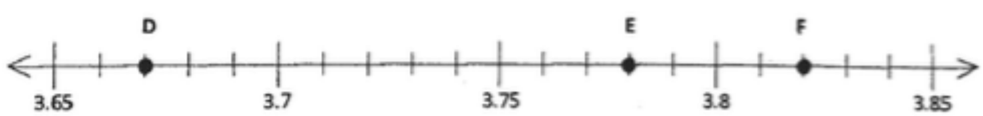
c. $\frac{2}{10} = \frac{}{}$ ___ = ___

d. $\frac{5}{10} = \frac{}{}$ ___ = ___

2. Several points are plotted on the number lines below. Identify the decimal number associated with each point.



A. ____ B. ____ C. ____



D. ____ E. ____ F. ____

3. Use the symbols >, =, or < to compare the following. Justify your conclusions using pictures, numbers, or words.

a. 0.02 ◯ 0.22

b. 0.6 ◯ 0.60

c. 17 tenths ◯ 1.7

d. 1.04 ◯ $1\frac{4}{10}$

e. 0.38 ◯ $\frac{38}{10}$

f. 4.05 ◯ $4\frac{5}{100}$

g. 3 tenths + 2 hundredths ◯ 1 tenth + 13 hundredths

h. 8 hundredths + 7 tenths ◯ 6 tenths + 17 hundredths

4. Solve.

   a. Express your solution as a fraction of a meter. 0.3 m + 1.45 m

   b. Express your solution as a fraction of a liter. 1.7 L + 0.82 L

   c. Express your solution as a fraction of a dollar. 4 dimes 1 penny + 77 pennies

5. Solve.

   a. $\frac{7}{10} + \frac{8}{100}$

   b. $\frac{4}{10} + \frac{51}{100}$

   c. $\frac{5}{10} + \frac{68}{100}$

   d. $\frac{98}{100} + \frac{2}{10}$

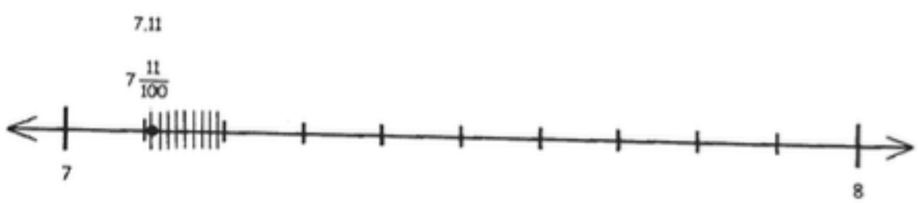
   e. $\frac{12}{100} + \frac{12}{10}$

   f. $\frac{1}{10} + \frac{13}{100} + \frac{8}{10}$

6. Answer the following questions about a track meet.

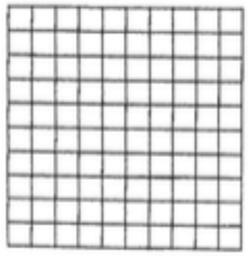
   a. Jim and Joe ran in a relay race. Jim had a time of 9.8 seconds. Joe had a time of 10.32 seconds. Together, how long did it take them to complete the race? Record your answer as a decimal.

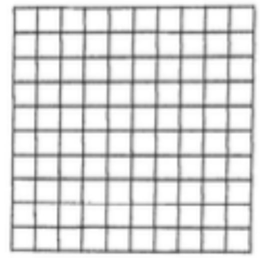
   b. The times of the 5 fastest runners were 7.11 seconds, 7.06 seconds, 7.6 seconds, 7.90 seconds, and 7.75 seconds. Locate these times on the number line. Record the times as decimals and fractions. One has been completed for you.



   c. Natalie threw a discus 32.04 meters. She threw 3.8 meters farther on her next throw. Write a statement to compare the two distances that Natalie threw the discus using >, <, or =.

d. At the concession stand, Marta spent 89 cents on a bottle of water and 5 dimes on a bag of chips. Shade the area models to represent the cost of each item.





e. Write a number sentence in fraction form to find the total cost of a water bottle and a bag of chips. After solving, write the complete number sentence in decimal form.

___ + ___ = ___ ___ + ___ = ___

f. Brian and Sonya each have a container. They mark their containers to show tenths. Brian and Sonya both fill their containers with 0.7 units of juice. However, Brian has more juice in his container. Explain how this is possible.

