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# How Do Different Stakeholder Groups Describe Their Feelings About Low-ability Math Groups?

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Abstract

Two significant challenges confronting math educators in the United States today are overall achievement rates that lag behind many countries, and a sizeable achievement gap between White students and students of color. Research provides some explanations for these trends and ideas for reversing them, but it is rare to hear from students themselves. This qualitative phenomenological study gave voice to middle school students enrolled in lower-level math classes. Through a series of focus groups, students shared their feelings about math, perceptions of their math abilities, and instructional practices they find helpful. This study also included parent and teacher perspectives on the math experiences of students deemed "low in math." The data revealed that students feel very negatively about their current math classes, due to classroom climate and insufficient time with teachers, and view themselves as having little potential in math. Parents find fault with the school's math program and make excuses for not being more involved. Teachers recognize that students in lower-level classes are unhappy and unproductive, which they attribute to habits and attitudes picked up from parents, elementary teachers, and society as a whole. All three groups speculated that students' experiences might improve in mixed-ability classes. Recommendations for educators include: analyzing math class groupings to see how the structure affects students' attitudes and achievement; setting conditions to make learning more successful for lower-ability students, including more time with teachers, better classroom climate, and more opportunities for success; and counseling parents on course options and ways to support math learning at home.

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I owe a special debt of gratitude to the administrators and staff of Sagepond Middle School (a pseudonym) for allowing me to conduct this study in their school. I am especially grateful to the students, parents, and math teachers who donated their time and shared their thoughts, feelings, and experiences related to math. I genuinely

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Finally, I dedicate this dissertation to my dad, Bill Kreie, who did not live to see this accomplishment, but played a very big role in helping to inspire me to make it happen.

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## Chapter I: Introduction

Mathematics education in the United States has been under the microscope for several decades. Since the emergence of Sputnik in 1957 and the ensuing space race, questions have been swirling about how to improve mathematics instruction in the United States and the math achievement of America's youth. Recent results from Trends in International Mathematics and Science Study (TIMSS) revealed discrepancies between the math skills of students in the United States and students in countries considered our economic competitors (Mullis, Martin, Foy, & Arora, 2012; Mullis, Martin, Foy, & Hooper, 2016). There are also indicators in the 2003, 2006, and 2015 results of the mathematics portion of the Program for International Student Assessment (PISA) exam that the United States lags behind more than 20 other nations in regard to the mathematical reasoning of its students (Provasnik, Gonzales, Miller & National Center for Education Statistics, 2009; OECD, 2016). Moreover, the performance of 15-year-olds from the United States on the mathematics portion of this exam is trending downward (OECD, 2016). This is cause for concern as the United States strives to maintain an economically competitive edge in a world that is becoming increasingly dependent on STEM skills (Science, Technology, Engineering and Mathematics).

Different measures have been used to illustrate the depth of the "math crisis" in this country. There are the international comparisons, K-12 achievement data, statistics on the number of students enrolled in higher-level math courses in high

school, and information on college readiness and graduates with math degrees. There is also a fair amount of research on the negative emotions and attitudes associated with math (Boling, 1991; Flores, 2007; Gutierrez, 2008; Levpuscek & Zupancic, 2009; Palmer, 2009). One can sense a degree of disenchantment with mathematics among some of America's youth. For some, the negative feelings start in primary school. For others, they are the result of a series of disappointments or failures in math extending over a period of several years. By the time they reach middle school (generally Grades 5-8), many students exhibit a decline in engagement levels and motivation to do well in math (Martin, Way, Bobis, & Anderson, 2015; Middleton & Spanias, 1999).

Not surprisingly, the negative attitudes about math are often present among middle school students who have a history of low math achievement (Boling, 1991; Choi & Chang, 2011; Lee & Shute, 2010; Newton, 2010). Many of these students are placed in low-level math courses, or the "low track," during their middle school years. Their motivation is lacking and their outlook is gloomy. They are accustomed to confusion about math concepts and repeated failure in terms of grades and standardized tests. While middle school students in the low math track represent all races/ethnicities, socio-economic levels, and language proficiencies, they disproportionally represent students of color, families living in poverty, and families who speak a language other than English at home (Alvarez & Mehan, 2006; Ballon, 2008; Boaler & Staples, 2008; Newton, 2010). In other words, if you walk into a low-level math class in a random middle school in the United States, you will likely

see a higher percentage of students of color, poor students, and English Learners than in the school as a whole.

In a confirmation of this phenomenon, Table 1.1 shows the student enrollment of the different math classes at Sagepond Middle School (a pseudonym), the site of this study. The percentage of students of color and White students varies substantially, depending on the level of the course. Standard-level Math is the lowest-level math class in each of the three grades. Table 1.1 indicates that the percentages of students of color are much higher in Standard-level Math classes than in Advanced or Double-advanced Math classes.

Table 1.1

*Percentages of Students (by Ethnicity) in Math Courses at Sagepond Middle School, 2015-16*

| Course name | Total number of students | Number and percentage of students of color (Asian/Pacific Islander, Hispanic, Black) | Number and percentage of White students |
|---|---|---|---|
| Standard-level Math 6 | 192 | 113 (59%) | 79 (41%) |
| Standard-level Math 7 | 155 | 95 (61%) | 60 (39%) |
| Standard-level Math 8 | 142 | 83 (58%) | 59 (42%) |
| | | | |
| Advanced Math 6 | 79 | 22 (28%) | 57 (72%) |
| Advanced Math 7 | 121 | 37 (31%) | 84 (69%) |
| Advanced Math 8 | 156 | 29 (19%) | 127 (81%) |
| | | | |
| Double-advanced Math 6 | 56 | 13 (23%) | 43 (77%) |
| Double-advanced Math 8 (same as HS Geometry) | 49 | 3 (6%) | 46 (94%) |

There are similar discrepancies in the percentages of students eligible for free or reduced-price lunch in the different math classes at Sagepond Middle School. Eligibility for free or reduced-price lunch is an indicator of lower family income, in other words, lower socio-economic status. Table 1.2 illustrates how the percentage of students eligible for free or reduced-price lunch is significantly higher in the Standard-level Math classes than in the Advanced or Double-advanced Math classes. As a reference point, the overall percentage of students eligible for free or reduced-price lunch at Sagepond Middle School is 37.5%. Table 1.2 indicates that the percentages of eligible students in the Standard-level classes far exceed the percentage of eligible students in the school overall.

Table 1.2

*Percentages of Students (by Free or Reduced-price Lunch Eligibility) in Math Courses at Sagepond Middle School, 2015-16*

| Course name | Total number of students | Number and percentage of students eligible for free or reduced-price lunch | Number and percentage of students *not* eligible for free or reduced-price lunch |
|---|---|---|---|
| Standard-level Math 6 | 192 | 101 (53%) | 91 (47%) |
| Standard-level Math 7 | 155 | 92 (59%) | 63 (41%) |
| Standard-level Math 8 | 142 | 87 (61%) | 55 (39%) |
| | | | |
| Advanced Math 6 | 79 | 11 (14%) | 68 (86%) |
| Advanced Math 7 | 121 | 20 (16.5%) | 101 (83.5%) |
| Advanced Math 8 | 157 | 15 (10%) | 142 (90%) |
| | | | |
| Double-advanced Math 6 | 56 | 5 (9%) | 51 (91%) |

Many schools in the United States are not providing successful, enjoyable, or

motivating experiences in math for many students. A large number of those students are students of color. This study examines the convergence of two of the most prevailing issues in education today: the lack of success in math and the racial achievement gap.

**Statement of the Problem**

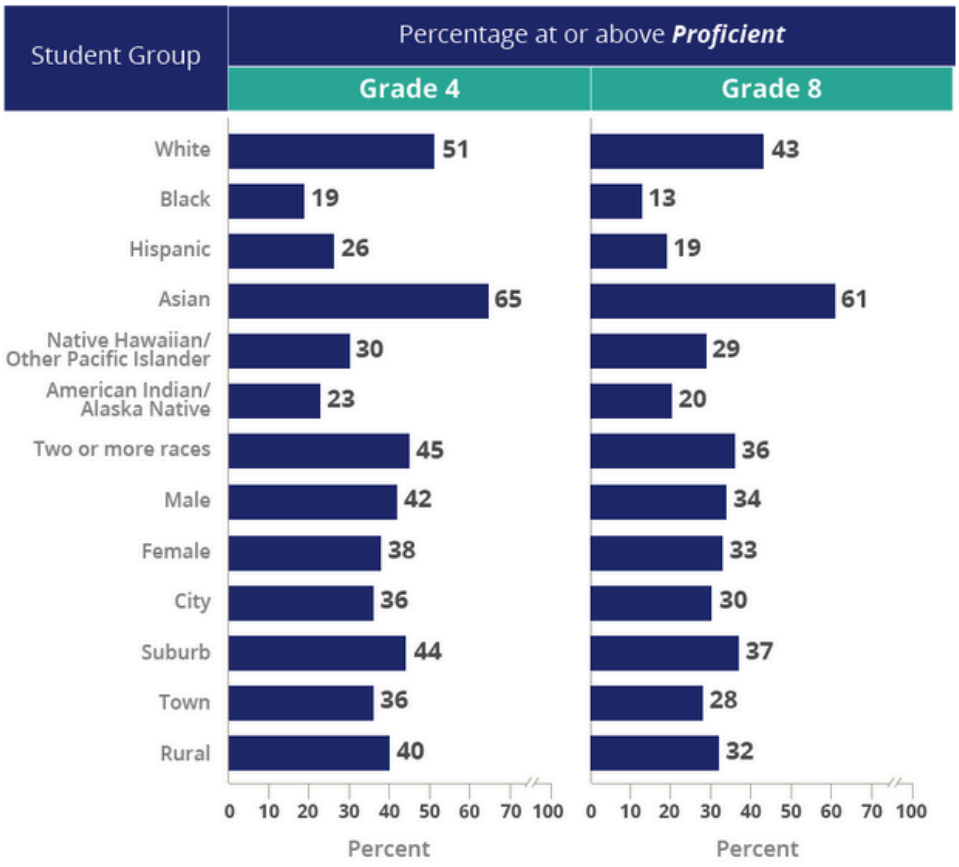
Numerous studies and statistics have shown that other industrialized countries are outpacing the United States in mathematics achievement (Aud, Wilkinson-Flicker, Kristapovich, Rathbun, Wang, Zhang, & National Center for Education Statistics, 2013; Mullis et al., 2012; OECD, 2016; Provasnik et al., 2009). Perhaps just as many studies have shown that there is a glaring disparity in math achievement between White students and students of color (Gutierrez, 2008; Madrid, 2011; National Center for Education Statistics [NCES], 2013; Paik & Walberg, 2007; Robinson, 2010; Rojas-LeBouef & Slate, 2012; Rowley & Wright, 2011). Although there are examples of schools in the United States that have succeeded in narrowing or eliminating the racial achievement gap in mathematics (Carter, 2000; Chenoweth, 2009), for many schools, the gap is persisting, even widening.

In 2002, No Child Left Behind (NCLB) became law, largely with the goal of improving national achievement levels in math and reading. NCLB required schools receiving federal funding to demonstrate the academic achievement of their students in those two disciplines. The purpose of that requirement has been to determine how well schools are meeting the achievement levels set by the standards of their particular states. One major provision of NCLB, as well as its 2015 replacement, the

Every Student Succeeds Act (ESSA), has been to disaggregate and publish assessment data by race/ethnicity, language background, poverty level, and special needs. In large part, during the past decade, those data have revealed that in many states there is a significant achievement gap in math between White students and students of color. Figures 1.1-1.4 depict those disparities both nation-wide and in the state of Minnesota.

Figure 1.1

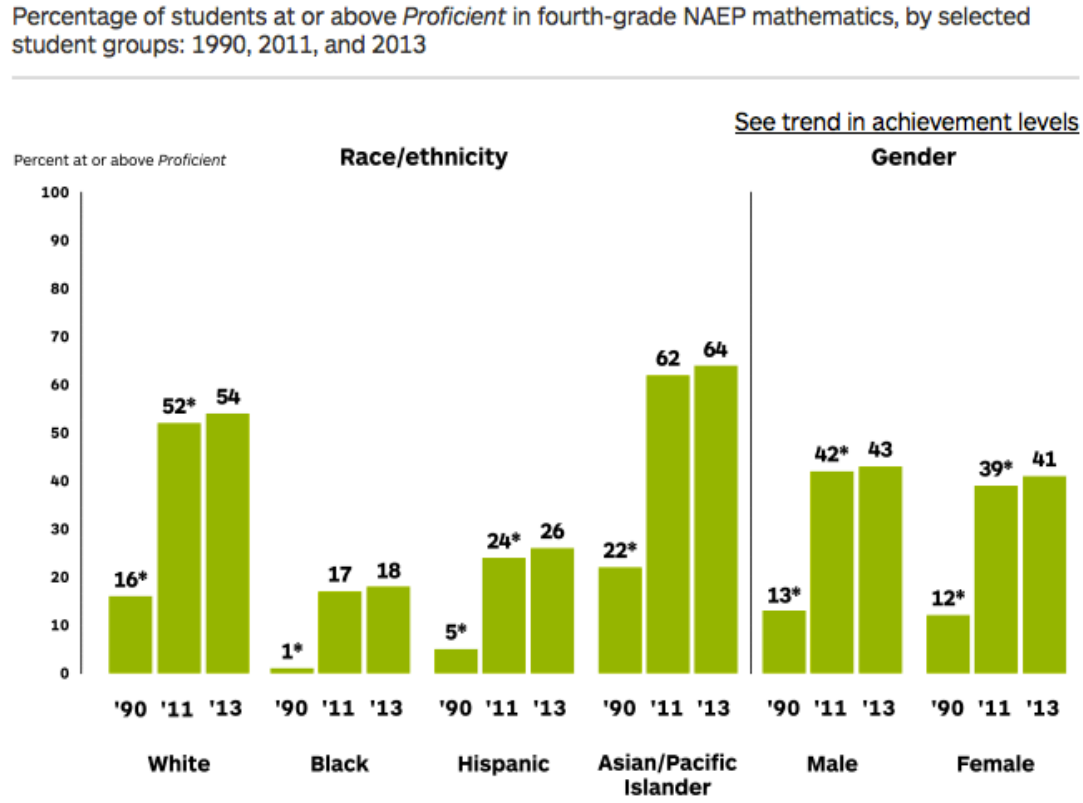
*2015 NAEP Mathematics Proficiency Rates for Selected Student Groups*




(NCES, 2015)

Figure 1.2

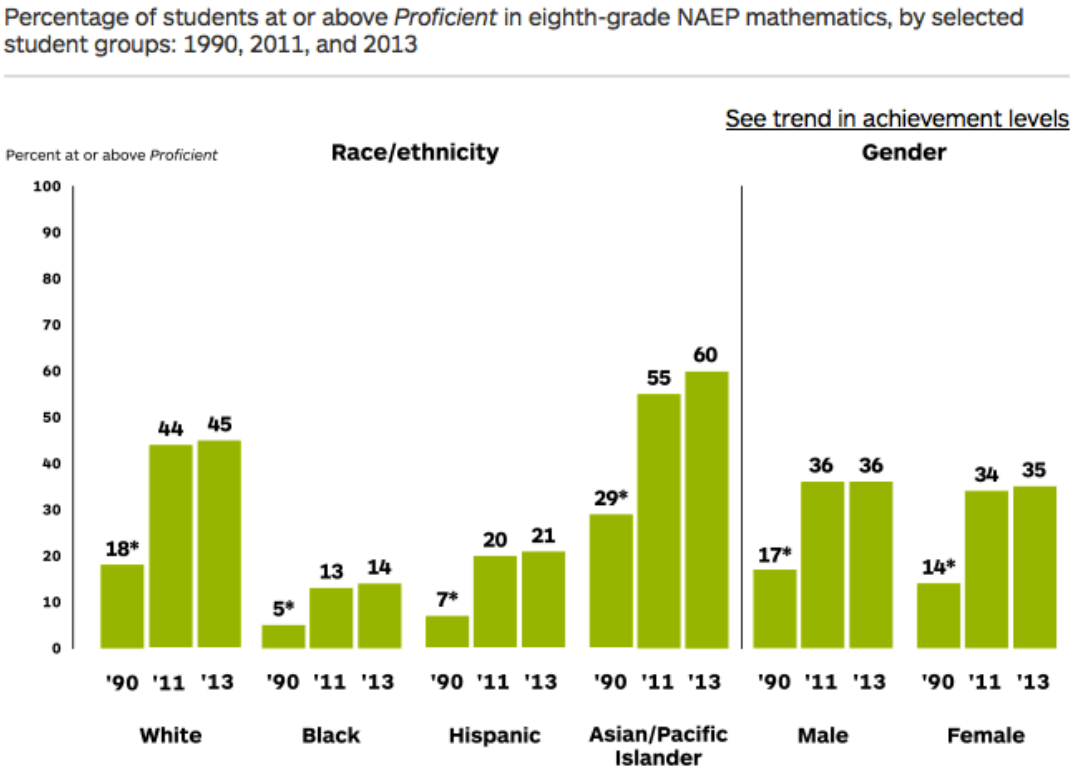
*NAEP Mathematics Proficiency Trends for U.S. Fourth Graders by Student Group*




(NCES, 2015)

Figure 1.3

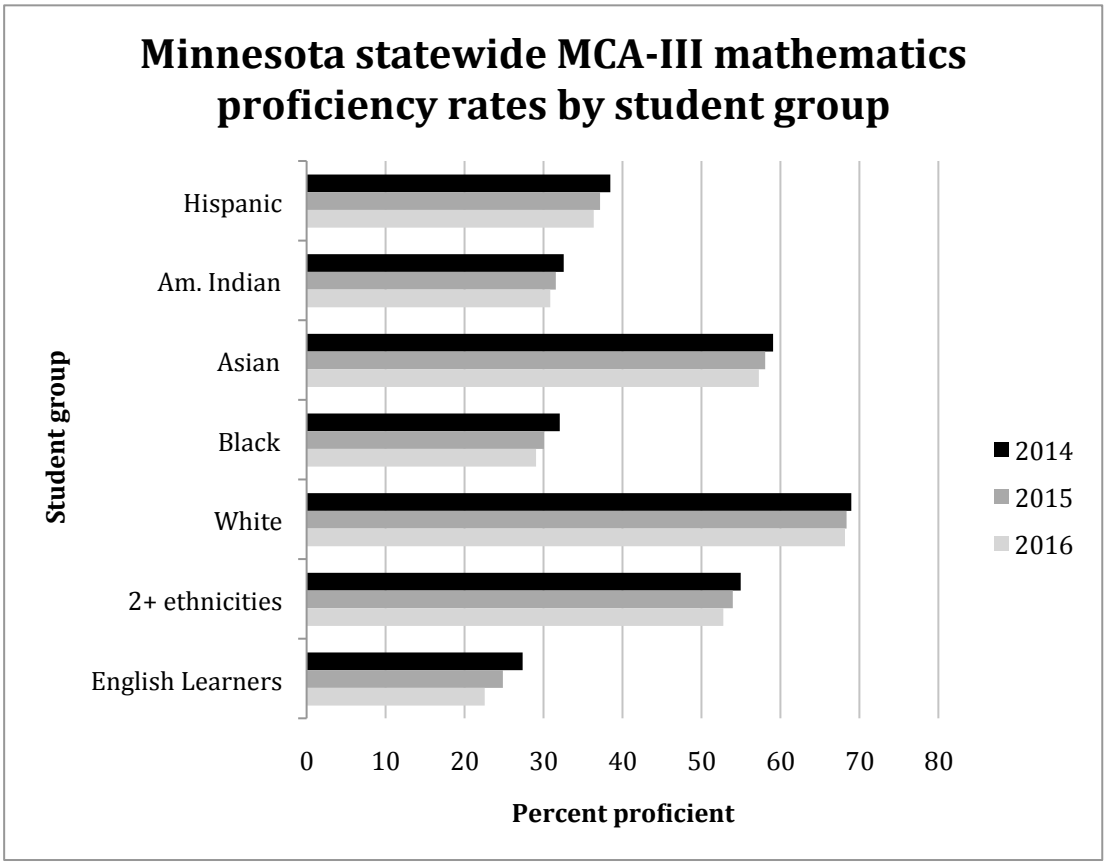
*NAEP Mathematics Proficiency Trends for U.S. Eighth Graders by Student Group*




(NCES, 2015)

Figure 1.4

*Minnesota State-wide MCA-III Mathematics Proficiency by Student Group*




(Minnesota Report Card [MRC], 2017)

Many people–including experts in the field of education, policy makers, teachers, parents, and students themselves–have characterized the racial achievement gap as a national crisis. Some have even referred to it as the civil rights issue of the current generation (Moses & Cobb, 2001). Countless school districts across the country have taken a closer look at the gaps among their students and have made achievement equity a significant part of their missions. The racial achievement gap has become the focus of numerous academic studies and textbooks, professional

development organizations, and teacher and school improvement efforts.

Yet the math achievement gap and student distaste for math continue to plague many schools. While some districts have succeeded in narrowing and even closing the math gap, others face similar or worse disparities than they did prior to NCLB. As Vigdor (2013) established, "there is still evidence that American performance on the Program for International Student Assessment (PISA) has slipped over the past decade, notwithstanding the No Child Left Behind movement" (p. 4). Educational leaders in individual school districts, despite pouring abundant resources into closing the gap and bringing an equity focus to their schools, are scratching their heads at the persistent disparities.

There are many theories offering explanations for the gap in math achievement among students of different races and ethnicities. People point to the different life experiences that all students bring into their school lives (Popham, 2006). Some have shown that low academic achievement is associated with low socio-economic status (Gutstein, 2006; Paik & Walberg, 2007). Other commonly identified reasons include level of parent involvement, lack of meaningful teacher-student relationships, language barriers, different learning styles, and discrepancies that have existed since before the students entered kindergarten (Ginsberg, 2012; Paik & Walberg; Singleton & Comer, 2013).

There are also many theories as to why so many students in the United States struggle with math, regardless of race or social class. There is the never-ending math debate between traditionalists and New Math supporters. The former have claimed

that schools in the United States have strayed too far from how math used to be taught–or should be taught. The latter have expressed a need to make math more real and less formulaic for students (Wright, 2012). Further studies blame the lack of interest in math on math phobia/anxiety, parent disengagement, lack of math understanding among elementary teachers, a long-standing emphasis on reading over math in America, and a prevailing belief that students either have the so-called math gene or they do not (Alliman-Brisset & Turner, 2010; Burns, 1998; Choi & Chang, 2011; Furner & Gonzalez-DeHass, 2011; Geist, 2010; Willis, 2010).

A common notion among some math educators and researchers is that both the math achievement gap and the student distaste for math are exacerbated by practices and scheduling structures that continue to exist in schools across the United States. Because math gaps seem to already exist when students enter kindergarten (Berliner, 2010), it is also fairly common for schools to start separating students into ability groups in math, even in the early elementary grades (Hattie & Anderman, 2013). That practice is commonly referred to as "tracking," "streaming," or "ability grouping." Opponents of tracking contend that once students are in a low track, it is very difficult for them to move up to another level (Yonezawa & Jones, 2006). These students will likely be classified as "low-group math students" for the duration of their K-12 schooling. Some research has shown that students in the low math group lack the opportunities to learn higher-level math, are presented with a "dumbed-down" version of the curriculum and standards, receive less encouragement or positive feedback from teachers, and are often taught by the least-qualified math

teachers in the school (Abedi & Herman, 2010; Flores, 2007; Peske, Haycock, & Education Trust, 2006). Furthermore, placement in the low group can trigger students to hate math, doubt their math abilities, and rule out any success in math in the future (Horn, 2006; Kelly & Carbonaro, 2012). Thus begins the internalization by students that they "don't get" or are "no good" at math; students adopt a poor attitude toward math accordingly.

Research suggests that narrowing the math achievement gap and improving students' attitudes about math go hand-in-hand (Hrabowski, 2003; Paik & Walberg, 2007; Robards, 2008; Tennison, 2007; Welner, 1999). There is speculation that a more positive attitude toward math on the part of the students will improve their motivation and effort, which will in turn improve their performance on standardized math assessments. It would therefore behoove the schools that struggle with math achievement and equity to tackle the issues of improving student attitudes about math and the math achievement gap as a singular mission. One approach is to study and adopt the strategies that have been used successfully by similar schools. Another is to get to the root of students' negative attitudes about math by hearing directly from the students themselves.

**Purpose**

The purpose of this study was to hear the voices of the students. Students who have repeatedly struggled in math and have reached a point in which math is of no importance to them rarely get an opportunity to speak. They are rarely asked about how they arrived at this stage in their education. This study featured middle school

students from the lower-level math classes at Sagepond Middle School (a pseudonym). Several of them are students of color. Some have grown up speaking a language other than English at home. Many have been assigned to the low math track since the early primary grades. Many have long doubted their abilities in math, lacked motivation to work during class or at home, and abandoned an expectation to do well on math tests.

The purpose of the current study was to hear these students' side of the story. This study focused on their experiences in school, feelings about math, and perceptions of what others expect of them. This study also examined the role of their teachers and parents, and drew comparisons among the three groups of people. Hearing about the math experience from the students' vantage point could very likely open educators' eyes as to how students see their math education. It could very likely point to some existing practices that have unwittingly driven these students to this point. Finally, it could provide some insight as to what needs to be done to turn the attitudes and results from negative to positive.

**Significance of the Study**

Moses and Cobb (2001) wrote that algebra is the civil rights issue of our time. Others have referred to the state of mathematics education in the United States as a "crisis" or an "epidemic." It is not unusual to hear well-educated adults say that they are not "math people." Students in this country are being promoted from grade to grade without ever mastering the grade-level concepts. In math especially, students fail to solidify their skills and proficiency at one grade, and are consequently taught

the same types of math problems year after year. Many experts consider good math skills key to graduation, college admission, and certain career opportunities, as well as very good predictors of success in higher education. Some have termed higher-level math courses in high school as the "gatekeepers" to college (Rech & Harrington, 2000; Stone, 1998). The fact that only certain students attain those skills, or have access to those courses, is viewed by many as cause for alarm (Ballon, 2008; Boaler & Staples, 2008).

Educators need to face this national problem head-on. With respect to math, certain children are being left behind and many are giving up on math at an all-too-early age. It is significant that the United States address this issue, as peer nations are advancing beyond us and these same students will someday compete with highly-skilled workers from all over the world (Acker, 2007; Miller & Slocombe, 2012; Roman, 2009). There is a need to identify not only the sources that lead students and schools down this path, but also some concrete, realistic, immediate actions that can be taken to change course. Unless the United States can find a way to bridge the gap, there is a risk of having fewer students attain proficiency or develop the necessary math skills to gain access to college and STEM careers.

Teachers and school leaders need more insight regarding the experiences of lower-achieving students in math. Even though education policy has shifted a bit with each new presidential administration and congress, states continue to publish results of standardized tests in math and reading. Each year, schools and districts anxiously await their test results in the hope that some difference has been made since

the last go-around. Each year, educators come face to face with assessment data and must plan new strategies for the following year. It should be of interest to everyone involved to know some of the background that has brought the educational system to this point.

For educators who are looking for new strategies, this study is extremely important. Throughout the years, there have been many suggested strategies for increasing math interest and achievement of middle level students. There have been studies showing varying degrees of success of some approaches to teaching math (Rowan-Kenyon, Swan, & Creager, 2012; Woolley, Strutchens, Gilbert, & Martin, 2010). However, there have been very few studies depicting the math problem in students' own words. This study is significant because it gives us a glimpse into why students believe they have reached such a low point in math.

Finally, this study is significant because it goes straight to the heart of the issue: the student. Teaching strategies and building initiatives surrounding math come and go. They are implemented in distinct ways and with varying degrees of success across the country. Sometimes the process of implementing a new program gets in the way of actually helping students. Other times, programs cause adults to point fingers and blame factors beyond the control of the school. This study proposes that educators stop making excuses and start looking at the issue of low math achievement through their students' eyes.

**Definition of Terms**

Connected Mathematics Project (CMP): The math textbook series being used for

Grades 6-8 at Sagepond Middle School at the time of this study.

English Language Learner (ELL or EL): Student learning English as a second or third language, whose mother tongue is not English, but is taught in English at school.

Gifted and Talented (GT): Refers to the program for advanced learners at Sagepond Middle School or the students who qualify for that program.

Individualized Education Program (IEP): A document that describes the goals, needs, and educational services provided for students who qualify for Special Education.

National Assessment of Educational Progress (NAEP): A test administered nationally in a variety of subject areas to gauge the achievement of students in the United States (Aud et al., 2013).

National Council of Teachers of Mathematics (NCTM): An organization of mathematics educators founded in 1920 in the United States.

No Child Left Behind (NCLB): The Elementary and Secondary Education Act of 2001 (Bunch, 2011).

Organization for Economic Co-operation and Development (OECD): The international organization that administers the Program for International Student Assessment exam.

Program for International Student Assessment (PISA): An international assessment measuring the reading, mathematics, and science literacy of 15-year-old students; results are used to make international comparisons (Aud et al., 2013).

Response to Intervention (RTI): Refers to the Tier II intervention block at Sagepond Middle School; an hour-long course in which qualifying students are re-taught

concepts they are currently learning in math and reading.

Science, Technology, Engineering, and Mathematics (STEM): Academic courses and activities that have the purpose of enhancing students' skills, opportunities, and interests in the subjects/areas of science, technology, engineering, and mathematics (Bybee, 2007).

Take a Break (TAB): A classroom management practice used at Sagepond Middle School in which students are directed to sit apart from the rest of the class and contemplate their behavior until they are prepared to rejoin the class and focus on their learning.

Trends in International Mathematics and Science Study (TIMSS): A test of mathematics and science administered internationally to students in $4^{th}$, $8^{th}$, and $12^{th}$ (finishing) grades; results are used to make international comparisons (Aud et al., 2013).

## Chapter II: Review of the Literature

### Introduction

The literature pertaining to this topic covers a range of subtopics. The subtopics include the math "crisis" in the United States, the response of the mathematics community to events of history, the math achievement gap, common school and teacher practices, family influences, effects of school and teacher practices on students, and key steps for achieving progress in mathematics education.

### The Math Crisis (History)

On October 4, 1957, the Soviet Union launched the artificial satellite Sputnik into space. By some accounts, the American people were caught off-guard and the federal government reacted immediately by enacting the National Defense Education Act (NDEA) of 1958 (Jolly, 2009). NDEA included increased funding aimed at completely reforming public education in the United States, especially mathematics and science education. Alongside the new law came an onslaught of criticism about the educational system within the United States. Much of the criticism and funding was targeted to areas now referred to as STEM education: science, technology, engineering, and mathematics (Jolly, 2009).

Researchers have pointed to the Sputnik era as not only the beginning of modern school reform in the United States, but also as the point at which many began to label the nation's mathematics and science education as inadequate (Bybee, 2007; Johanningmeier, 2010; Jolly, 2009; Steeves, Bernhardt, Burns, & Lombard, 2009).

The years following Sputnik witnessed various waves of education reform, which mostly fell short of their goals (Bunting, 1999).

In 1983, the United States Department of Education published a report titled *A Nation at Risk* (ANAR), which again drew attention to the performance of America's schools and sparked new calls to action in education reform (Bunting, 1999; Johanningmeier, 2010). Speculating that the United States still lagged behind other nations academically and faced stiff economic competition from countries such as Japan, ANAR included demands for higher academic standards that would provide American students with the skills necessary to compete in the new Global Economy (Johanningmeier). ANAR helped initiate a common, bipartisan notion in the United States that "most of our nation's problems can be blamed on our school system" (Meier & Harman, 2008, p. 79). Again, many of the shortcomings were identified to be in the areas of science, technology, engineering, and mathematics (Bracey, 2008; Meier & Harman).

In subsequent years, Americans were exposed to news reports that the math and science performance of United States students was trailing that of many of their international peers in measurements such as the TIMMS, PISA, and college completion data (Schmidt, 2012). The next significant educational reform to hit the country was the 2001 Elementary and Secondary Education Act, more commonly known as No Child Left Behind, or NCLB (Meier & Harman, 2008). NCLB required states to set high-level academic standards on which all students could be measured. In addition, NCLB established accountability provisions that would identify low-

performing schools and take action to give students alternative schooling options, require those schools to fund tutoring programs, transform the structure and programming of those schools, replace school administration and teaching staff, or close the school altogether (Maleyko & Gawlik, 2011). NCLB also drew attention to a new aspect of the state of education in America: the achievement gap. Student performance on state math and reading tests was required to be disaggregated by demographic groups, including race/ethnicity, socio-economic status, English language proficiency, and Special Education qualifications. These accountability provisions were intended to close the achievement gap "between high and low achieving students and especially the achievement gaps between minority and non-minority students along with the advantaged and disadvantaged students" (Maleyko & Gawlik, p. 600).

The accountability requirements of NCLB again put the shortcomings of math education in the United States directly in the spotlight. President Obama, in the first year of his presidency, repeated the call for more rigorous reforms of education, especially in the STEM fields (Permuth & Dalzell, 2013). That same year, state leaders and governors from 48 states collaborated to develop the Common Core State Standards in Mathematics and English Language Arts (Common Core State Standards Initiative [CCSSI], 2015). Since then, some states have come together to develop common standardized assessments to measure achievement of the Common Core State Standards. In 2015, President Obama signed into law the Every Student Succeeds Act (ESSA), which replaced NCLB and reauthorized the Elementary and

Secondary Education Act (ESEA) of 1965. ESSA continues to require adherence to high academic standards and many of the same accountability measures as were required by NCLB (U.S. Department of Education, 2017). In 2017, under another new presidential administration, it is unclear which direction the country will take with regard to ESSA. Still, people across the country continue to deliberate the pros and cons of the Common Core State Standards, state proficiency test results are publicly scrutinized, and achievement gaps are compared from school district to school district, and from state to state. Educators and policymakers closely examine the results of such international and national tests as the TIMMS, PISA, and The National Assessment of Educational Progress (NAEP). Recent TIMSS results showed that the math scores of 4$^{th}$ graders in the United States increased steadily between 1995 and 2011, but declined a bit between 2011 and 2015. The TIMMS results for 8$^{th}$ graders in the United States showed little change between 1999 and 2011, but in 2015 there was a marked uptick. In both age groups, students from the United States continued to be outperformed by their peers in Hong Kong, Japan, Singapore, The Republic of Korea, The Russian Federation, and Chinese Taipei (Mullis, Martin, Foy, & Hooper, 2016; Provasnik, Kastberg, Ferraro, Lemanski, Roey, Jenkins, & Westat, 2012). On each of the most recent administrations of the PISA, which assesses the ability of 15-year-olds to apply mathematical concepts and skills to real-world tasks, more than 20 countries outperformed the United States (OECD, 2016; Provasnik et al., 2009).

Koretz (2009) emphasized viewing such international results with some

degree of skepticism. He pointed out that while western countries on the whole did worse than East-Asian countries, the public should focus more on comparisons among countries with similar demographics, sizes, and economies. He also contended that multiple data points are needed to make any sweeping conclusions and that such studies, done before students even finish their schooling, do not tell the whole story.

**The Response of the Mathematics Community to Events in History**

The historical events of the past century and the accompanying cries for education reform have not been lost on the mathematics community. In fact, in many instances, when the United States has shown signs of falling behind on international measurements, mathematics scholars and educators have responded with adjustments to what is considered standard mathematics curriculum. As Permuth and Dalzell (2013) pointed out, events of history have strongly influenced the standards and practices of mathematics in this country: "Methodology for teaching mathematics responds to the directions of social change, economic pressure, and scientific and nonscientific progress because mathematics is central to a nation's standing and power" (p. 236).

In the wake of World War II, the National Council of Teachers of Mathematics (NCTM), an organization of mathematics educators founded in 1920, issued its Post-War Commission Report (Permuth & Dalzell, 2013). The Commission called attention to some of the failings of the United States military during the war and emphasized the importance of mathematical and technical skills at

times of international conflict. The report provided recommendations regarding mathematics education, with the end goal of increasing America's economic and military prowess in the world (Herrera & Owens, 2001). What followed were efforts by organizations such as the University of Illinois Committee on School Mathematics (UICSM), the College Entrance Examination Board (CEEB), and the National Science Foundation (NSF) to provide curriculum materials, guidance, and new college requirements that would improve the content and instruction of mathematics courses at primarily the junior high and high school levels. Their efforts were aimed mostly at college-bound students (Herrera & Owens, 2001).

The launching of Sputnik by the Soviet Union in 1957 and the creation of the NDEA in the United States in 1958 triggered new stages of reform in mathematics education. More government assistance was given to educational programs in mathematics, science, and foreign languages, including elementary, secondary, and post-secondary schools (Permuth & Dalzell, 2013). The content of mathematics classes at all levels shifted from the procedural to the conceptual and abstract. At this time, mathematics experts believed that mathematics instruction needed to include creativity, innovation, inquiry, and problem solving. This movement was referred to by many as the "New Math" movement (Herrera & Owens, 2001).

There was little consensus among the mathematics community regarding the changes brought into classrooms during the New Math movement (Herrera & Owens, 2001). Some mathematicians–as well as many parents of school-aged children–objected to this new style of learning in which procedural skills were de-emphasized.

Predictably, the pendulum swung back again in the 1970s, as mathematics education returned to its more traditional form: computation, procedures, and teacher-led lessons (Herrera & Owens, 2001).

It was at this point that NCTM began to act on what it saw as its obligation: to voice its expert opinions and advise the educational community on what a solid mathematics education must include (Herrera & Owens, 2001). They published *An Agenda for Action* in 1980, outlining reform strategies for the next ten years, including more problem solving and real-world skills (Herrera & Owens, 2001; Massell, 1994; Tate, 1996). In 1989, in part as a response to the 1983 publication of *A Nation at Risk*, NCTM produced *Curriculum and Evaluation Standards for School Mathematics*, which in effect launched the standards-based movement in mathematics education (Confrey, Strutchens, Battista, Schwan Smith, King, Sutton, Boerst, & Reed, 2008; Herrera & Owens, 2001; Massell, 1994).

The NCTM Standards embodied the vision of mathematicians and leaders in math education to provide high-quality mathematics curriculum to all children (Burrill, 1997). These standards were a response to not only the seemingly inadequate preparation of students in the United States for an ever-changing world, but also to concerns that across the country students did not have equal access to essential, academically-robust mathematics. The standards provided an outline of content to be taught at each grade level, as well as a framework for alignment and implementation in the classroom (Burrill, 1997). They emphasized conceptual knowledge, connections to real-world problems, integration of mathematical topics,

reasoning and proof, mathematical discussions, and higher-order thinking (Herrera & Owens, 2001).

The process NCTM followed to create and publish its standards was an arduous one. As early as 1986, they established research and writing groups, which included members from many stakeholder groups: math teachers, classroom assistants, teacher educators, math scholars and researchers, and experts in child and adolescent development (Massell, 1994). Steps taken during that 3-year period included extensive literature reviews, writing groups of different grade bands, several drafts of the standards document, review and revisions by mathematics and science scholars, focus groups with different stakeholders, including parents, administrators, district leaders, and representatives of business and industry, and collaboration to gain the endorsements of other professional education organizations (Massell, 1994).

The NCTM *Curriculum and Evaluation Standards for School Mathematics* document was followed up by the publication of the *Professional Standards for Teaching Mathematics* in 1991 and the *Assessment Standards for School Mathematics* in 1995 (Burrill, 1997). Other organizations followed suit with the publication of resources aligned to the NCTM standards. The most notable of these organizations was the National Science Foundation, which produced curriculum materials focusing on real-world problems and applications (Confrey et al., 2008). In 2000, NCTM published an updated version of all its standards in a document titled *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics [NCTM], n.d.). That version reflects information from research from the previous ten

years, adaptations for advancements in technology, additional grade bands and specific recommendations for pre-school students, more details on vertical alignment, and a new standard on mathematical representation, among other things (NCTM, 2002).

When the federal government required all states to set high-level academic standards in 2001 (with the passage of NCLB), many states wrote math standards that aligned to the NCTM *Principles and Standards of Mathematics* (Herrera & Owens, 2001). In addition, many districts across the country started implementing math curricula associated with the NSF, which were reportedly based on the NCTM standards (Confrey et al., 2008). However, because states interpreted the standards and implemented the curriculum differently, proficiency levels and student achievement varied greatly from one state to another. Tensions began to rise between federal and state governments regarding the specific content that should be taught in schools and measured on state tests (Permuth & Dalzell, 2013). Those tensions led to the development of the Common Core State Standards in Mathematics and English Language Arts.

According to Dacey and Polly (2012), the Common Core State Standards for Mathematics (CCSSM) were built upon NCTM's *Principles and Standards of Mathematics* of 2000, as well as NCTM's *Curriculum Focal Points*, published in 2006. They are designed to provide students with content that is rigorous and reflective of real-world problems requiring mathematical solutions. They are also aimed at preparing all students for college and/or career after graduation from high

school (Dacey & Polly, 2012). Similar to the NCTM standards, the process for development of the CCSSM was arduous and called on the expertise and input of many professional organizations and individual stakeholders (CCSSI, 2015). It relied on scholarly research, results of international test measures, and comparisons to the standards of highly-proficient states, as well as the input of teachers and teacher organizations including the National Education Association, American Federation of Teachers, and National Council of Teachers of Mathematics. A central tenet of the CCSSM is to provide students with a solid foundation in numeracy and conceptual knowledge and reasoning skills that can be applied to "real-world issues and challenges" (CCSSI, 2015, p. 6).