Appendix G

Sixth-Grade Assessment

Student:

Class:

Date:

1. **A high school golf coach ordered a uniform for each player on his team. The total cost of the uniforms was $325. If there are 12 golfers on the team, how much did each uniform cost to the nearest dollar?**
   - A. $25
   - B. $27
   - C. $30
   - D. $33

2. **30 beads divided into 5 groups is represented by which fraction?**
   - A. $\frac{5}{30}$
   - B. $\frac{5}{25}$
   - C. $\frac{25}{5}$
   - D. $\frac{30}{5}$

3. Mrs. Renning drove her car 3,718 miles last summer. Her car uses 1 gallon of gas for every 26 miles driven. How many gallons of gas did she use last summer?
   - A. 133
   - B. 139
   - C. 142
   - D. 143

4. **Donnie is completely covering a rectangular wall with tiles. The wall is $5\frac{1}{2}$ feet long and 7 feet wide. What is the area of the rectangular wall Donnie is covering?**
   - A. $12\frac{1}{2}$ square feet
   - B. 25 square feet
   - C. $38\frac{1}{2}$ square feet
   - D. 42 square feet

5. **Shelia made 57 beaded necklaces. If she sells the necklaces for $11.25 each, how much will she earn?**

A. $45.75
B. $68.25
C. $527.95
D. $641.25

6. **Andy has two dogs. One eats 3 cans of dog food every day. The other eats five cans every day. Each can of dog food costs $3.25. Which expression could Andy use to calculate the amount of money he spends on dog food every week?**

A. $2(3 \times 5)(3.25 \times 7)$
B. $(3 + 5)(3.25 + 7)$
C. $(3 + 5)(3.25 \times 7)$
D. $2(3 + 5)(3.25 \times 7)$

7. **What is the value of the expression** $7 - 3 + 28 \div 4 \times 2$?

A. 4
B. 14
C. 18
D. 22

8. A baker made cookies before he opened his store in the morning.

- He sold $2\frac{3}{4}$ dozen of his cookies in the morning.
- He sold $3\frac{1}{2}$ dozen of his cookies in the afternoon.
- There were still $4\frac{1}{3}$ dozen of his cookies left when he closed the store.

How many cookies did the baker make before he opened the store?

A. 10 dozen
B. $10\frac{5}{12}$ dozen
C. $10\frac{1}{2}$ dozen
D. $10\frac{7}{12}$ dozen

9. **Mr. Jacobson wrote this problem on the board.**

$\frac{1}{5} \div 3 = \frac{1}{15}$

Which equation can be used to check that Mr. Jacobson's solution is true?

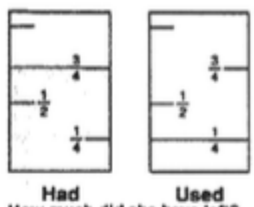
A. $\frac{1}{3} \times \frac{1}{15} = \frac{1}{45}$

B. $\frac{1}{5} \times \frac{1}{15} = \frac{1}{75}$

C. $\frac{1}{15} \times 5 = \frac{1}{3}$

D. $\frac{1}{15} \times 3 = \frac{1}{5}$

10. **Mandy had $\frac{3}{4}$ cup of water in a measuring cup. She gave a plant $\frac{1}{4}$ cup of water.**



How much did she have left?

A. $\frac{1}{4}$ cup

B. $\frac{1}{2}$ cup

C. $\frac{3}{4}$ cup

D. 1 cup

11. Jasmine feeds her cat $\frac{1}{4}$ cup of food each day. There are 6 cups of cat food in the bag. How many days will the bag of cat food last?

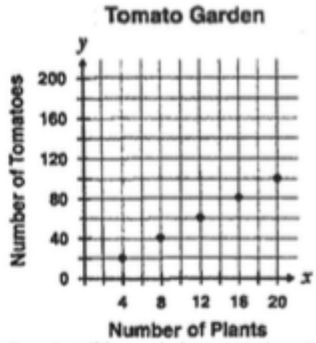
A. 4

B. 6

C. 10

D. 24

12. Bella has tomato plants in her garden. The graph shows the relationship between the number of tomato plants and the number of tomatoes produced.