It should be noted that the state of Minnesota, where this study was conducted, is one of the few states that has not adopted the Common Core State Standards in Mathematics. The state's reason for not adopting the CCSS in mathematics is that Minnesota had just developed its own set of academic standards in 2007, which were not due for revision for several years (Minnesota Department of Education [MDE], 2014). It remains to be seen whether the CCSSM will take the place of the current Minnesota math standards in the future. Minnesota's academic standards are developed by committees made up of teachers from all grades, content areas, and regions of the state, parents, administrators, schools board members, experts in the academic field, and community and business leaders. The steps the committee follows include reviewing public and professional feedback, making comparisons to standards of other states and countries, studying scholarly research

and achievement data from previous years, conducting town hall meetings across the state, and submitting several drafts to expert and specialized review teams (MDE, 2014). Mathematics standards that are contemporary, include the study of algebraic patterns from an early age, provide a strong foundation in number and operations, integrate different branches of mathematics, like geometry, discrete math, and data and statistics, and require students to apply critical reasoning and problem-solving skills to unknown situations are a critical component for preparing Minnesota students to be successful future citizens who will support Minnesota in a competitive global economy (SciMathMN, 2007).

Across the United States, the rigor of the mathematics curriculum and instruction in primary and secondary educational settings has increased in response to the demands of history and society. In every state, students are required to take mathematics courses and demonstrate proficiency based on a set of mathematics standards. As detailed above, math standards have typically undergone years of research, analysis, and revisions, and reflect the input of mathematicians, educators, and countless stakeholders. There is consensus among the developers of all three sets of standards described in this study that mathematics education needs to provide a strong foundation in computation and number sense, as well as opportunities to build problem-solving skills that can be applied to real-world situations. The thorough and lengthy processes for developing those standards, in addition to the endorsements of professional education organizations such as NCTM, SciMathMN, and the National Science Foundation, give significant credibility to the relevance and importance of

what is now being taught at each grade level in most schools across the United States.

**The Math Achievement Gap**

The achievement gap in math has garnered a great deal of attention and has been the focus of myriad studies in recent years (Flores, 2007; Fry, 2007; Guglielmi, 2012; Madrid, 2011; Rojas-LeBouef & Slate, 2012; Wildhagen, 2012). While often thought of as the Black-White gap, there is really more to it than that. It is necessary to disaggregate the data by racial category in order to fully understand the scope and meaning of achievement disparities.

Results of the 2015 TIMSS are depicted in Figures 2.1 and 2.2. Some of the key findings include:

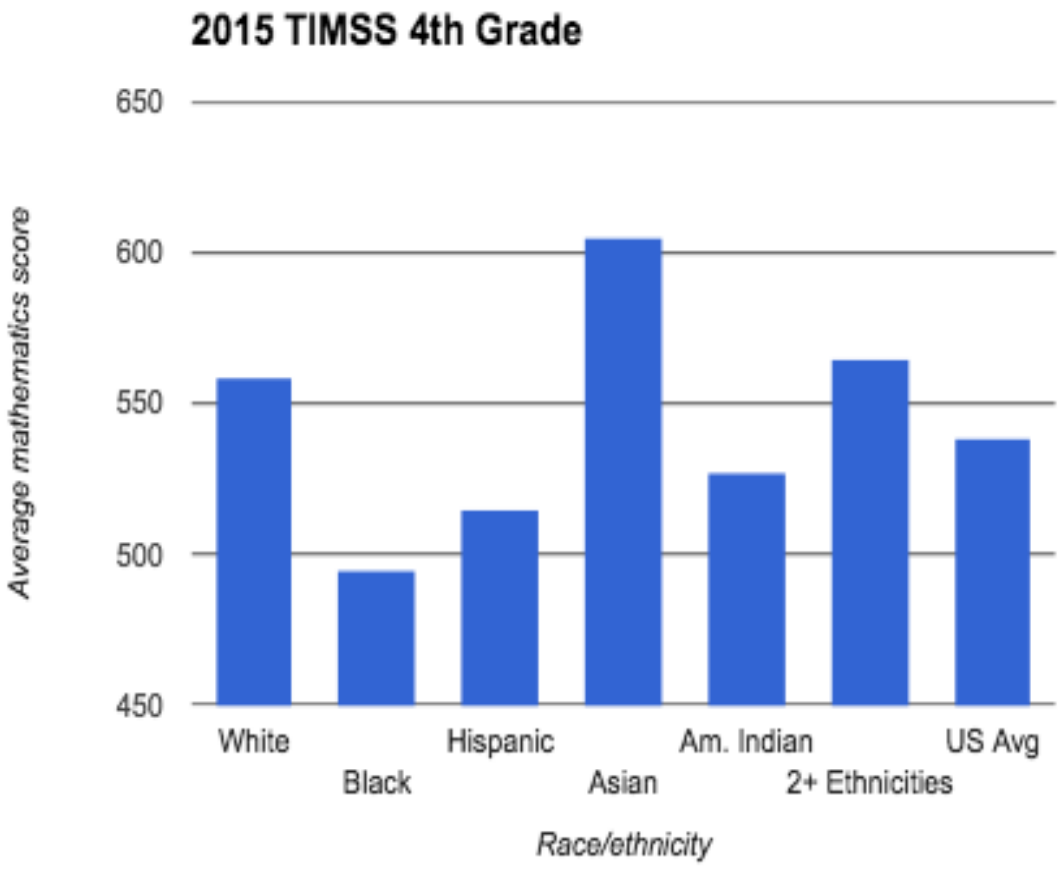
- U.S. 4th grade students' average score was lower than the average scores of 10 other school systems from around the world, but higher than the average scores of 34 other school systems from around the world.
- U.S. 8th grade students' average score was lower than the average scores of 8 other school systems from around the world, but higher than the average scores of 24 other school systems from around the world.
- U.S. Hispanic, White, Asian and multiracial students in 4th grade scored above the TIMSS scale (international) average, but Black students were below the TIMSS scale average.
- U.S. White, Asian, and multiracial students in 4th grade were above the U.S. national average, whereas U.S. Black and Hispanic students were below.
- At the 8th grade level, U.S. White, Asian, and multiracial students were above

the TIMSS scale average and U.S. national average.

- U.S. Black and Hispanic 8th graders scored lower than the TIMSS scale average and the U.S. national average (Provasnik, Malley, Stephens, Landeros, Perkins, & Tang, 2016).

Figure 2.1

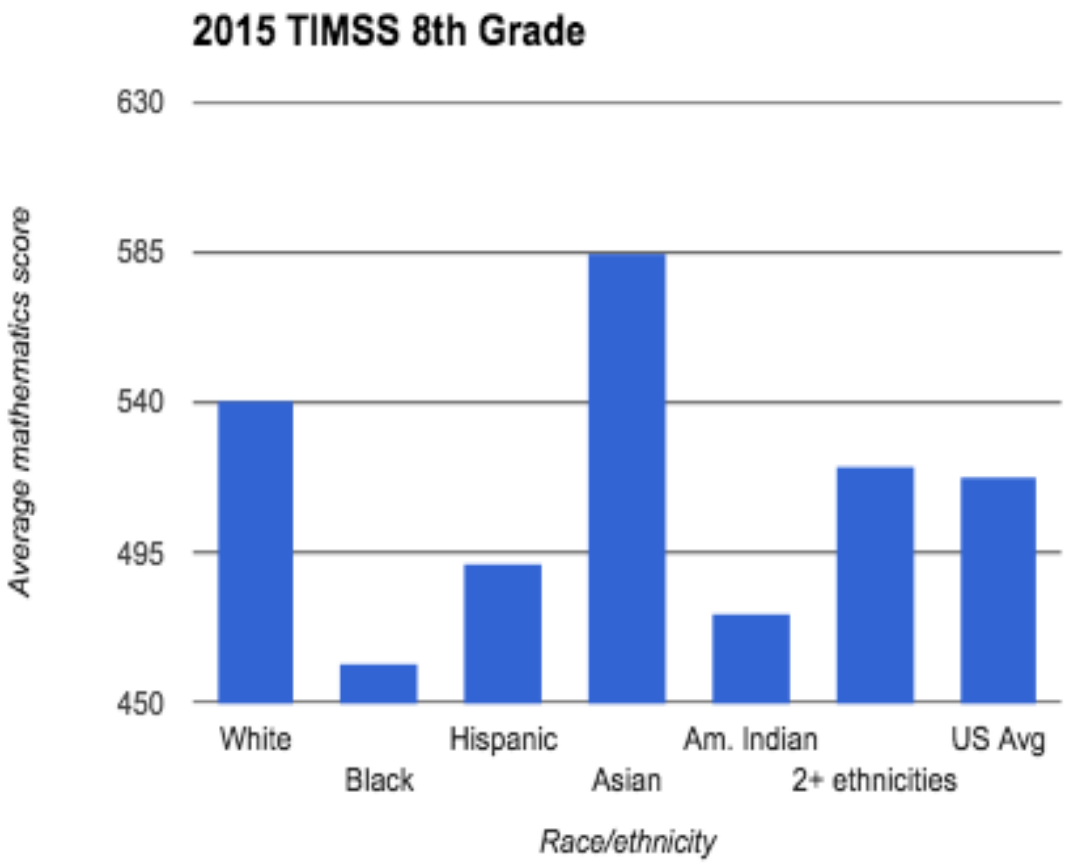
*Average Math Scores of U.S. 4th Graders by Race/Ethnicity on the 2015 TIMSS*




(Provasnik et al., 2016)

Figure 2.2

*Average Math Scores of U.S. 8th Graders by Race/Ethnicity on the 2015 TIMSS*




(Provasnik et al., 2016)

The 2015 mathematics proficiency rates of the NAEP, which measures students' math abilities in five different content areas (number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and algebra and functions), continue to show significant disparities among different student groups (NCES, 2015). At closer inspection of the 2015 NAEP results (Figure 1.1), one can see how the math scores break down by ethnicity. At the 4th grade level, the percent of students scoring at or above proficient was 65% for Asian students, 51% for White students, 30% for Native Hawaiian/Other Pacific Islanders, 26% for Hispanic students, 23% for American Indian/Alaska Natives, and 19% for Black students. The 2015 NAEP math results followed a similar pattern at the 8th grade level. The percent of 8th grade students scoring at or above proficient was 61% for Asian students, 43% for White students, 29% for Native Hawaiian/Other Pacific Islanders, 20% for American Indians/Alaskan Natives, 19% for Hispanic students, and 13% for Black students.

While some may take solace in the fact that proficiencies in general are inching upwards and disparities are shrinking slightly, it is impossible to deny that the gaps are still significant. Flores (2007) wrote that the gap between African-American and Latino students, as compared to their White peers, has not been closing at a fast enough pace. He contended that the United States must try framing the discussion on the achievement gap differently, in order to get to the root of the issue. In their specific focus on Latino, Black, and Asian students in the United States, Paik and Walberg (2007) asserted that the achievement gap between minority and non-

minority groups in the United States persists and is in danger of widening. In addition, there are growing gaps even within certain minority groups. Paik and Walberg (2007) pointed to the urgent need for the country to address these gaps, because the numbers in those minority populations are growing steadily. Abedi and Herman (2010) wrote that assessments have suggested that English Language Learners (ELLs) are indeed being left behind in school districts across the country. The unique needs and challenges of ELLs, who are faced with the task of mastering difficult content in a language that is not their mother tongue, put them at an immediate disadvantage.

Speculation abounds as to what has caused the achievement gap and what may be the key to eliminating it. Some studies have identified the root of the problem to be as much a matter of economics as race, highlighting measurable disparities in mathematics proficiency between students of different socio-economic statuses (Crook & Evans, 2014; Dahl & Lochner, 2012; Evans & Rosenbaum, 2008; Vanneman, Hamilton, Anderson, Rahman, & National Center for Education Statistics, 2009). These discrepancies are often referred to as the "poverty gap" (Gradin, 2012) or the "income achievement gap" (Crook & Evans, 2014). Flores (2007) characterized it more as an "opportunity gap," because minority students have less access to difficult math courses, are often exposed to the least-qualified math instructors in a school system, are enrolled in schools that receive less funding, and are the recipients of low teacher expectations. There is also a correlation between maternal education and student achievement. Magnuson (2007) found that when

young mothers with lower levels of education received additional schooling and were able to improve learning environments at home, the achievement levels of their children increased. Madrid (2011) described a decades-long struggle for Latino students nationwide and in California to make any significant gains in relation to White students, in both math and reading. Acknowledging the complexity of this issue, Madrid attributed part of the problem to the negative perceptions that teachers have of Latino students and families, and to the ineffective instructional practices employed by the same teachers. Alliman-Brissett and Turner (2010) suggested that racism plays a role in the gap.

According to Alliman-Brissett and Turner (2010), the racism that adolescents experience or perceive in school influences the courses they select and consequently the career paths they pursue after high school. Alliman-Brissett and Turner suggested that racism is not only prevalent in schools across the country, but also that it negatively impacts adolescent African-American students in terms of their self-efficacy in math, expectations for positive outcomes in math class, and interest level in pursuing a profession in math or science. When students sense a barrier to their own success in math, their interest levels wane (2010). This underscores the importance of early interventions in math, as well as purposeful instruction and teacher-student interactions that communicate high levels of confidence in students' ability to succeed in math. "Helping African-American middle school students see themselves as competent to succeed in math can put them in a more advantageous position to consider math-based careers and prepare themselves to pursue math and

science throughout their educational and career endeavors" (Alliman-Brissett & Turner, p. 200).

**School Practices**

Despite the abundance of research showing the detrimental effect of the school practice of tracking students (Alvarez & Mehan, 2006; Ballon, 2008; Oakes & Lipton, 1992), many high schools, middle schools, and even elementary schools continue to use some form of tracking or ability grouping in mathematics and reading. That means that students who have scored high on standardized tests and/or performed well in prior math classes are grouped together in one math class. Similarly, students who scored low on standardized tests and/or performed poorly in prior math classes are grouped together in another math class. There may be just two tracks–high and low, or there could be several.

Tracking means separating students into so-called homogeneous ability groups. What often occurs is that the ability grouping separates students in terms of ethnicity and socio-economic status (Newton, 2010). Opponents of tracking claim that putting students into high and low tracks is essentially a way to segregate schools that were long ago desegregated (Oakes & Lipton, 1992). DeSena and Ansalone (2009) asserted that such grouping is a reinforcement of societal inequalities and could be one of the factors contributing to disparities in achievement.

Newton (2010) exposed many problematic issues associated with tracking. In one study that followed students' math performance and achievement from seventh grade through high school, Newton demonstrated that students starting seventh grade

in the high math group had faster rates of growth in math and higher math achievement at the end of high school than the students who started seventh grade in the low math group. Newton also noted that high school math achievement scores of students in the low math group were even lower in schools with higher percentages of minority students. The discrepancy between high and low only widened as students moved up in grades. Newton wrote:

> Given that low-income students and students of minority background tend to be placed in lower tracks than their White and middle-class counterparts, these findings have important implications. The findings not only point to the detrimental effect of practices such as early tracking of children into less challenging curricular paths who are vulnerable to such practices, but also reinforce the notion that all children could potentially benefit from a challenging curricular pathway regardless of where they start in Grade 7. (p. 1088)

Although schools may not explicitly state that they employ tracking or ability grouping in math, most students know very well in which track they have been placed, and assess their own mathematical abilities in accordance with that track. In a study conducted by Swinton, Kurtz-Costes, Rowley, and Okeke-Adeyanju (2011), African-American students from middle to high school commonly attributed their failures in math to a lack of ability in that subject, rather than just bad luck or lack of effort. Dweck (2008) described how students with fixed mindsets tend to see failures as indicators of their lack of ability, competence, or worth, and use them as an excuse

to not put forth more effort. Swinton et al. (2011) found that when students attribute failure to low ability they likely give up all hope of ever finding success in math. Indeed, the students with the most negative attributions about math were found to be less engaged in math three years later. Furthermore, negative attributions became more prevalent in boys than girls during the high school years.

Students have also condemned the use of tracking in subjects like math and reading. Yonezawa and Jones (2006) held focus groups with students of 12 different schools that were in the process of detracking. Some of them believed that the tracking system existed because of deep cultural, structural, and political reasons, and that it promoted a sense of meritocracy in their schools. Others stated that the decisions about class placement were a mystery to them. Many felt that those decisions had been unfair. They felt like once they were in a track, they could not advance to a higher level. Some students claimed that the high-ability classes had the most skilled teachers, and that in general, teachers gave higher math students more attention and guidance than lower students. The effect of this, in their opinion, was a widening achievement gap. Finally, students pointed out that teachers communicated higher expectations to the high students when they should have held high expectations for all students in all levels.

An issue plaguing most tracking programs is what some have termed the "Opportunity Gap." The ramifications of tracking extend beyond simply separating students by ability. In many cases, the different tracks of students are not even exposed to the same math concepts (Useem, 1992). Stone (1998) found that many

high-level math classes were not accessible to certain students, because they had spent year after year in the lower-level or remedial math classes. She asserted that since upper-level math courses are often the "gateway" to post-secondary education, denying certain students the opportunity to reach that gateway essentially determines who goes to college and consequently who enters certain professions.

According to Alvarez and Mehan (2006), students in the low math tracks are commonly cheated of such things as cognitively demanding tasks, higher-order problem solving, critical thinking, and effective communication strategies. Instead, the low-level students are given low-level rote instruction and are drilled on math facts, year after year. Walker (2007) discovered that in many schools with high minority populations, advanced math classes are not even offered. It was common for teachers to reject certain math curricula because their students were allegedly not ready.

To compound the issue, basic-level math curricula may not come close to meeting students' needs. It may, in fact, neglect to expose them to the state standards of their particular grade level (Tennison, 2007), which is devastating at state testing time. As Tennison wrote, "No student in high school should be doomed to two years of arithmetic with little opportunity to do anything substantial" (p. 31). According to Ramentol (2011), it is up to teachers to make sure students are given every opportunity for success.

As more schools have decided to eliminate or reduce tracking, research has emerged detailing some of their results. Boaler and Staples (2008) described the

experiences of an urban high school in California in which math classes were not organized by ability. All classes had a mixture of ability groups. Boaler and Staples reported several measures of success at that school that were not witnessed at two comparative high schools which still organized classes by ability. Those measures included higher increases in student achievement, students' reported enjoyment of math, students' pursuit of higher-level math courses in the future, and a reduction of achievement disparities among ethnic groups. Alvarez and Mehan (2006) reported similar results from a diverse high school in San Diego, in which all students-regardless of ability level-were enrolled in the same college-preparatory courses. Corbett Burris, Heubert, and Levin (2006) found that the heterogeneous grouping of students in accelerated math courses at a particular middle school increased the performance and participation rates of those students in high school Advanced Placement math courses.

**Teacher Practices**

While school practices and structures play a significant role in the academic and social learning of adolescents, one cannot overstate the role of the teacher. Teachers can compensate for faulty programs. Conversely, ineffective teachers can hinder the otherwise successful work of a school system.

Teachers influence students in immeasurable ways. In the context of middle school mathematics, students are more motivated and obtain higher grades if their teachers attend to their needs for relationship and competence, hold and communicate high expectations, provide academic help, and persist until a student reaches a level

of understanding (Levpuscek & Zupancic, 2009; Woolley, Strutchens, Gilbert, & Martin, 2010). It is also crucial that teachers acknowledge students for their successes and hard work. All of these teacher practices can be difference-makers in a student's math self-efficacy, especially for students who have felt neglected, uninspired, and insecure about their abilities in the past (Woolley et al.).

In contrast, when students sense that their teachers are not supportive, they tend to lose interest and disengage from the classroom activity altogether (Rowan-Kenyon, Swan, & Creager, 2012). They may consider math unrelated to their lives. Even worse, they might not feel like there is a place for them in that setting. Kususanto, Ismail, and Jamil (2010) discovered a striking difference in how teachers' behaviors were perceived by high-achieving students compared to low-achieving students. While the students in the high-achieving group described their teachers as "supportive," the students in the low-achieving group characterized them as "controlling" (Kususanto et al., p. 707). Kususanto et al. also found that those teacher behaviors had a profound impact on their students' self-esteem, which led them to conclude that teachers' attitudes, beliefs, expectations, and interactions with students have more influence on students' math achievement than does their method of instruction.

Teachers are able to counteract the normally negative association, or even a phobia, that middle school students have about math (Boling, 1991; Dodd, 1992; Quander, 2013; Stuart, 2000). Rather than dominate math classes with a lot of teacher talk, effective teachers are known to incorporate more cooperative group

learning into the lessons. Middle school is where students build the foundation for problem-solving skills (Woolley et al., 2010). Researchers have found that to meet the need of increased social interaction, effective teachers set up problem-solving teams in which communicating one's strategies is an important component. Teachers de-emphasize the memorization of algorithms and rules, and focus instead on relevant applications of math in the real world, solving problems collaboratively, and using mistakes as an opportunity to learn (Quander, 2013; Stuart, 2000). Instead of rehashing the same concepts in the same contexts as elementary school, teachers integrate math concepts with more advanced skills in measurement, statistics, and algebra. Teachers also weave in topics that are important in adolescent students' lives, provide more hands-on activities, introduce more games and puzzles, and relate what is happening in class to possible applications outside of school and in the professional world (Dodd, 1992; Rowan-Kenyon, Swan & Creager, 2012). To impact students positively, it is also imperative that teachers give students many opportunities to succeed in and feel positive about math, especially early in the school year (Stuart, 2000).