Based on this graph, how many tomatoes would Bella have if she had 14 tomato plants in her garden?

A. 60
B. 70
C. 80
D. 90

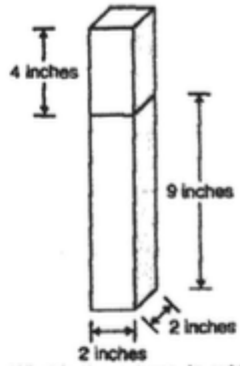
13. Patrick ate $\frac{3}{5}$ of a small pizza on Friday night. For lunch on Saturday, he ate $\frac{1}{2}$ of the leftover pizza. How much pizza did he eat for lunch on Saturday?

A. $\frac{7}{10}$ of the small pizza
B. $\frac{2}{5}$ of the small pizza
C. $\frac{3}{10}$ of the small pizza
D. $\frac{1}{5}$ of the small pizza

14. Rose went to the store to purchase a 35 ft and 50 ft cable. If the cable cost $1.50 per foot, which of the following expressions could she use to calculate her total cost for the cable?

A. $35 + 50 \cdot (1.5)$
B. $(35 + 50)1.5$
C. $(50 + 35 \cdot 1.5)$
D. $50 \cdot (35 + 1.5)$

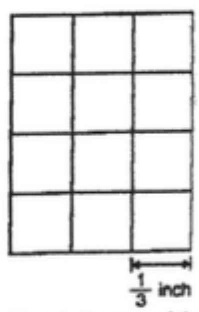
15. **The solid figure below is made up of 2 blocks.**



What is the volume, in cubic inches, of the solid figure?

A. 34
B. 52
C. 88
D. 144

16. **The rectangle below is made up of 12 congruent squares.**



What is the area of the rectangle, in square inches?

A. $1\frac{1}{3}$
B. $2\frac{1}{3}$
C. 4
D. $4\frac{2}{3}$

17. **What is the product when 842 is multiplied by 24?**

A. 19,108
B. 20,006
C. 20,108
D. 20,208

18. **Mrs. Sanchez has a rectangular deck. The length of the deck is $6\frac{2}{3}$ yards, and the width is $\frac{3}{4}$ of the length. Which equation can be used to find *w*, the width of the deck?**

A. $w = 6\frac{2}{3} + \frac{3}{4}$

B. $w = 6\frac{2}{3} - \frac{3}{4}$

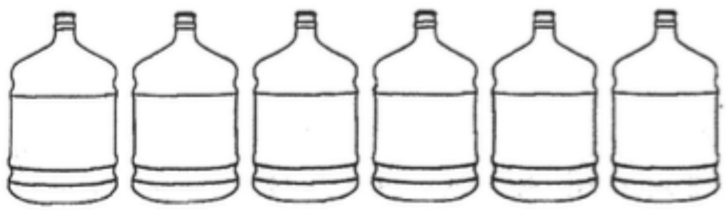
C. $w = 6\frac{2}{3} \div \frac{3}{4}$

D. $w = 6\frac{2}{3} \times \frac{3}{4}$

19. $\begin{array}{r} 980 \\ \times \quad 73 \\ \hline \end{array}$

A. 2940
B. 9800
C. 71,540
D. 71,613

20. **Tori filled $\frac{2}{3}$ of each jug with water as shown below.**



Tori wrote the equation $6 \times \frac{2}{3} = \frac{12}{3}$ to show the total amount of water in the jugs. Which equation could also have been used to show this same amount?

A. $\left(12 + \frac{1}{3}\right) = \left(6 \times 2 + \frac{1}{3}\right) = 12\frac{1}{3}$

B. $\left(6 \times \frac{3}{2}\right) = \left(6 \times 3 \times \frac{1}{2}\right) = \frac{18}{3}$

C. $\left(6 \times \frac{2}{3}\right) = \left(\frac{6}{6} \times \frac{2}{3}\right) = \frac{12}{18}$

D. $\left(6 \times 2 \times \frac{1}{3}\right) = \frac{12}{3}$

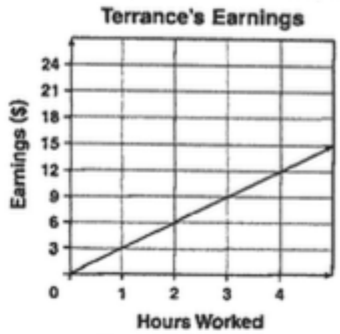
21. **The table below shows how much Terrance will earn for working different numbers of hours.**