Teachers play a determining role in students' math identities. When instruction is planned with students' interests in mind, and the problems presented in class are novel, hands-on, and relevant to students' lives, students see math from a different perspective (Palmer, 2009). Students who have never before considered themselves "math people" can reverse that characterization based primarily on the opportunities and motivation the teacher provides. The role a teacher plays can dispel

the myth that there is such thing as a "math person" or a "non-math person." For many teachers, this means altering their own negative associations or low self-concepts about math.

The relationships that teachers establish with students are a key component of success for upper-elementary and middle school students (Andersen, Evans, & Harvey, 2012). The importance of relationships is magnified with Black students (Woolley et al., 2010). A critical component of relationship-building is establishing and communicating high expectations for all students. Woolley, et al. found that the combination of high teacher expectations, positive relationships, and novel instructional practices are associated with higher student motivation to learn math and higher standardized test scores. Interestingly, with the increase in teacher expectations, students' anxiety levels rose, but so did their self-confidence in math.

**The Power of Language**

Teachers may not be aware of how powerful their language is. Dodd (1992) wrote:

> What a teacher says without thinking can have a serious negative effect on a given student. Teachers should continually monitor their classroom banter and consider the impact that their words and their manner have on students, especially those with fragile confidence. (p. 297)

Effective math teachers establish a classroom environment in which making mistakes is not only acceptable, but also a key ingredient in the learning process. The environment encourages students to help each other by explaining new ways to look

at the same problems. The classroom environment also encourages students to openly express what they do or do not understand about the math they are learning. This openness is known to help students see that they are not alone in their confusion. When teachers use language that encourages effort and engagement in the problem-solving process, students see that process often outweighs product (Dweck, 2008). One of the principle goals of effective math teaching is to employ positive language that empowers students to take on new problems and, most of all, believe in themselves (Furner & Gonzalez-DeHass, 2011; Geist, 2010; Taylor & Fraser, 2013).

**Teacher and Parent Attitudes about Math Reform Efforts**

Teachers' influence on students extends beyond their practice and demeanor within their classrooms. In some cases, teachers are the ones who stand in the way of education reform (Welner, 1999). This has happened within school districts that have attempted to implement new systems with the goal of making educational opportunities more equitable. One example is teacher resistance to detracking initiatives. An argument teachers often make is that preparing for and teaching heterogeneous math or reading classes (in terms of ability) requires considerably more work from the teacher, as compared to homogeneous classes. Teachers have also cited greater discipline problems in the detracked systems, as well as greater challenges in meeting all students' needs. Other less defendable arguments are that teachers do not want to give up their privileged positions of teaching higher-level classes, that certain students are less capable and harder to teach, and that detracking requires them to "water down the curriculum" (p. 203).

It is not uncommon for teachers to point fingers at parents when asked why reform efforts cannot be successful (Welner, 1999). With regard to detracking, specifically, teachers note that many parents fervently oppose it as well. To be fair, Welner (1999) confirmed this sentiment among parents, some of whom thought making heterogeneous groups would cheat their children of an otherwise excellent education. He noticed that the more vocal opponents of detracking tended to be White parents, who often impeded any efforts toward reform.

**Family Involvement and Influence on Math Engagement**

The manner in which teachers perceive parent involvement in their children's education can also have profound implications on the students' success. Most educators recognize the crucial role that parents play in a child's education (Schnee & Bose, 2010). However, teachers may have a notion of parent involvement that is very distinct from the notions held by different families. Teachers may perceive parents to be completely uninvolved because they do not return telephone calls or fail to come to conferences. Unbeknownst to teachers, those same parents might take a very active role in helping with homework or advocating for a strong education. They may even intentionally choose to not contact the school because they want to instill that responsibility in their children. In the case of mathematics, some parents do not get involved because they lack confidence in their abilities to help their children, or language barriers prevent them from understanding the problems (Drummond & Stipek, 2004). Schnee and Bose (2010) concluded that educators may need to adjust their definitions of parent involvement, especially in schools with diverse

populations, and not allow what they perceive to be parent inaction to stop them from doing what is best for students.

The degree to which adolescent students are interested in math is closely aligned to the support they receive from their parents (Alliman-Brissett & Turner, 2010). Rowan-Kenyon et al. (2012) reported that parents are key providers of support as students develop confidence and choose to engage in math and science. Turner, Steward, and Lapan (2004) had similar findings, also noting that the support students receive from their mothers is highly influential on their own expectations in math. Moreover, when mothers endorse the stereotype that girls are not as strong in math as boys, their daughters' performance in math can start to decline, as early as during the primary grades (Tomasetto, Alparone, & Cadinu, 2011). Casad, Hale, and Wachs (2015) found that parents' math anxiety is related to children's math anxiety, and both are predictive of such things as math grade point average, degree of self-efficacy in math, and attitude toward math. Research has also shown that math anxiety tends to be higher among women (Maloney, Waechter, Risko, & Fugelsang, 2012). That has implications for children relative to interactions with their mothers, as well as with their elementary math teachers, many of whom are female (Beilock, Gunderson, Ramirez, & Levine, 2010). According Beilock et al., math-anxious elementary teachers tend to have a more negative impact on the math achievement of their female students than their male students, because girls often buy into the stereotype that they are not very strong in math.

Another factor in students' attitude toward and participation in mathematics is

their parents' education level. Yoshino (2012) concluded that parent education level was positively associated with the math achievement of their children. Furthermore, Yoshino found a stronger connection between fathers' education levels and student achievement than between mother and student. Other studies have shown that maternal education level is more closely correlated with student achievement (Magnuson, 2007; Magnuson, Sexton, Davis-Kean, & Huston, 2009). Useem (1992) found that children of affluent and well-educated parents are more likely to enroll in demanding coursework in math and science. This could result because those parents know the importance of advanced courses for their children's futures. They also tend to be more adept at communicating with the school and navigating scheduling, as well as having more familiarity with the workings of the school system. By contrast, less-educated parents may not be aware of the advantages of higher-level courses or even of the existence of different course levels. In her research, Useem confirmed that there was indeed a correlation between student math placement in 6$^{th}$ and 7$^{th}$ grades and their parents' levels of education.

Specifically regarding mathematics tracking systems, Useem (1992) reported that mothers of students in the high track knew much more about the system than did mothers of low-track students. Those mothers with little education in math had very limited knowledge of the different courses and tracks. The higher-educated parents were more likely to have taken higher-level math courses themselves, which triggered an advocacy for their students in those courses that did not exist with less-educated families. Also, the well-educated parents tended to take a more active role in class

placement decisions, whereas the less-educated parents gave the students more say. Useem (1992) made a startling discovery:

> In a number of cases studied here, it appeared to be the parents' lack of involvement, social isolation, and reluctance to intervene and influence their children's program in a more demanding direction–factors that are all highly associated with their own educational background–rather than the children's academic ability, that accounted for the children's placement in a lower-level mathematics course. (p. 276)

Another trend observed by Useem (1992) was that parents' involvement in their children's schooling declined when their children reached middle school. This is a concern to many educators, because that is precisely the time that kids need their parental support the most. A study by Kadlec, Friedman, and Ott (2007) revealed that there exists a rather laissez-fare attitude about math, science, and technology education among the general population of parents. Parents do not seem to have the same sense of urgency about those subjects as do educators and policy makers. They may recognize the issue as one concerning the nation as a whole, but neglect to see it as a petition to improve their personal results. In the study conducted by Kadlec, Friedman, and Ott (2007), parents also asserted that their children were learning much more advanced mathematics than they did at that same age, and they admitted that their children do not recognize the relevance of math in their lives.

Finally, what parents believe about their children's math abilities does matter to middle school students (Bouchey, 2004). In fact, students' own self-efficacy in

math tends to replicate their parents' and teachers' beliefs in their ability. The implication is that schools and teachers would be wise to enlist the help of parents in motivating middle school students to exert more effort and take on more challenging tasks in mathematics (Bowen, Hopson, Rose, & Glennie, 2012). According to Bowen et al., the higher the parent expectations for the students, the higher the performance of the students in middle school mathematics classes. Research suggests it may also be beneficial for schools to provide parents with more explicit suggestions/directions for exactly how they can help their children with math at home (Drummond & Stipek, 2004) and to counsel parents on how they can support their children's math self-efficacy, expectations, and interests (Turner et al., 2004).

**Impact on Students**

When students are separated into ability groups or tracks according to prior math achievement results, history has shown there is a disproportionate number of students from poor and racially diverse backgrounds in the low track compared with the high track (Woodward & Brown, 2006). Moreover, those low-track classes tend to be skills-based and cover the same ideas that students have seen year after year.

**Math self-concept.** There is concern among educators that placement in a particular math track can damage–sometimes irreparably–the confidence level of students in math. One explanation proposed in the research literature for this could be that students have a keen sense of their own placement in the math tracks. Students recognize when they are being instructed with drill-and-practice exercises instead of the higher-level projects being taught in the higher tracks. They readily

perceive that they are not being held to the same high expectations (Yonezawa & Jones, 2006). According to Bouchey and Harter (2005), students who perceive low expectations on the part of the adults around them tend to adjust their own expectations to align with the adults. This impacts those students' self-efficacy, expectations, effort, performance, and future decisions. Bouchey and Harter also found that Latino students gave themselves very low competency rates in math and science. This could be, in part, that Latino students internalize the stereotypes projected in society and the low expectations of their teachers and peers.

Students' self-concept in math is often a precursor to their achievement. Yoshino (2012) discovered that in both Japan and the United States, the key determinant of student success in math was a student's mathematical self-concept. He also determined that self-concept had a stronger association with math achievement than did parent education level or exposure to academic material outside of school. This finding emphasizes the importance of a student's own characterization of his/her math ability. Gilpin (2010) noted that when students expect failure, they commonly choose to not try at all. This absence of confidence and effort can lower students' self-esteem and academic achievement, as well as limit their future undertakings (Gilpin, 2010; Turner et al., 2004). This sequence of low expectations, low self-concept, lack of effort, and poor results tends to repeat itself time and time again, and proves very difficult to stop (Sparrow & Hurst, 2010). (See Appendix G.)

To be fair, not all research corroborates the notion that a student's placement

in a particular math ability group affects his/her math self-concept. Trautwein, Ludtke, Marsh, Koller, and Baumert (2006) found that students in high and low math tracks do not consistently compare themselves between tracks. In other words, students in the low math track did not have lower math self-efficacy, because instead of comparing themselves to peers in the higher tracks, they compared themselves to their classmates in the same track. Similarly, higher-tracked math students based their math self-efficacy on how they compared to other high-tracked students.

**Perceived irrelevance.** Another concern among educators is the negative opinion that many lower-track math students have about mathematics. Many factors contribute to a negative attitude about math among middle school students in general: it is too repetitive; the teacher is overly verbose; and concepts are more abstract (Boling, 1991). In the middle years, students may also begin to doubt the relevance or usefulness of math (Rowan-Kenyon et al., 2012). In a study conducted by Kadlec et al. (2007), 76% of the more than 2,500 middle and high school students surveyed expressed the belief that students do poorly in math and science because "these subjects are irrelevant to their lives" (p. 14). In the same study, students taking part in focus groups had difficulty identifying careers requiring strong math and science skills.

Those negative attitudes are compounded among students in the lower-level math classes. Their low confidence levels and pessimism about achieving any success in math trigger a decline in interest in that subject (Rowan-Kenyon et al., 2012). Furthermore, their engagement in class decreases, and students begin to view

math as irrelevant and unconnected to their future. Such attitudes perpetuate a cycle of disengagement and pessimism (Cleary & Chen, 2009). (See Appendix G.)

Research has shown that negative attitudes toward math can be closely associated with low math achievement (Choi & Chang, 2011). In a comparison study between United States and Taiwanese math achievement, Tsao (2004) concluded that the superior Taiwanese scores could be the result of the more positive perceptions of mathematics among students in Taiwan. Tsao maintained that a student's academic achievement depends on three unique factors: school experience, home experience, and intelligence. He challenged the United States to come up with ways to make math a positive experience, including emphasizing effort over ability and creating more collaborative math learning experiences in school.

In related research, Schommer-Aikins, Duell, and Hutter (2005) described the importance of relevance for middle school students. They wrote that students will likely resist putting effort, energy, or time into something they feel will not matter to their future. They challenged teachers to make mathematics more interesting and relevant to the lives of students by interweaving math lessons with topics that are highly interesting to adolescents, such as pop culture, professional sports, or school activities.

As described earlier, many historical events, years of research, and revisions of mathematics academic standards have brought math education in the United States to where it is today (Permuth & Dalzell, 2013). Clearly, the majority of mathematicians, math educators, and professional math and educational organizations

see the rationale and relevance of mathematics in students' lives. Still, students may question this notion and balk when their teachers tell them math is relevant because mathematicians, teachers, educational leaders, and NCTM think so. It is critical that teachers remind themselves and their students that mathematics content and process standards have been thoroughly researched and endorsed by experts and educators alike. However, the standards do not prescribe *how* mathematics should be delivered in *every* classroom, nor how the teachers should go about building connections with their students. That is something that teachers must figure out on their own. They must make mathematics as applicable, relevant, and real as possible for the students in their classroom. If that is done well, students will recognize the relevance of math in their lives.

**Lack of motivation.** When students believe something is irrelevant or they lack understanding of its underlying concepts, their disengagement and boredom in class is palpable. The environment becomes toxic. Even students who were once motivated can become cynical and uninspired in this setting. Once things get to this point, the cycle is very difficult to break (Sparrow & Hurst, 2010). For that reason, Ramentol (2011) emphasized that motivation must be a key component in every math class. He asserted that teachers have the responsibility to offer students frequent opportunities to succeed in math. In addition, teachers need to help instill in students a sense of purpose and drive, but at the same time enjoy what they are doing. Those elements are rarely evident in the lower-track math classes.

**Paving the Road to Success**

For schools, teachers, parents, and students hoping to stave off the negative association with mathematics, especially for the lowest achievers, research provides some suggestions. Swinton et al. (2011) suggested that early efforts should be made to prevent students from attributing their struggles in math to low ability. The more students are convinced that obstacles can be overcome with repeated effort, the more engaged they will remain in their studies. Dweck (2008) emphasized the need to cultivate students' growth mindset by acknowledging their effort, persistence, and strategies rather than praising them for pure talent or intelligence. According to Newton (2010), there are several key factors that middle school educators should focus on in order to facilitate higher learning and future success for their students. They include providing students with opportunities to make continual progress in math, fostering high self-esteem and expectations, addressing behavior issues consistently, and employing early intervention strategies for both academic and social needs. Gamble, Kim, and An (2012) noted the need for intervention programs that target students' positive math disposition.

A number of researchers have suggested doing away with tracking systems (Alvarez & Mehan, 2006; Welner & Burris, 2006). Others have emphasized the obligation teachers and schools have to challenge all students–minorities included–with rigorous mathematics instruction (Alvarez & Mehan, 2006; Walker 2007; Woodward & Brown, 2006). Researchers have asserted that this is not an easy

undertaking. It involves not only changing past practices but also breaking long-held assumptions. It includes pointing the finger away from parents and back at schools. Finally, it requires educators to seek unconventional ways to meet the need for both equity and excellence in schools.

## Chapter III: Procedures and Research Design

### Introduction

The purpose of this study was to examine the feelings of different stakeholders about low-ability math groups. These stakeholders included middle school students, their parents, and their math teachers. The goals of such an examination included: identifying patterns in the feelings and beliefs expressed by students, parents, and teachers; comparing and contrasting the experiences of the three stakeholder groups; studying the similarities of responses among ethnic groups; and shedding light on educator practices that may contribute to negative attitudes and low achievement in math.

Since this study was intended to describe the state of mathematics at the middle school level in the students', teachers', and parents' own words, the methodology consisted of a series of focus groups. The researcher conducted a total of nine different focus groups: five involved students, three involved parents, and one involved math teachers. The setting was Sagepond Middle School in Sagepond (a pseudonym), Minnesota, and the majority of students participating in the focus groups were enrolled in a low-level math class at the time of data collection.

### Research Method and Design

This was a qualitative phenomenological research study which included a series of focus groups with students, parents, and teachers. This methodology was appropriate because the researcher sought to relay the attitudes, emotions, and

descriptive experiences of the subjects. As Sagoe (2012) asserted, focus group methodology is very effective for generating new ideas and exploring how points of view have been built and are expressed. The intent was to analyze the participants' exact words, which came from their hearts, not choices provided on a survey.

The researcher conducted all nine focus groups herself. This study is phenomenological in nature because students, parents, and teachers described their own experiences with mathematics education. The researcher facilitated the focus groups by posing several open-ended questions, outlined in Appendices A-C. As expected, some subjects took the conversation in directions that were not anticipated by the researcher, or provided answers that led to questions that were not on the original lists. That is the essence of emergent design research. Those additional questions have been added at the bottom of each set of focus group questions in Appendices A-C.

The intention was to conduct five to six different focus groups: three or four with students, one or two with parents, and one with math teachers. Due to the schedule constraints of some participants, as well as a desire to get a more diverse group of participants, the researcher actually conducted nine focus groups. The researcher intended to limit focus group participants to a minimum of three and a maximum of six people. Again, because of differences in availability, one of the student focus groups as well as the teacher focus group exceeded the maximum, and two of the parent focus groups had fewer than the minimum. The number of participants in each focus group is broken down in Table 3.1.

Table 3.1

*Size of the Samples*

| Focus group name and number | Number of participants |
|---|---|
| Student Focus Group 1 (SFG1) | 6 |
| Student Focus Group 2 (SFG2) | 6 |
| Student Focus Group 3 (SFG3) | 4 |
| Student Focus Group 4 (SFG4) | 4 |
| Student Focus Group 5 (SFG5) | 11 |
| Parent Focus Group 1 (PFG1) | 1 |
| Parent Focus Group 2 (PFG2) | 1 parent, 1 former student |
| Parent Focus Group 3 (PFG3) | 5 |
| Teacher Focus Group | 8 |

**Research Questions**

The purpose of this qualitative research study was to identify and analyze the feelings and experiences of middle school students enrolled in low-level math classes, as described in their own words. A secondary purpose was to describe their experiences in mathematics from the perspectives of their parents and math teachers. There were two principal research questions and three subquestions.

Research questions:

1. How do middle school students who are typically classified as "low in math" describe their feelings about math?
2. According to these students, what factors have contributed to their attitudes toward math?

Research subquestions:

A. How do these students personally feel about math and their school

experiences in math class?

B. How do families influence their students' attitudes toward math?

C. How do the messages they get from teachers influence their attitudes toward and confidence level in math?

**Objectives**

The objectives included finding patterns in how students, parents, and teachers describe their feelings about and experiences with math, analyzing the factors that contribute to those feelings, and revealing the ramifications of certain school and teacher practices.

**Sample**

The data for this study were drawn from nine focus groups conducted with three distinct samples. The subjects in all three samples had some association with Sagepond Middle School and a connection or experience with the lower-level math classes that exist in that school. At Sagepond, the lower-level math classes in each grade are often referred to as "Standard-level Math" or "Regular Math."

1) The first sample was comprised mostly of students from Grades 6-8 who were enrolled in a lower-track math class at the time of the focus groups. There were two exceptions. One student participant had been in the lower-track math class previously, but was taking Advanced Math at the time of the focus group. Another student participant was in tenth grade at the time of the focus group, but had been through three years in a lower-level math class at Sagepond. The sample size was 32. The students in this sample represented

the different backgrounds that are present at Sagepond Middle School, including White students, students of color, students from upper middle class families, and students living in poverty. The sample was a cross-section of the population of students in the lower-level math classes. The sample was divided into five different focus groups (with the caveat that one student was part of the second parent focus group).

2) The second sample included the parents and/or guardians of some of the student focus group participants. This sample was made up of seven parents or guardians, and was divided into three different focus groups of varying sizes.
3) The third sample included math teachers from Sagepond Middle School who have had experience teaching one of the low-level math classes. At the time of the focus group, their teaching assignments included all three grades (6-8). There was only one focus group from this sample, due to limited teacher availability.

All the students, parents, and teachers who met these qualifications were invited to participate in the focus groups. Written invitations were sent home with students enrolled in the lower-level math class at the time of data collection. Students and parents that were interested in participating in the study returned that initial interest form to the students' current math teachers, who gave them to the researcher. The researcher then contacted the parents and students via telephone or email, to inform them about the required Informed Consent Document and to schedule the

focus groups. In order for parents or guardians to be eligible to participate, their children had to agree to participate in one of the student focus groups. The math teachers who took part in this study were contacted via email by the researcher.

**Setting**

The setting for this study was Sagepond Middle School in Sagepond, Minnesota. Sagepond is a suburb of Minneapolis. At the time of data collection, approximately 4,400 students in Grades Kindergarten through 12 were enrolled in the Sagepond Public School District. In a typical year, the district employs about 500 staff. It is made up of one high school (Grades 9-12), one middle school (Grades 6-8), and four elementary schools (Grades K-5). The district also has a community center, which houses Community Education and Early Childhood Programming, and a learning center for seniors.

The majority of residents in the city and district of Sagepond are Caucasian (about 83%). However, the community is becoming more racially diverse. Official census data show that from the year 2000 to 2010, the percentage of residents identifying themselves as Asian, Black, Hispanic/Latino, or bi-racial grew at rates of +22.5%, +74.7%, +50%, and +84%, respectively. (Retrieved at http://censusviewer.com). Only the White population saw a decrease over that ten-year span, even though the overall population of the city increased by more than 1,000 residents.

Sagepond Middle School (SMS) was selected for the setting of this study because it presented numerous advantages. First, there is a very diverse student

population at SMS. (See Table 3.2 for a demographic breakdown of the student body.) Second, for many years, students in Grades 6-8 have been grouped according to ability in mathematics. Math classes range from remedial to double-advanced at each grade level. Third, the researcher has professional connections with several people in the school and district, and therefore was a familiar face when approaching students, parents, and teachers for the focus groups.

Table 3.2

*Student Enrollment at Sagepond Middle School, 2016-17*

| Student group | Number of students | Percent of student body |
|---|---|---|
| School total | 1035 | 100% |
| Hispanic | 138 | 13% |
| American Indian | 6 | Less than 1% |
| Asian | 39 | 4% |
| Black/African American | 207 | 20% |
| White | 561 | 54% |
| 2 or more ethnicities | 84 | 8% |
| English Learner | 86 | 8.3% |
| Special Education | 111 | 10.7% |
| Free & reduced price lunch | 388 | 37.5% |
| Homeless | 25 | 2.4% |

(Minnesota Report Card [MRC], 2017)

There are some disadvantages in having chosen Sagepond Middle School as the setting for this study. SMS provides only a small sample from which to determine how students, teachers, and parents feel about math. The sample was not large enough or representative enough of the larger population for the results to be generalizable. Secondly, some may see the researcher's connections at the school as an indication that certain results may be favored over others. Although that may raise

the stakes a bit, the researcher took measures to eliminate personal bias. Those measures included carefully planning the focus group questions ahead of time, meticulously explaining the focus group protocol to all participants, including the importance of honesty, and making audio-recordings of the focus groups, so that a research assistant could verify the reliability of the findings.

The opinions expressed in this study are limited to the perceptions of the participants as reported from their own points of view. When research subjects characterize their own feelings, they may be motivated to exaggerate or downplay their own sentiments. Also, the focus group method planned for this research could reflect some bias on the part of the researcher, due to many years of experience as a mathematics teacher. The questions asked in the focus groups were carefully constructed and tested, in order to not lead the subjects in any particular direction.

**Instrumentation and Measures**

The focus groups were conducted in-person. They began with an ice-breaker and a short, unimposing, open-ended question. The questions that followed varied according to the subjects within each focus group. In the student groups, questions were asked about prior math experiences, the usefulness of math, perceptions of math ability, current feelings about math, and strategies used to solve mathematical problems. The parent questions focused on their perceptions of their children's and their own mathematical ability, the usefulness of math, and their level of involvement in their children's math homework. The math teachers were asked about their attitudes, approaches, beliefs, and expectations about the low-level math groups. The

specific focus group protocols can be found in Appendices A-C.

**Data Collection**

The researcher made audio-recordings during the focus groups, which allowed her to be fully engaged in the conversation and facilitate the discussion in the most effective manner. She took a minimal amount of notes using the LiveScribe smart pen. She used a list of themes and questions for each group, but permitted the discussion to veer in some new directions, depending on the subjects. It was important that the researcher participate in the conversation in a friendly manner in order to obtain the true sentiments of the subjects. However, it was equally important that she did not pose leading questions or guide the conversation in a particular direction that she wanted it to go. Each focus group type followed its own, unique interview protocol (Appendices A-C), and lasted approximately one hour.

**Data Analysis**

Following each focus group, the researcher reviewed her notes and added additional questions based on prior participants' responses to be used in subsequent focus groups (see additions at the bottom of Appendices A-C). After all focus groups had been conducted, the researcher listened to the audio-recordings while dictating the participant responses into Google documents using voice typing. While listening to the recordings and viewing the transcripts, the researcher continually reviewed the purpose of this study and the research questions (Merriam, 2009).

The first step in data analysis was to read through the entire set of transcripts several times, in order to gain an overall feel for the main themes and patterns,

expected and unexpected. On the first read-through, the researcher noted the main findings of each focus group and took notes that would assist in the coding of the data. She also assigned pseudonyms to all the participants, in order to protect their anonymity.

On the second full read-through, the researcher began coding the data by hand. She used codes that had been pre-established to correspond to the research questions and subquestions, as well as new codes which were needed to represent prevalent themes that unexpectedly emerged during the research (Merriam, 2009). All codes are explained in detail in Appendix D. To enhance the validity and reliability of the study, the researcher had a research assistant use the same coding system to analyze pieces of data, and the results were compared to verify inter-rater reliability.

After coding the data, the researcher did a third read-through of all the transcripts, while at the same time tallying the number of times each code appeared. She then organized the codes by frequency and began establishing some of the major findings of the study.

The following step involved a fourth read-through of the transcripts. During this phase, the researcher constructed an idea map on the wall, organizing all the data by themes. Adjacent to each idea on the map, she made note of which participants had responded and what, precisely, they had said. From the idea map, the researcher was able to build an outline of major themes she garnered from the focus groups (eight themes in total). In large part, she organized those themes according to the

research questions and subquestions.

In a separate phase of data analysis, the researcher created a spreadsheet in which she organized participant responses to some of the focus group questions. Those were questions to which students gave a short response, like, "Do you like math?" or "Who helps you with math at home?" That spreadsheet allowed the researcher to quickly tabulate response types across all focus groups, which also provided insight into how the sample as a whole characterized their feelings and attitudes.

**Limitations and Delimitations**

The main limitation of the study was that it focused on a singular school setting. This is a descriptive study, which by nature relies on the subjects' self-reported experiences, opinions, and feelings. It also relies on the voluntary participation of students, parents, and teachers. The simple act of volunteering for such a study may indicate that these participants place a higher degree of importance on mathematics than do students, parents, and teachers who did not volunteer. This may sway their opinions in one way or another. For that reason, the results of this study cannot be generalized to the broader population of students at Sagepond, nor to other populations outside of the school.

A second limitation is the researcher's personal and professional experiences with the school, its staff, students, and families. Since the principal method of data collection was through focus groups conducted by the researcher, it is possible that the results may reflect the researcher's bias. In this case, the researcher had

previously worked as a teacher of sixth grade mathematics in the same school (Sagepond Middle School). Some questions or interactions with the subjects may have reflected some pre-conceived notions of the researcher, though every effort was made to keep the questions and tone neutral. In addition, most of the students involved in the study knew the researcher, and some had been students in her math class in previous years. The researcher recognized that that could conceivably sway their responses in some way. She made every attempt to point out in the research instances in which familiarity with the researcher may have affected students' responses.

Similarly, the familiarity of the researcher with many of the participants may constitute a particular bias in the manner in which she has presented their responses and attitudes. This is especially true in the case of the math teachers at Sagepond, most of whom were former colleagues of the researcher. It is quite possible that the researcher did not want to be overly critical of her former colleagues, or even the students and parents of their school. Knowing that many of the participants will likely read the results of this study may have prompted the researcher to depict their responses or draw conclusions about their roles in a more positive light.

There are other possible limitations associated with this type of focus group methodology. First, some participants may have been reluctant to share their true opinions, especially when discussing more sensitive topics. The researcher made attempts to include all participants in all the focus groups. Secondly, some participants may have been worried about the confidentiality of the group. For this

reason, the researcher talked specifically about the expectation of confidentiality with each group prior to getting started. At the other end of the spectrum, there were a few participants that dominated some of the discussions and may have prevented other participants from saying all that they wanted to (Sagoe, 2012). Again, the researcher tried to mitigate this by prompting others to take their turn to speak. Finally, the environment may have seemed artificial and not conducive to a whole group of people talking comfortably with one another. The researcher tried to choose locations in which students, parents, and teachers felt comfortable expressing their true feelings and opinions.

In short, this study was intended to give a snapshot of how students, parents, and teachers in one middle school feel about the mathematics program. The purpose was to catch a glimpse of the classroom through various stakeholders' eyes and gain an understanding for how current practice is or is not working.

**Ethical Considerations**

The most important ethical considerations for this study involved the protection of human subjects. The researcher understood that she needed to fully inform the subjects about "the procedures and risks involved in the research project" (Roberts, 2010, p. 33) prior to commencing the study. Participants were all given informed consent documents with specific provisions, depending on whether they were students, parents, or teachers. Those documents contained specific information about the purposes of the research, expected duration of the study, risks and benefits involved, measures taken to protect confidentiality and anonymity, contact name and

telephone number of the researcher, and assurance that participation in the study was voluntary (Roberts, 2010; United States National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978). In addition, because the focus group discussions were audio-recorded, the researcher needed to gain specific consent for that. She informed the subjects that those recordings were to be utilized exclusively by her to transcribe the discussions, and that they would be stored for one year after the completion of the study, at which time they would be destroyed and/or deleted. Moreover, the researcher took great care in assigning pseudonyms to all participants and coding their responses to maintain their anonymity. That included taking precautions to not inadvertently link data to specific subjects by revealing excess information that might allow someone to deduce their identities. Finally, the researcher communicated to the participants that at any point during the research it was their prerogative, if they so chose, to withdraw from participation.

The chapters that follow include the very thoughts and words expressed by the students, teachers, and parents of Sagepond Middle School. In Chapter IV, their responses are broken down and analyzed in comparison with the research questions and subquestions to determine how key stakeholder groups feel about their experiences in or with the lower-level math groups. Also in Chapter IV, patterns or similarities within and among groups are identified and notable commentary made by participants is highlighted. In Chapter V, determinations are made as to what information from this study can be helpful to math educators, school administrators, and district leaders in designing the math programming in their schools. Finally, the

researcher discusses implications for current and future practice, as well as recommendations for additional research.

# Chapter IV: Results

## Introduction

By many measures, the proficiency rates in math among youth in the United States are not as high as they could be. For several decades, there has been sharp criticism of the education students are receiving in math and science in the United States, largely because math achievement has lagged behind other industrialized countries and the United States fears losing a competitive edge in an increasingly global economy. Another problem that has surfaced in mathematics education in recent years is a gap in achievement between White students and students of color. On average, students of color are over-represented at the low end of the math proficiency continuum, and under-represented among top achievers.

The problem addressed in this study is a combination of those two issues: low math proficiency across the board, but especially among students of color. Both of these issues have been the focus of numerous research studies, school improvement plans, and professional development training sessions all across the country. There are theories about strategies and systems that can help to reverse these trends, but nothing has emerged as the clear-cut solution for raising math achievement and closing the racial achievement gap. This study attempted to tackle those issues by going directly to the people most affected: students who have been labeled "low in math." It gave them an opportunity to share how they view math, their math teachers, and their own abilities in math. It allowed them to voice what has brought them to this point, and what they see as their future in the area of mathematics. It also

solicited their opinions on how math instructional practices and class structures in their school could be improved in order for them to be more successful and happy in math class. One of the key practices confronted by participants in this study was ability grouping, specifically whether it has helped or hurt students' efforts to learn. The objective of this study was to better understand the feelings and experiences of students who are already being separated out as the lowest math achievers in their school. Once their stories are heard, educators may have a better idea of what is missing in their math experience, what schools are doing that may actually be harmful to their learning, and what can be done to provide what is needed for them to thrive in the area of mathematics.

This chapter presents the results of the nine focus group discussions that were conducted during this phenomenological research study. There is a brief description of the participants, including their grade levels, ethnicities, and genders. Pseudonyms have been used to protect the privacy and anonymity of all participants. Following the description of the participants, there is a synopsis of the math program at Sagepond Middle School, which is the setting of this research study. The synopsis is followed by a detailed analysis of the data related to each of the research questions and subquestions. In addition, there are three categories of findings that emerged over the course of the study and are not specifically connected to any of the research questions. This chapter concludes with a summary of the major findings of this research study.

**Demographic Description of the Participants**

The participants in this study were all associated in some way with the lower-level math classes at Sagepond Middle School. Thirty participants were students currently enrolled in the "Standard-level Math class," which is the term used at Sagepond for the lowest-level core math class in each grade. One student had recently moved to an Advanced-level Math course, after having previously been in Standard-level. Another student had been enrolled in Standard-level Math during the years she attended Sagepond, but has since moved on to Sagepond High School. There were seven parent/guardian participants. One of them was actually the grandparent of one of the student participants. Finally, eight math teachers from Sagepond participated in the teacher focus group. They have all, at some point, taught the Standard-level Math class in one or more of the three grades.

The ethnicities and genders of the participants are listed in Table 4.1. Every attempt was made to involve a cross-section of the population at Sagepond Middle School. The student sample is quite diverse. Unfortunately, the parent and teacher groups are racially homogeneous, due in part to a limited response to the interest forms sent out by the researcher. The math faculty at Sagepond is not very diverse. There are no people of color working in the math department, and at the time of this study, there was only one male math teacher at the school.

Table 4.1

*Demographic Information of the Focus Group Participants*

| Participants | Students (n=32) | Parents (n=7) | Teachers (n=8) |
|---|---|---|---|
| Names (pseudonyms) | Ariana, Scarlett, Olivia, Anthony, Graham, Manny, Darla, Tess, Ava, Trevor, Chase, Bailey, Skyler, Maxwell, Oliver, Martin, Bryan, Madeline, Wyatt, Colby, Eliza, Sonia, Andrew, Willa, Randal, Spencer, Cecilia, Maisy, Noah, Chloe, Nathaniel, Renae | Carlee, Katherine, Patrick, Neil, Beth, Margaret, Julia | Ms. Keys, Ms. Arndt, Ms. Ladd, Ms. Murdoch, Ms. Foster, Ms. Hannon, Ms. Samuel, Mr. Parker |
| Grade Levels | Gr 6: 11 students<br>Gr 7: 13 students<br>Gr 8: 7 students<br>Gr 10 (former MS student): 1 student | Grade level of children<br>Gr 6: 5 parents<br>Gr 7: 1 parent<br>Gr 8: 1 parent | Grade level currently teaching<br>Gr 6: 5 teachers<br>Gr 7: 4 teachers<br>Gr 8: 2 teachers |
| Ethnicity | Black: 11 students<br>Hispanic: 5 students<br>Asian: 4 students<br>White: 12 students | Black: 0 parents<br>Hispanic: 0 parents<br>Asian: 0 parents<br>White: 7 parents | Black: 0 teachers<br>Hispanic: 0 teachers<br>Asian: 0 teachers<br>White: 8 teachers |
| Gender | Female: 15 students<br>Male: 17 students | Female: 5 parents<br>Male: 2 parents | Female: 7 teachers<br>Male: 1 teacher |
| Other Information | 3 students with IEPs<br>14 students whose first language was not English | 1 participant is a grandparent of SMS student | Some teachers teach more than one grade level |

**Description of the Ability Grouping System Used at Sagepond Middle School**

At the time in which this study was conducted, the math department at Sagepond Middle School offered students a choice of three different core math

courses at each grade level (6-8). Those choices were Standard-level Math, which was at grade level; Advanced Math, which covered grade-level standards, plus several concepts of the following grade; and Double-advanced Math, which was a year or more above grade level. The program was referred to as "self-select," which meant that students could actually choose any one of those three courses, regardless of courses they had taken previously. At the time of registration, teachers would share students' test scores with students and parents and give recommendations for which course would be appropriate for the students. However, parents and students had the final say. Many students tended to follow their teachers' recommendations, but every year there were several students who decided to strive for something higher, or opt for a less rigorous option than their teachers were recommending. The motivations of families and students were not necessarily known to school personnel.

At the time of this study, there were a handful of other math courses offered at Sagepond, but they were characterized more as remedial courses, enrichment opportunities, or Tier II math interventions. Those classes were to be taken *in addition to* students' core math class. The remedial course was called Pi Math, and it met every other day. Students qualifying for the Gifted and Talented Program would often have additional math hours working with their GT teachers. Finally, once per week, Sagepond had a block of time called "RTI," in which students who needed to be re-taught concepts currently being covered in their core math classes received an additional hour of math instruction. Students were invited to RTI on a week-by-week basis, depending on their needs. During the focus group exchanges, many students

referred to all those courses by name.

## Key Findings

### Findings related to research questions.

***Findings for research question 1.*** Question: How do middle school students who are typically classified as "low in math" describe their feelings about math? Finding: Students draw striking distinctions between how they feel about math as a general subject area versus how they feel about the math class they are currently taking.

In order to analyze students' feelings about different aspects of math, it is crucial to hear their answers in their own words. However, it is also helpful to see their aggregate responses to some of the more basic questions. Table 4.2 lists some of the key questions that were asked of students during the focus groups, as well as the percentage breakdowns of their responses. More elaborate student responses are presented in the paragraphs that follow.

Table 4.2

*Responses to Key Questions Asked in Student Focus Groups*

| | Total Responses | Yes/ positive | No/ negative | Other/ somewhat/ neutral |
|---|---|---|---|---|
| Do you like math? | 25 | 15 (60%) | 3 (12%) | 7 (28%) |
| Do you think math is important? | 26 | 25 (96%) | 0 (0%) | 1 (4%) |
| Are you good at math? | 28 | 9 (32%) | 9 (32%) | 10 (36%) |
| Describe your current math class. | 24 | 1 (4%) | 21 (88%) | 2 (8%) |
| Do your parents think math is important? | 28 | 25 (89%) | 2 (7%) | 1 (4%) |
| Are any of your family members good at math? | 26 | 16 (62%) | 10 (38%) | 0 (0%) |

One of the first questions put to all student focus groups was simply, "Do you like math?" Of the 25 students who responded, 15 said "yes," and 7 said either "it depends," "sometimes," or "kind of." Only three of the 25 students (12%) said definitively that they do *not* like math. However, as students began providing details about their feelings, their widespread positive portrayal of math turned decidedly negative, especially when discussing their current math classes.

> Like, I know I'm good at it but at times I don't feel that way like if I get something wrong I feel really discouraged and, like, sad about it… It's really hard for me sometimes to actually pay attention because of my class. And so that's why sometimes I feel that I'm not good at math, because I can't hear anything, and like maybe it's my fault because I can't hear. (Adriana)
>
> I'm pretty good at math, and I like it. I try my hardest to concentrate in math but…it's super distracting in my math class. Like, that's why I really kind of want to be in Advanced now because like, I know, like, maybe the kids there are a little bit less crazy, but, like, it's so hard to learn in a class that where everyone is trying to get attention and people are fighting for no reason. (Scarlett)

It is therefore helpful to look at students' feelings about math through two lenses: 1) how they feel about math in general; and 2) how they feel about their current math classes.

*Feelings about math in general*. Students' responses to the question, "Do you

think math is important?" were also very positive. Of the 26 students responding to the question, 25 gave a definitive answer of "yes." That is 96%. Even the one student who dissented acknowledged that "some parts" of math are indeed important. Students mentioned the significance of math for college and their future, including future employment. Anthony said, "You have to have math for a job," to which Manny added, "that's how you get into college." Martin even claimed that, "if you don't do math, you're not going to know what to do in life."

When students were asked about their own abilities in math, the responses were more mixed. Of the 28 responses to the question, "Are you good at math?," nine students said "yes," nine said "no," and 10 said something like "kind-of," "somewhat," "average," or "it depends on what we're learning." The revelation there is that just as many students feel they are good at math as feel they are not. Moreover, 19 of 28 students (68%) feel they are either good at math or at least some aspect of it.

It is worth noting that some students who rated themselves as "not good at math" were extremely negative about their own math abilities. Chase and Skyler acknowledged that their math classes are "so hard." Oliver said that he sometimes acts out during math class "because [he's] anxious." Manny and Graham both said they feel stressed from the minute they walk into math class. Graham commented, "I don't think I'm all that good at math compared to my friends, and myself, cuz like it's challenging, really challenging for me, and it puts a lot of stress on me and I don't do well with stress." Renae recalled her years in middle school math: "I just pulled

through math. It was…it was dreadful. I just didn't like it, and I couldn't wait for it to be over… It was dreadful." Other feelings about math in general that surfaced during the student focus groups included a lack of confidence in their abilities to solve math problems, frustration with not receiving the help they need, a lingering sense of confusion, and a general feeling of being overwhelmed.