Terrance's Earnings	
Number of Hours Worked	**Earnings**
1	$6.00
2	$12.00

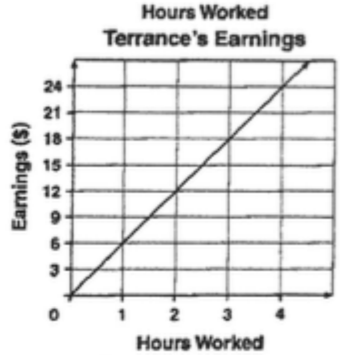
3	$18.00
4	$24.00

Which graph best represents the relationship in the table?

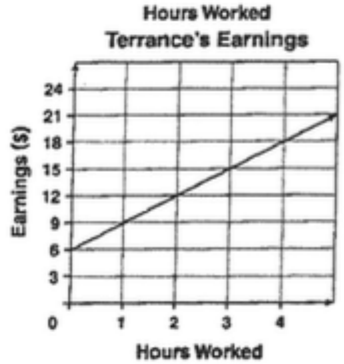
A.



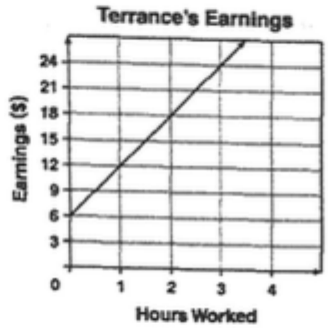
B.



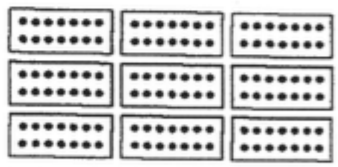
C.



D.



22. **Which division equation is illustrated by the following drawing?**

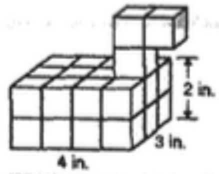


A. $9 \div 3 = 3$
B. $14 \div 2 = 7$
C. $126 \div 21 = 6$
D. $126 \div 9 = 14$

23. **Darin had \$15.00. After spending $\frac{3}{5}$ of his money for a movie and popcorn, how much of his money did he have left?**

A. \$3.00
B. \$6.00
C. \$9.00
D. \$12.00

24. Raúl built a solid using unit cubes, with no gaps or overlaps, as shown below. The length of each edge of a unit cube is 1 inch (in.).



Which statement is true?

A. The solid has 8 unit cubes in the front face, so the volume is 16 cubic inches.
B. The solid has 12 unit cubes on the top face, so the volume is 24 cubic inches.
C. Raúl used exactly 27 unit cubes, so the volume of the solid is 27 cubic inches.
D. Raúl used exactly 27 unit cubes, so the volume of the solid is 54 cubic inches.

25. Ava earned $59.70 selling handmade bracelets at the craft fair. She sold a total of 6 bracelets. If all the bracelets were priced the same, how much did she charge for each bracelet?

A. $8.98
B. $9.95
C. $53.70
D. $65.70

26. Connie makes cloth cat toys. She bought 6 yards of material for $42.00 and 1 spool of thread for $2.58. She can make 2 cat toys from each yard of material. Connie sells each toy for $5.00. How much profit will she make?

A. $12.00
B. $14.58
C. $15.42
D. $18.00

27. $\begin{array}{r} 444 \\ \times\ 555 \\ \hline \end{array}$

A. 6660
B. 110,889
C. 246,420
D. 606,060

28. Mrs. Lewis will put a fence around her rectangular garden.

- The length of the garden is $9\frac{5}{6}$ yards.
- The width of the garden is $5\frac{1}{4}$ yards.

How many yards of fencing does Mrs. Lewis need?

A. $14\frac{6}{10}$

B. $29\frac{1}{12}$

C. $29\frac{1}{5}$

D. $30\frac{1}{6}$

29. A farmer is packing grapefruit into boxes.

- He packs the same number of grapefruit into each box.
- He has packed a total of 264 grapefruit into 22 boxes.
- He still has 180 grapefruit that must be packed.

How many more boxes must the farmer pack?