*Feelings about current math class*. As the topic of the focus groups shifted from math in general to the students' current math classes, their commentary became much more negative. When asked to describe their current math classes, most participants gave emphatically negative descriptions (21 out of 24 responses, or 88%). Their complaints included the following: middle school math is "boring," "it's just not fun anymore," and "it's not as engaging." They also talked about how they feel when they are in math class: stressed out, frustrated, distracted, overwhelmed, and annoyed. For some, the feelings were about their own insecurities. Ariana explained that the reason she did not register for Advanced Math was because she was unsure of her own abilities. "I didn't have much confidence…that I would succeed." For others, the feelings were more about the irrelevance of the math they were learning. Madeline stated, "Some of the stuff they all teach us, we do not use that in everyday life." Renae stated, "Algebra is useless. You're never going to need it in your life. I hate to break it to you." Other students described a classroom environment lacking motivation. Trevor shared this about his math class: "Some kids like don't even do anything. They just sit there the whole class." Darla agreed: "Kids in our class don't even try." Some students simply expressed an overall negativity

about their math classes. Tess said, “I like math, but I don’t like, um, my class.” Bailey said that sometimes in math she thinks to herself, “This is so stupid. I don't even know why I’m here.” The sources of the students’ negativity, including teachers, peers, and math programming, will be elaborated upon in the section addressing Research Question 2.

Despite the overwhelmingly negative view of their current math classes, in addition to the varied assessments of their own math abilities, most student participants agreed that their current placement in Standard-level Math was appropriate. A large majority expressed no interest in attempting a higher-level math class. They gave many reasons to justify their decisions to register for Standard-level Math. Maxwell, Colby, and Sonia all said that Standard appealed to them because it was “not too hard.” Madeline expressed that Advanced Math was “too fast…I would just feel dumb in there.” Martin’s motive was similar to Madeline’s: “The only reason that I didn’t want to do Advanced Math was because I knew I wasn’t that, like, that good in math.” Trevor said with all seriousness, “My mom said I should do Regular Math cuz I’m not the brightest bulb.” Olivia explained, “I was scared, like, I would like fail on tests and stuff, so like I just didn’t do it.” Finally, Wyatt admitted that it was about his grades: “Advanced…it would just bring my grades down.” Several students acknowledged that they simply registered for Standard-level Math because that is where they have always been, or because it was what their teachers recommended. When asked whether their current math class was “too hard, too easy, or just right,” 27 out of 32 (84%) students responded with “just right.” Hence,

although unhappy in their current classes, they did not see another option.

The fact that so many students expressed pessimistic sentiments about their current math classes and yet had no interest in challenging themselves or improving their math level or class placement indicates a degree of hopelessness among students in the Standard-level Math classes. Some students alluded to the fact that they are not motivated to do anything hard in math. The idea of potential came up a few times in the student focus groups. Spencer shared that he had been changed mid-year from Advanced Math to Standard-level Math. Once that change occurred, he said, "I just gave up, like I'm asleep in the class." Bailey, Ariana, and Scarlett all talked about a lack of potential or motivation to achieve academically.

> Yeah, so now I'm just in Regular Math and now that I'm in Regular Math, I don't have any like potential for math and I hate my 4th hour, cuz there is, I just don't feel the need to do math any time. (Bailey)
>
> I think it's like because the people in Advanced, I think, are taking the class to either, you know, succeed, and really want to get, like...you know, have confidence in what they're doing in Advanced and stuff. Like they actually care about their education and stuff like that, education and stuff, and they're like taking it seriously so they really want to get stuff done. On the other hand, in Standard, I think it's people that are less confident and like they don't have like a deeper meaning for education. They just want to goof around sometimes. (Ariana)
>
> Standard-class people probably like, the ones that are disruptive, probably

think that, “This is just a class. I'm not going to need this in the future. It’s not what I want to be in the future. I want to be an athlete. I’m not going to need to know math.” (Scarlett)

Willa confirmed that many students in Standard-level Math have a defeatist attitude: “I feel like if you want the kids in Standard to pay attention, then you shouldn’t classify them as Standard, cuz it makes them feel like they can’t learn as much.” This sense that they have no potential has caused many students to give up the idea of ever being good at math, let alone pursuing math-related careers in the future.

***Findings for research question 2.*** Question: According to these students, what factors have contributed to their attitudes toward math? Finding: Most students feel very negatively about their current math classes, due to the misbehavior of their peers, poor classroom management, and ineffective instructional practices.

*Factors contributing to their feelings about math in general.* Students spent very little time talking about how they feel about math as a subject area or what has influenced those feelings. The comments they did make, which were mostly positive, indicated that parents play a large role in determining their sentiments. Many students (25 of 28, or 89%) reported that their parents communicate to them that math is important. Of those 25, at least two stated that their parents believe that math is *their most important* class. Several students seemed to equate their parents’ concerns about their grades as a sign that they believe math is important.

It also appears that students’ views on math as a school subject were shaped in part by their experiences in elementary school. Overall, students had generally

positive reviews of their elementary math experiences. Manny and Anthony stated that in elementary school they felt competent in math. Darla shared that she had been in the Gifted and Talented (GT) math class in elementary school. A few students also said they liked math more in elementary than in middle school because it was "fun" and more "engaging." They said that only since coming to the middle school has math become confusing and uninteresting. Darla and Tess had a short conversation about this very notion. Darla said, "I don't think the math like lessons…like not to be mean to the teachers, but they're just, not engaging." Tess added, "It isn't as fun as it was in elementary school." Darla concluded, "There are better ways, like in elementary schools, there's better ways…to teach it so it's a little more engaging."

*Factors contributing to their feelings about their current math classes.* The two most influential factors shaping students' attitudes about their current math classes seem to be their peers and teachers. By far, the most common cause of students' negativity about their math classes was the behavior of their classmates. Chase said at one point that his math class is "hard because of the people." Maxwell stated, "The thing that isn't hard is the math; it's just like the students in my class." Most students mentioned *something* negative about at least *some* of their classmates. (See Appendix F for further elaboration.) They characterized them as disruptive, annoying, disrespectful, irritating, bad, loud, out of control, off task, and "dorks." They also listed some of their peers' actions on a typical day in math: talking all the time, throwing stuff, saying bad words, dancing and messing around, arriving late to class, and spending lots of time in Take a Break (TAB). Spencer depicted the climate

in his math class: “Like, it's just a war inside my classroom, everyone’s throwing stuff, yelling. It's crazy. [The teacher] always screams.” Scarlett also spoke about her peers’ behavior in math and how it has affected the classroom climate.

> I also feel like they just want attention basically, like, they’ll lash out and do something stupid just to get a couple laughs, for someone to look at them, and like it's hard not to look at them because some of their jokes—although inappropriate—are really, really funny…and they’ll raise their hand just to say something stupid and then that will disrupt everything. (Scarlett)

For many, it is very difficult to focus and learn in math class because of the antics of their peers. Manny declared, pointing at Graham, “Him and I, we ask people to stop all the time. We’re like the only ones that ask them to stop doing…stuff…chewing their gum, putting their feet under our desks, annoying, talking.” Ariana shared that in her math class, she “can’t hear anything.” Bailey said, “I can’t focus ever.” Scarlett commented that it is very “hard to learn.” Ariana recalled a time when she was trying to take a test in math: “It was hard for me to actually even get one page of the test done because I had two disruptive kids sitting next to me just talking, blurting out.” Bailey added, “I don’t have enough like energy. I’m not into it. I’m just like always sitting there not trying…Because my class is really disruptive and I can’t learn anything… Once I don’t get it, I just don’t try.” When one focus group was asked whether they completed much work in math, Martin replied, “No…because people be distracting and the teacher can’t even give two questions.” Three students, Wyatt, Martin, and Madeline, admitted that the

misbehavior of their peers causes *them* to misbehave as well, which leads to even *less* learning on their part.

Several students agreed their classmates' misbehavior is preventing them from learning what they should, due to the fact that their math teachers' time and attention are totally consumed with classroom management. They expressed frustration about having to wait a long time for their teacher's help, and when they do not get it, they give up.

> There's so many kids that don't do [the work], that when they, like, when they ask for help, and if they didn't do the work that we've been doing before, it takes her forever to help them. And then she doesn't get to the people that actually need help who have been doing it. (Tess)
>
> We have to stay after the bell sometimes because they keep on talking and they don't let her get to her lesson... I sit in the front sometimes, because the kids in the, like in the back, they're always like yelling and trying to roast each other in the back and stuff. A lot of students in my class, like, they're just there to disrupt other students. They don't really pay attention and they just, like, don't care about the whole subject of math. And so they disrupt the other kids that are really trying to focus and get better at their ability in math. (Maxwell)

Willa and Maisy shared that they are currently in the same math class, and they described what it is like trying to get help from their teacher. Willa said, "I'll ask for help, but sometimes she doesn't hear or doesn't see that my hand is up." Maisy

added, "And then, she'll be busy like helping another student, and then class will be over." Willa responded, "In our class, you can't really raise your hand cuz she's always doing something, so she won't see your hand… Sometimes she doesn't get the chance to get to every student."

Students also mentioned that when so many of their peers misbehave, everyone's time is wasted, learning is rushed, and the overall progress for the semester is reduced. This is clearly frustrating for many students, and some blamed their classmates for "holding them back."

> Usually we spend like twenty minutes on the…[warm-up] at the beginning of class…and then like another ten minutes on the actual thing that we're supposed to be doing [the day's lesson]. So work time is very short and that's because of the talking kids and that. (Skyler)

Madeline also spoke of the time wasted in her math class: "If we're messing around, [the warm-up] will take like half of the class. Like 30 minutes." Scarlett talked about the frustration of not getting to all the material they need to cover.

> The tests are pretty hard, cuz like, whatever we take a test on, there will be a certain page but we never covered that… And then it'll be like the whole time when I'm doing it, like I have no idea what this is and *after* the test we go through it. (Scarlett)

Over the course of the focus group discussions, a few students began to reconsider the possible advantages of being in one of the Advanced Math classes. Bryan said, "I think I would learn more [in Advanced Math]." Others agreed that in Advanced

Math their peers would probably be more helpful when working in groups, and they would be held to higher academic and behavior expectations.

Many students suggested that classmates misbehave because they do not care, try, or believe they will ever need to know math in the future. Darla shared, "Kids in our class don't even try." There was an acknowledgment by several students that the behavior in their math classes is worse than in any other class. Bailey stated, "The kids that are in Advanced Math are better than the kids that are in Regular Math. Like with behavior." When asked how the noise level in math compared to their other classes, many agreed that math is *the loudest* of all their classes.

A second factor shaping the way students feel about their math classes is their teachers, including how they relate to students, deliver instruction, and manage the classroom. Some students shared examples of ways in which their math teachers have *positively* impacted their middle school math experience, such as communicating high expectations, showing they believe students can succeed, and demonstrating encouragement and a sense of caring for their students. Students also mentioned specific instructional practices their teachers have used that really help them improve in math. Those practices include staying after school to work with students one-on-one, giving thorough explanations to problems, even after students seem to have given up, inviting students to come to the Tier II math intervention block (RTI), and including more active learning opportunities in the lessons.

A larger number of students in the focus groups claimed that their middle school math teachers have impacted their attitudes about math in a *negative* way. A

few of the complaints centered on specific personality conflicts. Madeline and Bryan expressed that they do not think their math teachers demonstrate a belief in students' abilities to succeed in math. Madeline said, "They don't show it… They always yell at you and then send you to Time-out." Bryan said, "They don't have manners when they speak to us." Wyatt shared a wish that his teacher would "stay calm" in class. For some, the problem lies in the stringent rules their math teachers have, for example, prohibiting students from talking with peers or walking to another part of the classroom to get help. When asked if there were student leaders in her class that could help others, Eliza said, "[My teacher] doesn't always let us… We're not allowed to get up and walk around." Renae remarked that one problem in middle school is that teachers cannot really get to know students or learn how to best help them "because they only [have students] for one hour, you know." Bryan bluntly stated that his math class has been bad this year simply because, "I just don't like the teacher."

Students were even more critical of the teaching practices used by their current math teachers. Some of that criticism called attention to their teaching style. Madeline said, "It's boring… She don't know how to teach." Nathaniel shared that his math teacher "talks too much," to which Andrew added, "[she] keeps on repeating and repeating and repeating." Many students mentioned the annoyance they feel when working in cooperative groups, mainly because no one wants to do the work. Noah described a typical day in math:

Worksheets and then we work on it for five minutes. And then the teacher is

like, "You're supposed to be done by now," and then we're not done. And then we talk about it, and then, and then I'm bored, yeah. (Noah)

Other students, like Trevor, were more critical of their teachers' lack of response to their needs: "When I ask a question, and somebody else is, like, somebody else calls her name, she just walks over there and just stops explaining to us." Bailey, who has the same teacher as Trevor, agreed: "Yeah, and she'll be like, 'Oh read it and figure it out'. And I'm like, 'I tried that.'" Bailey said that when that happens, she just stops trying all together. Other students were not happy with the way their math teachers rush their lessons. Wyatt said, "This year, they just like…they're just going fast." Andrew complained about how his math teacher "only gives like four minutes to work at the end of the class."

By far, the teacher practice that has left the biggest impression on these middle school students has been their mostly ineffective classroom management. As stated above, students spoke very negatively of the behaviors in their current math classes. It appears that many of them lay the blame for this squarely on their teachers. Some said that their math teachers "spend too much time on discipline," and that it is obvious they are "frustrated with student behavior." Willa stated, "The teacher can't teach you because she's distracted by everybody else." Scarlett touched on this as well, saying, "When the teacher's talking, she has to pause constantly." Spencer described how his math teacher sometimes reacts to students' behavior: "Her face becomes red, and then she starts yelling… I feel bad for her." Willa added: "Yeah, I feel bad, because, like, she always asks us like what can *she* do to be a better teacher,

and honestly, it feels like, what can *we* do to be a better class?" Anthony indicated that his math teacher often gets very upset: "One time she almost cried…did start crying." Some students shared examples of what they characterized as their teachers' unsuccessful discipline strategies, like leaving the room and slamming the door, getting really mad and yelling a lot, requiring them to put their heads down on their desks, and sending students to Take-a-Break (TAB) time after time. For some, the most significant problem with discipline is that students are not held accountable for their behavior, or as Trevor put it, his teacher just "lets everything slide." Bailey agreed.

> The teacher, like, lets all the bad kids, like, take away our time, and it's really unfair to us. And we're just, like, sitting there trying to learn, while they're, like, slipping away with talking, and doing, eating, and doing all this other stuff. (Bailey)

Anthony added, "They think they can do whatever they want."

***Findings for research subquestion a.*** Question: How do these students personally feel about math and their school experiences in math class? Finding: Although students' feelings about math are generally positive, their experiences with math at the middle school level have been very unpleasant.

There has been much elaboration on students' feelings about math in previous sections. To reiterate, with a few exceptions, students overall seem quite upbeat about the math experiences they had in elementary school. The negative feelings they currently have do not seem to date back many years. With most of the students

involved in this study, the negativity toward math seems to be more associated with their experiences at the middle school, specifically with their current math classes and aspects related to it, such as peers, teachers, and programming.

> I used to love math and I used to be super good at it, and now I'm just like really good at reading and everything. I used to be really, really good at math and I really liked math, but now, like since I came to the middle school, I just…blech (unidentified noise). (Bailey)

> I've been doing the Advanced, and like Advanced Language and Literature, Advanced like Math, and stuff. Like I did challenge, like GT in elementary school. But then in middle school, I just, I don't know. They just made it so boring. So yeah. I did Advanced Math last year. It was pretty easy, but now this year I do Regular Math. (Darla)

When students shared stories of their school experiences in math, many of them focused on the math programming at Sagepond Middle School, both the class structure and curriculum. One issue that students raised was the organization of math classes by ability level. Several spoke of the student populations in their math classes and seemed to agree that most of the students in the school who struggle to control their behavior are in Standard-level Math.

> Since I was always really bad at math, they'd always put like the behavior problem kids in my math class, so it was kind of an issue, like talking…there was always talking, too much talking, too much behavioral problems. That's the math class that I was in. (Renae)

Maisy and Nathaniel both wondered whether the school "purposely puts students who are distracted in the Regular classes." Eliza quickly countered by reminding them that everyone gets to make their own choice about their math classes. However, as a few students pointed out, the school policy requires reassigning students to Standard-level Math if they are unable to maintain the high grades and fast pace of Advanced Math. Hence, there really is not much choice after all. Several students speculated that their experiences in math would be very different if there were mixed-ability classes.

> I feel like if it was balanced out with like the kids that really wanted to learn and stuff, like that there wouldn't be as much like chaos going on, and then also I just feel like it would benefit everybody else, because like, right now, there's like one or two kids that people go to like hear, go to like figure out things and ask questions. But if there was like the Advanced class kids mixed in, then there would be like one person at every table that could like help people. (Eliza)

While recognizing that mixed classes might have positive effects on their learning, some students maintained that they *already* feel unable to keep up, even in Standard-level Math. Renae said, "Middle school math [is] like really, really hard…the way they [explain] it." Chase stated that "the math problems and the people" make his math class "hard." Both the pace and difficulty were mentioned as reasons for students staying in Standard-level Math, which, according to Noah, is the class for students who "don't care as much [about math] as [the students in

Advanced] do." Some students cited the difficulty level of their current math class as the reason they give up so quickly.

Students also drew stark contrasts between their math classes and other classes, including Advanced Math and classes in other subject areas. When asked whether they thought the Advanced Math classes were the same or different with respect to the number of disruptive students, several students answered loudly and in unison, "Different!" When asked *how* they are different, Nathaniel said, referring to the students in Advanced Math, "They're too smart." Maisy described those in Advanced Math as students who, "actually want to learn, like, they picked Advanced to learn." Willa said, "Like, they always do their work... They're more motivated to do well." Eliza conjectured that students in Advanced Math are driven to get good grades, and Colby stated, "Like, they do like everything the teacher says." Maxwell speculated about the class climate of Advanced Math: "I think it might be a little less disruptive, because the loud kids are usually the ones that don't really care about math. And so why would they pick the harder math if they don't really care about the Standard Math?" Graham also talked about the overall environment within the Advanced Math classrooms: "It's calmer in general." Skyler stated, "I have a friend who's in the Advanced [class], and he said that it's way less loud than mine."

Some students attributed the difference in classroom climate to the teachers, claiming that in higher-level math classes teachers have better classroom management skills, or at least they hold students to higher behavior expectations. Darla shared that when she was in Advanced Math class, she often witnessed her math teacher easing

up on the rules for her Standard-level classes. She stated, "She would do, like, you could tell, you could tell that she was a little more loose and lets the lower class do more stuff." When the researcher followed that up with the question, "Like get away with more?," Darla answered, "Yeah." Tess talked about how teachers treat Advanced students differently: "They treat them with like different respect. Yeah, they treat them better and different respect than they do with just Regular Math, because they think that like, like, [Regular Math students are] not smart or they don't try." When asked if their math teachers have high expectations for students in their Standard-level classes, Randal replied, "They do, but they don't care as much if [we] get it." Andrew claimed that his math teacher lowers expectations for how much Standard-level students can learn due to all the disruptive behavior. Trevor stated, "Especially cuz she knows other people aren't working, so she gives us the easier papers that they can easily do, but they still don't do them. It keeps going down, but we need to go up."

Some students compared the behaviors they see in their math classes to what they see in their other subject area classes. Many concluded that their math classes have the worst behavior of all their classes, by far. Maxwell stated, "My science class, they're really quiet and respect the space and everyone in there, but in math everyone's loud and they don't let you focus on what you're trying to learn."

One idea that came up throughout the student focus groups, which has not been elaborated on thus far, is the wealth of ideas that students have about how to improve their math classes. Many students named characteristics they wished their

math teachers had: flexibility, patience, a calm demeanor, and a caring nature. Trevor said he prefers a teacher who is "strict, but nice." Bryan wished that his math teacher would use "better manners" and treat him with greater respect. Manny complained about his teacher's lack of encouragement: "She's never said good job to me since the beginning of the year." Madeline expressed a desire for her teacher to "not give up" on students. Finally, Colby would like his teacher to "explain things better."

Some suggested that teachers change the types of activities they do in math class and teach in a more engaging way. Randal recommended making math more hands-on, while Maisy wished it were more visual. An example students gave was being allowed to work out their problems on the white board. Oliver proposed that they should play more games. Wyatt expressed a desire for math to be more fun, include more active learning opportunities, and allow for more small group work with peers of their choice.

Not surprisingly, many of the students' suggestions for their math classes were aimed at improving classroom management. Students mentioned the need for teachers to hold their classmates accountable for not paying attention, expect more work out of all students, and create and enforce seating charts. Several students asserted that things would be better if the composition of students in Standard-level Math classes were different. Willa explained one of the problems of separating students by ability: "It's probably also because of the way that like the Standard and Advanced are kind of split up. I feel like [Standard-level students] feel like there's lower expectations so they don't really have to do it." Trevor recommended

balancing out the classes (with regard to ability level).

> I know it's not a bad thing, but, like, I feel like if the kids from Advanced Math were in my class, I could, I could maybe learn a little bit better cuz they're not talking the whole class. Like [the students in Standard-level Math] never stop, even when the teacher gives them warnings. (Trevor)

Tess argued that if there were not so many students needing help all at once, her math teacher would have time to give her the help she needed.

***Findings for research subquestion b.*** Question: How do families influence their students' attitudes toward math? Finding: Parents' intentions are to pass along to their children the idea that math is important. However, their actions and strong opinions may contradict their intentions.

There is evidence from both the student and parent focus groups that families have a great deal of influence over students' attitudes toward math. Because the viewpoints are unique to each particular focus group, the responses to this question have been organized into two sections: one from the students' point of view, and the other from the parents' point of view. Just like with previous research questions and subquestions, the student responses seem to break down into two separate categories: attitudes about math in general and attitudes about their current math classes.

*Students' point of view.* Generally, students hear the message from parents that math is important. As mentioned earlier, of the 28 student responses to the question, "Do your parents think math is important?," 25 (89%) said "yes," one said "kind-of," and two said "they don't care." A smaller majority (16 out of 26, 62%) of

students said that at least one of their parents or a close family member was "good at math." These numbers indicate that most parents attempt to encourage their children to value math and give it their best effort. The two outliers indicated that they do not get much encouragement from their parents. When Manny said, "Some parents and families just doubt their children that they're not going to do well," Ariana stated, "My family does that sometimes." Randal said, "My dad…doesn't really care. Like he cares if I do it, but like, if I get like a C or higher, he's fine."

When asked to describe how their parents impact their current situations in math, students were not entirely complimentary. Only ten students out of 27 (37%) said that their parents are able to help them with math. Eight said they have to seek help from someone outside of the family; five said that *no one* is able to help them with their math homework; and seven said things similar to "my parents confuse me," or "when my parents help me, I get it wrong." A few students pointed out that their parents are not able to help them due to their very abbreviated schooling when they were young. Others said that their parents are too busy to help with homework. Several students had stories about how frustrating it has been when they have sought help from their parents. Andrew said, "My parents confuse me." Eliza complained that her dad "over-explains things…what could have been like a 10-minute problem is like an hour." Chase and Bailey remarked that they get very irritated when they work on math with their parents. Several students said their parents make excuses for not being able to help them, such as they have forgotten the math, math has changed too much since they were in school, or they would rather do English than math.

Many students listed other resources they have had to use to assist them with math at home, because they are unable to get help from their parents. Those resources include telephones, calculators, videos on the internet, and neighbors.

*Parents' point of view.* The parents involved in the focus groups overwhelming agreed that math is important and should be valued by their children. One clear indicator of that is their participation in this math-related focus group. However, to get a complete view of parents' influence on their children's attitudes toward math, it is necessary to elicit further details about the math-related interactions they have with their children, as well as the degree to which they are involved in their children's math experiences at school. Parents' actions, or lack thereof, could possibly be just as influential on their children's attitudes, or perhaps even more so, than the messages they verbalize in a focus group.

Generally speaking, the parents involved in this study admitted that they help their children very little with math. For some, the reason is that their children rarely bring home a textbook, homework, or anything math related with which they require help. This is a source of frustration for those parents. For others, the most significant hurdle is what they described as their inability to help their children with math. Carlee reported, "I feel ineffective because I can't help him, because I don't understand… There's like an underlying frustration between parent and child–in our house at least–and I can't help him." Patrick concurred: "Yeah, I wish I could help [my daughter]." Several parents expressed exasperation about how much math has changed since they were in school. Beth uttered, "I hate New Math. I cannot stand

the way they teach math." Neil and Margaret complained about new ways of multiplying, such as using repeated addition and area models. Carlee said, "I feel like the math that they're teaching these days, it's like, 'What?' It's not how we were taught math." Parents also shared experiences of frustration in trying to help their children. Carlee said neither she or her son are clear about what his math teacher wants when she requires him to show his work. Beth and Neil spoke of their irritation that their children will only do the math the way their teacher does it, and get confused if they show them any other way. Beth said, "That's the thing. We're all doing the math and we're showing the work how we all learned how to do it. 'Oh my God (imitating son)…but that's not the way the teacher showed us!'" Neil agreed, with a note of cynicism in his voice: "If the teacher says something, then by God, that's the way it's supposed to be done."

Parents also shared that when things do not go smoothly working on math at home, their children get very negative, impatient, and down on themselves.

> Like, it feels at times foreign. Like, he'll come home and put a problem down in front of me, and I'll be like, "Oh yeah, do it this way", and [he] goes, "No, no, no. That's not how you do it!" And I'm like, "Oh my God." (Carlee)
>
> It's over my head, and that's just the biggest frustration…and [my daughter] sort of picks up on my frustration and then that doubles her frustration because there's no one to help her. And so it just is a nasty cycle. And then she says, "Oh, I'm a failure. I'm stupid"…and I go, "Please don't get negative on me on it, because of my failures." That's what I tell her. But I think just

cognitively she can't understand that. (Patrick)

Such failed attempts at helping their children with math have left parents feeling sad, helpless, and very discouraged. Neil added his opinion that part of the problem is that math is made more difficult by what he referred to as political correctness. He declared, "All because in the name of political correctness and multiculturalism and making sure that everybody's comfortable and they're seeing names that they can relate to, puts up so many barriers to our children."

Despite their limited opportunities or capacities to help their children with math schoolwork, parents did speak of their efforts to talk with their children about math. Those conversations sometimes focus on encouraging their kids to do well in math.

> I really, really encourage him. [I say], "Chase, you could be in the most advanced math in the world and count on your fingers, and if you can figure out a path to get to that right answer, do it. Don't worry about how you get there." (Julia)

Margaret said she tries to emphasize to her kids that grades are not the priority. She tells them, "Do the best you can, and on homework, if you don't get it finished because you don't get one, that's your teacher's responsibility." Carlee described how she talks to her son about the importance of math. "We talk about how I do math every day in my job…and how it's important because I am doing math every day…and I'm so glad that I paid attention [in school]."

Several parents said that their conversations often concentrate on how things

are currently going on in their children's math classes. Some mentioned that their children have commented on the climate within their math classrooms. Julia recalled that her son has talked about how hard he tries in math, but "he feels like it still doesn't matter, because other kids are being disrespectful. Other kids are being loud." Katherine reflected on what she has heard from her grandchildren: "Maybe behavioral issues do come into play and affect their grades a little bit, because, yeah, not being able to focus and stay on task and stuff like that, I know…has challenged them." Beth said that one thing her son has complained about is the strict rules in math class, like not being able to talk with peers. Other parents said they have heard little to nothing about the other students in their children's math classes.

Some parents shared remarks they have heard from their children about math in general. A couple parents described those comments in positive terms. When asked whether her grandson likes math, Katherine said, "Yes, he generally does. He enjoys it… He likes working with numbers. He likes abstract stuff." Patrick shared that his daughter has really changed her attitude about math for the better because of recent support she has received from a friend. "Having a successful student in math really helped my daughter. It changed her attitude. And yeah, just having her have a better attitude I think really helped her… It just seemed to be night and day."

However, there were some parents who painted a bleak picture about how their children feel about math in general. Margaret talked about her son's self-doubt: "He thinks he's dumb, but he's not a dumb kid." Julia became emotional when describing conversations she has had with her son.

> [He says], "Math is really hard, mom. Mom, math is really hard for me. Mom, you know math is hard for me. Mom, you know math is confusing. Mom, you know I don't get math… I'm dumb at math… I don't understand math. I'm too stupid for math." (Julia)

She also described what she has witnessed when her son works on math at home.

> He doesn't quit… He is resilient. You know, he does completely believe that it's hard, but he does keep trying… I would define him as someone who still doesn't have his foundation… He doesn't even want to attempt to solve the higher-level questions, because he'll sit at the table and kind of use his fingers to count out. Like he doesn't even want to start because he's embarrassed to do that... He really struggles with remedial things. (Julia)

This prompted other parents to share similar episodes in which their children have gotten down on themselves because of math. Parents indicated that their children are keenly aware of the fact that they are in the "lower math class." They get down on themselves because they are in Standard-level Math, and some are in the remedial (Pi Math) class as well. Julia said, "They *do* know that they're not where they would wish to be." Beth talked about the elitist attitude of the students in the Advanced Math classes: "You can *totally* see that at the school… You can see the groups. You can see the cliques. You can see the GT's. And they are–they don't mix. They stay up with their GT's."

Another topic parents discussed was their level of involvement with the school math program and teachers. Generally, the parents involved in this study do

not play a particularly active role in deciding which math classes their children take, nor in communicating with school administrators or teachers about math. Two of the seven parent participants had no idea which math classes their children were currently taking. Four of the seven could identify the class as simply "Basic Math 6" or "Math 7 Regular," without much knowledge of what that course covered, or where it would lead in the coming years. As stated above, many parents have heard their children describe their math abilities and/or school experiences in a negative light. Parents also expressed their own confusion about the way math is taught, frustration at the lack of math work being brought home, and concern about student behaviors in class. Yet, when asked whether they have communicated their concerns about their children's challenges in math to their math teachers, the majority of parents said they have not made any telephone calls to the teacher this year, and only one of the seven has communicated via email. Some explained that this is because they expect their children to take responsibility for communicating their own concerns to their teachers, now that they are in middle school. Others did not provide a reason.

To understand the full extent to which parents may influence their children's views on math, it is necessary to understand some of their own attitudes and experiences. It is unclear to what degree parents' attitudes get passed along to their children, and indeed, that was not an explicit focus of this study. However, one can surmise that parents' feelings and ways of projecting those feelings have at least some impact on their children's attitudes. For example, through everyday conversation, parents may reveal to their children some of their own negative experiences in math,

which can affect how students themselves feel about math. Most of the parents in these focus groups stated that they have grown to like math in adulthood. However, when asked, "Did you like math as a child?," five out of six (83%) parents replied with an emphatic, "No." They also described some of their childhood experiences. Carlee said, "I just hated all of it." Katherine remembered math class being "boring…with a lot of repetition and…memorization." Moreover, Katherine said that when she was in school, "the focus was mainly on boys and math," and she does not "remember a lot of girls getting called on." Margaret recalled that once she reached geometry, "It was done. I was done with math, because it was just, you know, just a bad experience." Julia described her childhood experiences with math in great detail.

> My entire life I was terrified of it. Hated it. Did not think I could ever even begin to possibly understand anything beyond basic math skills of addition, subtraction, multiplication, and division… I had a little group of friends and we said that we were all in the "dumb-dumb math group," but we totally supported each other and we weren't teased. But I loathed myself for being in that group, for sure. (Julia)

Some parents admitted a preference for language or art classes when they were young. For example, Katherine described reading, English, and other subjects as much more interesting than math, and more "on a personal level." Some indicated that their children have this same preference. Carlee, for instance, characterized her son this way: "He's an art brain kid, he's not a math and science brain kid." Patrick said, "My daughter is really good in literature and civics and that side of things."

Some students indicated that they characterize themselves in the same way.

> It's easier in art than it [is] in math, because there is right and wrong in math. And math is just so…I struggle with it a lot. I don't know why, I just do. I don't get math by myself as much as I do in other subjects because it's so hard. I just don't like it, you know. I'd rather do English than math. (Renae)

A theme that came up repeatedly and with considerable emotional emphasis in the parent focus groups was their distaste for the math education their children are receiving at Sagepond Middle School. This was evident in their comments about the math teachers, curriculum, and class structure. Several of them aimed their criticism at the teachers, citing their inadequate directions on math assignments. Neil spoke out against the way teachers are making things difficult through what he called, "idiotic thought processes." Consequently, parents do not know how to help their children approach the problems, work through them, or show their work. Margaret specified that parents should be able to demand more of the school, voicing things like, "This teacher is not working for my kid… They teach in a way that he's never going to understand, so it's been a waste of a year." Several parents implied that their children's math teachers are inflexible because they demand work only be done a certain way. Beth cited an episode in which her son rejected her help because her way of doing the problem was, in his words, "Not the way the teacher showed us!" To be fair, there was one parent, Carlee, who spoke very highly of her son's math teacher, saying her work is "beautiful" and "she is very available" to help students.

Several parents criticized the difficulty level and fast pace of middle school

math.

> [My son] did really, really well until…this is the first year that we've really seen him struggle with math. Otherwise it's always come really quickly to him and he's been able to just kind of go with whatever, but this year it got difficult. (Carlee)

Margaret gave her opinion of the difficulty level of middle school math today: "It's more advanced than I think that they have the concepts [for]." Julia concurred.

> I know for Chase, it's too advanced… Seeing some of the things that he is asked to do, is really laughable. And I still try to help him, but it's very, very laughable. I know…it's like…would be like someone handing me, "Figure out how to send the Space Shuttle to NASA. Just sit down at the table and do that. Keep these people alive on their journey." (Julia)

Margaret recalled a time that a neighbor, whom she described as very proficient in math, was surprised at the complexity of the math homework her son had at his current grade level. She agreed with her neighbor.

> Kids are struggling sometimes because they're trying to teach them so fast that they're not getting the basics. Like, they're going through it so fast that these kids…their heads spin. And, you know they test out of it, and it goes out of their mind. (Margaret)

Beth added, "Because they move on so quickly…they're not getting that repetition in grade school enough." Margaret added, "And maybe that's why kids are getting turned off by math."

A few parents spoke more specifically about the curriculum being used at Sagepond Middle School. Beth and Julia complained about the textbook and online resources. Several parents remarked about how confusing math seems now, compared to the procedural methods they learned as children. They complained that their children have never learned their multiplication tables, because it is not required, as it was for them. They also expressed displeasure about the lack of explanation in the textbook or from the teacher. The idea of students being presented with a problem, exploring different strategies, constructing their knowledge, and discovering possible solutions did not seem to resonate with them. Julia said, "I don't feel like you can discover math," which provoked a round of laughter by the rest of the parents at the table. In the opinion of several parents, what their children need is more drill and practice with math facts, including using flashcards. Katherine was an outlier in this category. She said she thinks that math "is taught a lot better [now]," adding, "I feel more relaxed about math. I feel more informed… It's more self-explanatory." She also said that the math problems her grandchildren are doing seem more applicable to real life, and are not as threatening as they were when she was in school.

Questions about the class structure within the math department at Sagepond Middle School also triggered strong emotional reactions on the part of some parents. Some of them questioned the soundness of organizing math classes by ability level. Katherine recalled hearing both her grandchildren talk about how there were a lot of students "acting up" in their math classes. Neil characterized the ability grouping as a stigmatization of children: "It isn't that we group kids together. It's that it becomes

stigmatized and so…it becomes a competition. 'Oh, well, you're in the good group or you're in the bad group.'" Beth and Margaret agreed with him whole-heartedly. Beth spoke of the how aware her kids are of the different levels, especially if they are not in the GT classes. "Those kids are…they're picked out and they go to a special teacher and they get, you know, special privileges." She also complained that the school starts leveling children by math group at a very early age. One of the pitfalls of that, according to Margaret, is that "middle kids get lost [in this system]," because the struggling students and advanced students get extra classes or privileges. Julia wondered how things might be different for her son if classes were more blended, or if he were given an opportunity to take some of the higher-level math classes.

> I do frequently wonder if the student who is mid-range or even low mid-range was placed in a class like that, given that extra attention, given a teacher who's not surrounded by a group of students who are maybe more challenging to teach, if that teacher would be able to get through to my kid in a way that a teacher in a different classroom isn't able to. I do wonder if Gifted and Talented students…not only do they already have a little bit of a leg up in that their skill set is a little bit more from the get-go, then having things along the way that have set them up for success. But then they also have a teacher who is maybe not quite as exhausted, maybe not quite as burnt out, as the teacher who's got a classroom full of kids who, they could not care less. (Julia)

Even though Sagepond Middle School now uses a self-select program (where students register for the course/level they want), Patrick stipulated that that does little

to change things. Many of the same students still end up in Standard-level Math classes, and many of the more advantaged students are placed in Advanced Math or GT math classes.

> That separation, or the…I think it's coming sort of from, you know, a certain, you know, I'll say it, a certain privileged class that is able to go and get the ear of the administrator and say, "Oh, I want my Gifted and Talented child or my exemplary child [to receive] a little bit more help"… The privileged few, you know, the one-percenters, they have the time and the ability and the money to be able to get that, and take time off to advocate for those things. (Patrick)

Margaret was very adamant that this current system is not working for her son, who has the remedial Pi Math course in addition to his Standard-level Math 6 course, plus he has an Individualized Education Program (IEP) in math.

> He struggles in math and then you put this kid in two math classes a day? And they don't even coincide. Where the Special Education one should be helping extra with, following along with the regular math class, and following and *helping* with that. If he's having questions, *that's* what this class should be. It shouldn't be two separate extra math. Well, you know what? Guess what? That kid's going to hate math. (Margaret)

Most of the parents agreed that the math assistance offered after school at Sagepond Middle School is not helpful.

***Findings for research subquestion c.*** Question: How do the messages they get from teachers influence their attitudes toward and confidence level in math?

Finding: While many students indicated that their teachers encourage them when they interact one-on-one, there was a consensus among students, parents, and teachers that teachers are not able to give students sufficient time or attention to positively impact their attitudes toward math.

Again, it is difficult to answer this subquestion in one all-encompassing block of participant answers. It is insightful to hear responses to this question grouped separately, from the points of view of students, parents, and teachers.

*Students' point of view.* Although students did fault their teachers for many of the aspects they dislike about math, they generally agreed that their teachers are quite encouraging when they speak directly with them. Willa mentioned that her math teacher communicates very high expectations for her, even higher than the expectations she has for herself. Other students described their math teachers as caring, friendly, and supportive. For some, the fact that their math teachers are willing to work with them after school, or pull them for RTI once a week, demonstrates that they care about and believe in them.

Even though many students spoke positively about their one-on-one exchanges with their math teachers, most students stipulated that teachers have little time to help individual students. Due to the abundance of classroom management issues in Standard-level Math classrooms, teachers spend much of their time dealing with students who are disruptive or off-task. Furthermore, in classes with large numbers of students who are in constant need of help, it impossible for teachers to connect with everyone, which leaves some students feeling helpless and annoyed.

Renae remembered that lack of teacher assistance when she was in middle school.

> Actually they helped as much as they could, but there were so many other kids that they couldn't. You know, there were so many other kids that they…that struggled with math. I didn't ask… I needed constant assistance. And they couldn't give that to me because there were only two teachers. There was the regular teacher and the para… And since there were only two of them, and not 30 of them, they couldn't just help me and not other kids. And when I raised my hand, I need constant assistance, like I said, cuz I don't have a lot of patience, apparently, and sometimes when things are just too hard I give up trying. (Renae)

Maisy reported that her teacher often does not make it around the room to help everyone either: "She'll be busy like helping other students, and then class will be over." Nathaniel noted that sometimes, when he needs help, his math teacher "just walks past [him]." Willa added, "In our class, you can't really raise your hand cuz she's always doing something, so she won't see your hand." When asked if their classmates' behavior and constant demands prevent them from getting the help they need in math, several students yelled, "Yes!" For those reasons, many students said they believe their teachers have lower expectations overall for students in Standard-level Math than for students in Advanced Math.

*Parents' point of view.* As stated earlier, parent focus group participants were quite critical about the math program at Sagepond Middle School. One of the opinions that parents conveyed is that students are being taught math ineffectively.

Some feel that teachers do not provide sufficient help and expect students to come up with strategies and answers on their own. Another common theme in the parent focus groups was that students are expected to do their work in a way that is unfamiliar to parents. Because their children have expressed a stubborn refusal to solve problems any way other than "the teacher's way," parents blame teachers for being inflexible and for demanding students do things in a way that seems foreign to parents.

*Teachers' point of view.* While it is difficult to determine, simply by talking to teachers, which of their messages students are really taking to heart, it is helpful to at least hear what teachers *attempt* to communicate to their students in Standard-level Math. According to teachers, they are very intentional about speaking positively to students and making personal connections in order to individualize their learning. Ms. Hannon described in great detail the "pep talks" she often gives to her math class, including stressing how important math will be for their future. "[We] have a whole conversation about if you don't do well in sixth grade, do you think seventh grade is going to be easy? And then eighth grade, and then what happens when you get to ninth grade?" Ms. Foster and Ms. Samuel spoke of the importance of really getting to know students, in order to encourage each one in a fruitful way. The teachers in the focus group seemed to agree their own attitudes matter, especially in Standard-level Math. They believe they need to convey a sense of excitement about math and act "way more excited" when their Standard-level students succeed. Generating excitement or even interest in math among students in Standard-level Math involves personalizing their learning, such as naming a problem-solving strategy after a

student in the class, as Ms. Samuel does. Ms. Arndt said that even at the middle school level, students want activities that are concrete.

> My 8th graders want to cut brownies. You know? They want to do fractions. You know? They want to see. They want to do things that are way more concrete, and sometimes it's really hard to make going between standard form and y-intercept form really concrete. (Ms. Arndt)

Ms. Samuel asserted that with her Standard-level students, "It's more important that they get their feedback *sooner* than my Advanced kids." That way they can immediately see their successes or fix their mistakes, which can inspire them to stick with it. Ms. Arndt shared how effective it is in her Standard-level Math classes to recognize students in front of the whole class, like when they are ready for the next activity, or when they have successfully solved a problem. She said, "And, you know, it's frightening that it works with *all* of them." Ms. Foster agreed.