A. 12

B. 15

C. 18

D. 21

30. **Olga had 3 granola bars. She wanted to give her 6 friends an equal amount of the granola bars, so she separated the granola bars into 6 parts as shown.**

Which fraction of one granola bar did each friend receive?

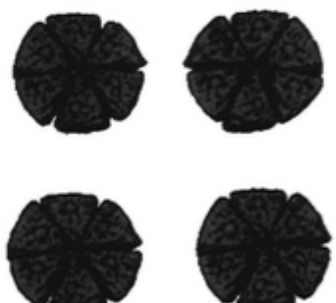
A. $\frac{1}{2}$ granola bar

B. $\frac{1}{6}$ granola bar

C. $\frac{1}{3}$ granola bar

D. $\frac{1}{18}$ granola bar

31. **Lionel wanted to share 4 muffins with his 5 friends. He separated the muffins into 6 equal parts as shown.**



What is the total amount each person would receive?

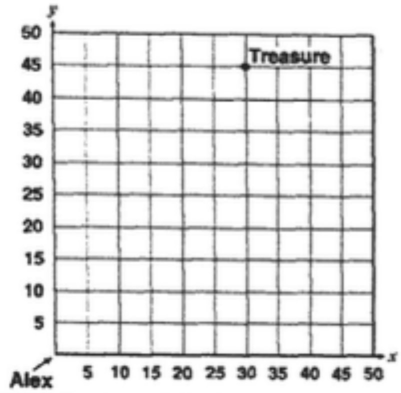
A. $\frac{1}{6}$ muffin

B. $\frac{4}{6}$ muffin

C. $\frac{1}{3}$ muffin

D. $\frac{1}{24}$ muffin

32. The location of "buried treasure" in a game is at (30, 45) on an imaginary coordinate grid and Alex is standing on the origin, facing the y-axis.



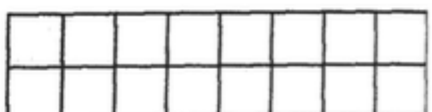
Which directions tell Alex how to get to the "buried treasure"?

A. Alex should walk forward 30 yards, turn right and go 45 yards.
B. Alex should turn to the right, walk 30 yards, turn left and go 45 yards.
C. Alex should turn to the right, walk 30 yards, turn right and go 45 yards.
D. Alex should turn 180 degrees to the right, walk 30 yards, turn left and go 45 yards.

33. There are currently 496 people in line for a roller coaster ride. If the ride is three minutes long and the cars can hold a maximum of 16 passengers at a time, what is the minimum amount of time it will take for all of the people in line to ride the roller coaster?

A. 31 minutes
B. 48 minutes
C. 93 minutes
D. 165 minutes

34. Mrs. Gomez had $\frac{5}{8}$ of a stick of butter. She wanted to use $\frac{1}{2}$ of the butter for a recipe. She drew this model to show the amount of butter she would have left after she was finished cooking.



Which expression is the result her model shows?

A. $\frac{5}{8} \times \frac{1}{2}$
B. $\frac{5}{8} \div \frac{1}{2}$
C. $\frac{5}{8} + \frac{1}{2}$
D. $\frac{5}{8} - \frac{1}{2}$

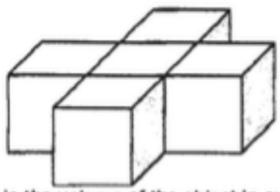
35. **The table shows the total distance Dave ran each week for four weeks.**

Week	Kilometers
1	48.9
2	35.8
3	27.4
4	42.1

Dave runs at an average speed of 8 kilometers per hour. Approximately how many hours did he run in the four weeks?

A. 10
B. 15
C. 20
D. 25

36. **The object below is made with five identical cubes. Each cube has 3-centimeter edges.**



What is the volume of the object in cubic centimeters?

A. 15
B. 45
C. 135
D. 198

37. **Colin's weekly budget is shown below.**

Colin's Weekly Budget			
Income	**$**	**Expenses**	**$**
Allowance	10	Save	15
Pet Sitting	15	Spend	15
Grass Cutting	12	Donate	5

Which statement best describes Colin's budget?

A. Colin's budget is balanced.
B. Colin has $2 more in income than expenses.
C. Colin needs $2 more in income to balance his budget.
D. Colin's budget has an $8 difference between income and expenses.