> Then helping them recognize that they *had* success, and helping them take that moment to *reflect* on that success and recognize, like, internally, like what does that *feel like* for them? And like *literally* just giving them the space to contemplate that for a moment, because then they can feel it, and they will want to achieve that feeling again. (Ms. Foster)

Ms. Hannon spoke about her attempts to motivate students to participate more in class. She said she emphasizes with students that asking questions is a way to grow, and that their classmates actually think students who ask a lot of questions are "the smartest kids in the class."

As intentional as these math teachers are about building relationships with their students, personalizing their learning, and encouraging them to believe in their own math abilities, they recognized that they do not have nearly enough time to help all students in their Standard-level Math classes. According to Ms. Keys, there are very few students in Standard-level Math that are self-directed learners. Many of them depend on hearing individual explanations before they even get started on their work. When they have to wait too long for that help, they lose patience and start to amuse themselves in other ways.

> It's just…with 34 kids…when one kid *pops*, there's…there's 33 others to pop off of that. You know what I mean? So…it's not the number of kids, you know, so much that you can't get to them. It's the fact that someone's going to do *something*. Yeah, it's like Whack-a-mole, and it's a lot faster Whack-a-mole. (Ms. Arndt)

Ms. Ladd related what she imagines her students are thinking in those situations: "Oh, if I don't get it, and she's…Ms. Ladd is helping someone else, I'm going to just go and bounce a ball off the wall, and do something…(laughter from other focus group members)…you know, find something else to keep myself busy." The consensus among teachers was that providing this one-on-one service to all students is unrealistic. In addition, it is difficult for teachers to enthusiastically encourage each individual student in class when they spend most of their time and energy on behavior.

> I know my energies are mainly spent on those kids, the beh-…who have the

behavior problems. And, I mean, on any given math period, I know I spend *way* more time with those kids than the kids who-…maybe not even the top kids... but the kids who are, like, right in that middle, who need just a little bit of help and they would just be very successful. And I'm not able to, because I'm controlling behavior. (Ms. Ladd)

**Emergent themes.** As with most focus group research, themes emerged which were not anticipated at the beginning of this study. Those themes have been broken down into three categories, Emergent Themes 1-3, and are described below.

***Emergent theme 1.*** Finding: Teacher perceptions of the middle school math experience for lower-level students confirm much of what students said, except that teachers frame it more in terms of a general attitude toward math as a subject area, rather than an attitude about their current math class.

The descriptions that teachers gave of their Standard-level Math classes were very similar to the descriptions given by students. According to both groups, students in Standard-level Math are dependent on the teacher for constant individual help, and when they do not get it, they misbehave. Moreover, they do not want that help from peers. They want it from their teacher.

The more advanced kids are able to work in a group. They listen to each other. They ask each other. And in the low group they…why… I've heard this from multiple people, either directed at me or directed at other teachers (representing student's voice), "[*My classmates*] are not supposed to be teaching me. *You* are. *You're* the teacher." And what that means to them is,

"I want my *personal* time with you. I'm not even going to listen when you do a full-group introduction, because I want *you* to work with *me.*" (Ms. Arndt)

Ms. Keys confirmed this: "Unless you're standing right there, they don't feel they can do anything." Ms. Hannon added that this has everything to do with students' confidence levels.

> What I've noticed is like with my students, if, if they feel like, if they *believe* that they *can* do it, they are *very* successful. They might not get it right away, but they aren't going to give up, and they're going to ask *great* questions, and they're going to focus and they're going to try really hard. And even if they don't get it right away, since they believe they can do it, they don't get frustrated and quit. And my students who *really*, like they have this thought in their mind, like, "I cannot do this," they just give up and just melt down…. And that's what I'm noticing a lot of my kids doing. They…they're lower-level, and so they're struggling, but then they convince themselves they can't, and that's the roadblock. (Ms. Hannon)

Some of the comments made by students confirmed that without their teachers' help, they do, indeed, give up. Wyatt implied that when his teacher does not help him, he has little hope for solving math problems. "If I don't get something, I just stop it, and if she still doesn't answer, then I'm just, yeah…"

The word "confused" came up often with teachers, just as it did with students. Ms. Foster described the situation of the lowest-achieving students in her math classes.

> I don't know how they could possibly feel like they like math, because it's *so hard* for them, and they are lost, and it's like, no matter what they try, they just have no idea what to write. It's like totally a foreign language to them. (Ms. Foster)

Ms. Arndt talked about how algebra has proven to be especially difficult for students in Standard-level Math, because "it's too abstract for them." She continued, "Even though it's the same step, over and over, and the self-talk is the exact same for *every single* question, they just see that…they see the enormity of it." Ms. Keys pointed out that part of the struggle is that "they're not…willing to take the risk of looking dumb. That's partly a middle school thing, too, where, you know, you don't want to be…somebody that's dumb or somebody that's different." That degree of confusion and sense of helplessness prompts students to misbehave, preferring to look silly or naughty than look dumb. In spite of the confusion, frustration, misbehavior, and lack of effort, teachers seemed to agree that their students generally like math, but that they have come to think of themselves as really low. Their approach to math has become one of dependence and hopelessness.

There is a significant difference between students' and teachers' assessments of where students' struggles originated. Whereas students placed a great deal of blame on more current entities, like classmates, teachers' instructional strategies, and the math curriculum of the middle school, teachers expressed a belief that students have been harboring negative feelings toward math since long before middle school. According to teachers, many students enter middle school with low self-confidence

and a reluctance to even attempt to do well in math. For teachers, the barrier for Standard-level Math students is a general attitude or mindset about math, rather than an aversion to their current math classes.

> One of the things that I find is that they actually are way more capable than their scores are showing. But they really are not confident, and so when I sit with them and I just sit and I wait, then all of sudden, they start answering. And they *can* do it, but…and some of them are just so much *slower*. They can do it, but it takes them longer to process. And so everybody else has already whipped by, and they're like… (Ms. Keys)

Teachers think their students are exhibiting long-standing attitudes and approaches to math. They also believe that students have likely struggled a great deal with math in the past and have perhaps had ineffective elementary math teachers. The math teachers from Sagepond spoke of their students' tendencies in math class, such as giving up early, disrupting the class to avoid work, and exhibiting a learned helplessness. They characterized those tendencies as habits born long ago that continue to manifest themselves almost daily in their comportment in math. Those habits include an unwillingness to work, a mindset of "I can't do it…[so I] don't even want to try," a desire for the instant gratification that comes from just getting an answer–any answer–to a problem, an expectation that "someone will do it for [them]," and a feigned ambition to do well but not work for it. It has proven difficult to motivate many of their students in Standard-level Math, because, according to Ms. Murdoch, grades and homework do not matter to them. Ms. Foster agreed: "They

don't do work outside of class." She described some of her students in Standard-level Math as "happy-go-lucky," but oblivious to the fact that they "have no idea how to do this math."

As teachers described the habits and attitudes of students in their Standard-level Math classes, they naturally began identifying some of the needs specific to those students, as well as strategies they have used in their instruction. One struggle has been trying to meet all students' needs when, as Ms. Arndt said, they each want their personal time with the teacher. Ms. Keys added that they need the teacher to constantly validate what they are doing.

> That's that personal attention piece, and unless you're standing right there, they don't feel they can do anything… They need to feel…they need confidence. And when you're standing there saying, "You're doing it right, you're doing it right," then they're willing to go. But they're not willing to take that risk of doing it wrong. (Ms. Keys)

Ms. Samuel shared the experiences she has had in one of her Standard-level classes: "We are consistently behind in content and pacing, because of the behavior management and how much *time* it takes to get 20 out of 28 kids on task, when you only have eight self-sufficient ones." That severely limits the amount of independent or group work that teachers can incorporate into those classes. Teachers talked about some of the ways they try to meet the unique needs of their students in Standard-level Math. Ms. Foster said, "For those lower students who need more processing time, we need to allow them more time to think before we…you know, the wait-time…before

we call on people, and that needs to be routine." Ms. Ladd and Ms. Foster stressed the importance of "keeping the language basic," especially with English Learners.

> I try to be *very* specific with my language in *all* my classes. I start out my day with an EL co-taught class, but even before I came to this school, at my other school, too, like…I feel like in order to make math accessible, the first part is language. (Ms. Foster)

Ms. Samuel said that the two keys to success for Standard-level Math students are relationships and time.

> I feel like a difference, too, for motivating kids, in the Regular class, it's, "Who can I sit down *next to*, put my hand on their back, talk to them, build that relationship to get them started, and walk away?" And they're more motivated, versus, like, the kids that do *not* want you to do that [the students in Advanced Math] because that's showing that they *need* help, and they don't want any. (Ms. Samuel)

Ms. Arndt and Ms. Foster agreed.

> And they'll push you away so many times, but if you're still there when they come back, that's *so huge* for them, because there are so many… so many kids who live in houses…where they push, and that person's gone. You know what I mean? (Ms. Arndt)
>
> I think a lot of it does, too, go to relationships… The kids might be struggling, too, but, but all kids are like…they like seeing me…and we greet each other, and we say, "How's it going?"… So I think, like, we underestimate our own

just *personal, human* impact on them, *separate* from the math even. I think has a big role. But if they know, like, if they *feel* like, "Oh, that teacher doesn't like me…" (Ms. Foster)

Ms. Samuel finished her sentence: "It's over."

Teachers shared some of the steps they have taken to motivate their Standard-level students. Ms. Foster said that the attitude she demonstrates to students has a huge impact on their effort and success. "That, I think in a lot of ways, has an even bigger impact than…my math skills or my attitude towards math. It's my attitude towards them, or at least what they *perceive* it is." Ms. Arndt said that students in Standard-level Math need lots of encouraging feedback, including phone calls to parents to relay news of anything positive that the student has done. She said that after getting positive feedback, "[The students] come back for...you got them for at least two days (laughter from focus group participants)." As stated previously, many students get motivated when they receive recognition in front of the class. Another important element of teaching Standard-level Math is making the work appear do-able to students.

I think a lot of it is belief. If they believe they can do it. Then they'll generally be more positive about it. Also, some of it is novelty…especially if it looks like it's doable, then they're like, "Okay." And then they give it a shot. And usually, like once they get going, then they're fine (laughter from focus group participants)." (Ms. Foster)

Teachers also touched on the need to adjust the curriculum and activities to

meet the high needs of their students in Standard-level Math. As stated earlier, teachers shared that cooperative learning is not very effective because group-mates are often not very helpful and may not even know how to get started on a problem. However, many teachers also said that whole-group direct instruction *absolutely* does *not* work. That puts teachers at a loss, trying to find some sort of hybrid strategy to which their students will respond. Every teacher pointed to strategies that seem to have worked best in the past. Ms. Arndt said that it is necessary to give Standard-level students problems that are concrete and applicable to their lives. Ms. Murdoch shared that she gives "more scaffolds for the Regular kids." She also said it helps when students know that they can utilize a "little crutch" to help them, such as a formula sheet. Ms. Ladd talked about how she has to break problems down into smaller steps, and Ms. Hannon said that she creates packets for students to use, because they cannot manage organizing a notebook or transferring information from the text to another sheet of paper. Ms. Arndt talked about how necessary it is to present problems in language that students understand, and that it helps to simplify things into cute terms like "timesy patterns" and "plussy patterns" (laughter from focus group participants). Ms. Samuel has found "The 3-Read Strategy" to be helpful with her students in Standard-level Math. With this strategy, students read problems three times. The first time they have to answer the question, "What's this problem about?" The second time, they answer, "What numbers did you hear/read?" The third time, they must figure out, "What are they asking you to do?" With that method, students feel empowered if they can answer any one of those three questions.

It also gives students of different abilities different entry points into the problem. Many of the teachers stressed the importance of accessibility of math problems they present to their students. They mentioned that students need to understand the language within the problems, recognize ways to get started, believe that problems are doable, and actually see themselves succeeding in finding solutions.

Part of the conversation in the teacher focus group centered on what has brought lower-level math students to this point, and how that could be changed, for the benefit of current and future students. As stated earlier, teachers placed a lot of blame for students' negativity toward math on prior experiences they have had in school. Ms. Keys talked about how many elementary teachers are "math phobic" and therefore do not give students a strong foundation in math. Mr. Parker contrasted that to the strengths of middle school math teachers:

> We're lucky… I think we're enlightened with CMP [Connected Mathematics Project], and how to teach it, and the whole idea, which goes exactly with the NCTM Standards. I mean they are talking about…how math should be taught, exactly that…[students are] the ones doing the discovery. They're the ones doing the explaining. That method of teaching: the constructivist idea is…key, and it just does not exist in the elementary school. There's only *one* way to do it. There's the teacher's way. He or she can't explain it. This is just how they were taught. And this is what you have to do. Or (expressing what an elementary teacher might be thinking when teaching math), "I don't know what they're doing here in the textbook, so I'm going to change it." (Mr.

Parker)

Ms. Samuel added, "And a student can present another *creative* way, and the teacher doesn't recognize it for the value that it is, and dismisses it cuz it's not *the* way to get the right answer." Ms. Murdoch brought up that "math is so successive," so that if students miss out or do not understand an important building block, like those introduced in elementary school, and "if they get lost along the way, like they have such a harder time coming back up." These particular middle school math teachers would love it if students arrived at the middle school with more experience in problem solving, stronger number sense, the ability to explain their answers, and just a greater love for math. Teachers also placed blame on society as a whole, for making it acceptable for people to dismiss math.

> I think there's a big component…that our society kind of accepts it if you're…not a strong math student… And so I think, too, a lot of these students come in thinking that it's okay. Like they're just getting by with the bare minimum. (Ms. Murdoch)
>
> It's too easy in our culture now to say, "I'm not good at math." And I think, um, that is the main thing that people…they…it's an easy scapegoat. And in our culture, everybody can do it. Um, everybody can use that. And then, it comes across like it doesn't matter. So, go ahead and say, "I'm not good at math. My mom wasn't good at math. I'm not going to do it. I'm not going to try." And so, giving up before you get [started], kind-of a fixed mindset idea, and a cultural problem. (Mr. Parker)

Ms. Arndt added to this idea: "In this country, if you don't get it right away, you're dumb. Quit." According Ms. Hannon, some parents feed right into these notions by telling their kids, even bragging, that they were never good at math. Ms. Murdoch recalled an experience she had at parent-teacher conferences: "I even heard that a lot at like my first round of conferences in the spring, where the parents were like, 'Oh, I was *never* good at math.'"

***Emergent theme 2.*** Finding: Teachers hold some very strong opinions about the effect that ability grouping has on Standard-level Math students.

Most of the teachers involved in the focus group have taught different levels of math over the years, including Standard-level, Advanced, Double-advanced, and Pi Math. Thus, they are able to draw from their own experiences to make comparisons and reach conclusions about the effects of ability grouping. Many of them readily acknowledged that negative, disruptive student behavior is much more prevalent in Standard-level Math than in Advanced or Double-advanced. Ms. Keys said, "We concentrated the lower-achieving and the behaviors together [in Standard-level Math classes]." Ms. Hannon added that the most disruptive behavior often comes from the students with the lowest abilities and the least hope for getting their learning back on track.

> From my experiences, I feel like a lot of my behavioral issues come from the kids who are the lowest in the class, who are not able to keep pace… They were acting out because it was better to look stupid because [they were] doing it on purpose, than to look stupid because [they] really can't get the math.

(Ms. Hannon)

Ms. Arndt agreed: "It's still cool to be naughty in middle school." Ms. Ladd talked about how her students' "behavior got in the way just because they were so low, so that was a challenge."

Teachers also made clear distinctions between the demographics of the students in Standard-level Math versus Advanced Math. They mentioned that their Standard-level classes have higher concentrations of English Learners and more students with IEPs. Ms. Ladd explained how only about *half* of her Standard-level Math class is motivated to get *anything* done. The other half is apathetic and frequently off task. Ms. Samuel pointed out that the different level classes are very racially segregated. Ms. Keys said the biggest issue with ability grouping at Sagepond Middle School is the concentration of off-task behaviors and low-ability students in the same math classes. Ms. Samuel stated, "We're spending all of our time trying to get those four kids engaged so that we *can* go take care of the other ones… We're spending all our time trying to get them *engaged* with the math."

Another topic that surfaced during the teacher focus groups was the math curriculum currently being used at Sagepond Middle School. There was a consensus that this particular textbook series, although challenging for *all* students, is especially challenging for Standard-level students.

> I think sometimes the material is unmotivating for them. You know, like, the CMP [Connected Mathematics Project] book, where it's so much words, for kids who are poor readers, that…they just quit, because they can't read it. It's

not even a matter of not being able to do it. They just…it's doing too much. (Ms. Keys)

Ms. Ladd noted that this puts up extra roadblocks for English Learners. Ms. Hannon mentioned that the layout of the text is very confusing, containing multiple-part questions and requiring students to keep very organized notes. She has seen that many Standard-level Math students do not have the organizational skills to keep notebooks, so she chooses instead to create packets. Ms. Arndt added that part of the challenge in Standard-level Math is that many students come to class without any supplies, which *rarely* happens in Advanced or Double-advanced Math. Other problems teachers mentioned about the curriculum were that it is too hard, too abstract, and "not very applicable to real life." Adding to the challenge is the pressure put on teachers to cover all the state standards prior to MCA [Minnesota Comprehensive Assessment] testing in April. This forces them to strictly follow the district pacing guide, which means rushing lessons and thus allowing less time for students to learn in meaningful and lasting ways. Ms. Foster said that she knows that in her Standard-level Math classes she gives students much less wait-time than they need to answer questions, because she has to keep the lesson moving.

> For those lower students who need more processing time, we need to allow them the more time to think before we…you know, the wait-time… before we call on people, and that needs to be routine… Especially in 6th grade, where there are so many standards and we're trying so hard to cover as *many* as we can in the course of the year, like, there's a real big push to keep the lesson

> moving. And in a lot of ways that really robs those students, because I do shorten my wait-time, because I know I need to keep this lesson moving, or we won't get through it. (Ms. Foster)

As teachers shared their experiences from their Standard-level Math classes, many of them began to take a clear stand against ability grouping, or tracking, in the math department at Sagepond Middle School. Most agreed that the way things are currently set up, with three distinct levels of core math (Standard-level, Advanced, and Double-advanced), puts students in Standard-level Math at a real disadvantage. This is because, as Ms. Keys put it, "we have filtered off all of our advanced kids." This makes the math classes the most segregated classes in the school, because even in Language Arts there are only two levels, rather than three. Mr. Parker referred to this system as tracking, which he sees as quite detrimental.

> We are really just institutionalizing racism, because we have a lot of kids that are in the Regular classes, mostly of color, and then we have the Advanced classes, which people are *choosing* to go into. Parents are saying, "Go in the Advanced classes because a lot of the kids that care [are in those classes]." (Mr. Parker)

Many teachers also pointed out that despite the self-select policy which allows students to register for whichever math class they want, students whose parents are less involved or unfamiliar with the ability levels are still likely to end up in the Standard-level Math classes. That means if parents are actively involved, savvy about school policies, and highly interested in having their children in Advanced

Math, they can register them for that class, regardless of their previous math level. This has opened the door for parents to choose higher-level math for their children for the wrong reasons, such as to avoid being with the most disruptive students. Mr. Parker believes that some parents put pressure on schools to have Advanced classes, even Double-advanced classes, so that they are able to say that their children are in the highest, fastest math group. Ms. Arndt suggested, based on conversations she has had in the past, that the school feels stuck with the situation as is. It is her impression that if Sagepond does not continue offering Advanced and Double-advanced Math classes, parents may threaten to remove their children from Sagepond and enroll them in one of the nearby, competing middle schools.

When asked to compare and contrast the different math levels, teachers were quick to point out all the advantages of the students in Advanced and Double-advanced Math. For example, Mr. Parker said that he does not have much trouble motivating students in his Advanced Math class. "In the Advanced class, I use more pressure of grading. I mean, you *can*, because they care. You know, when kids don't care about grades, and you're just trying to get them to learn, it's tougher." Ms. Samuel mentioned that the Advanced Math classes have greater capacity to do different types of activities, which makes teaching and learning more interesting. "The conversations are richer because of the kids in the group." In Advanced and Double-advanced, they can also work more productively in small groups and listen to one another explain their thinking. Ms. Arndt contrasted this with Standard-level Math.

> When you turn it over to small groups [in Standard-level Math], it's hard for them to listen to each other… With the more advanced kids, they're able to work in a group. They listen to each other. They ask each other [questions]. (Ms. Arndt)

Another advantage of the students in Advanced Math is that their classmates are more likely to help them. Students can look to one another for assistance with their work. Mr. Parker spoke of the advantage of having more student leaders in class. It allows students to turn to each other when they are stuck. It also provides more role models and examples of productive behavior so that those students who are a bit confused can follow along with someone sitting nearby. Several teachers commented on the positive behaviors of students in the Advanced Math classes.

> Most of the students in my Advanced class have pretty good self-regulation skills, so they're not going to be absolutely perfect kids and never talk out of turn or anything like that, but, like, if they get upset about something, they deal with it a little better. Or if they make a mistake, they deal with it a little better. Um, they don't walk into the room with as much drama (laughter). (Ms. Foster)

Ms. Murdoch described the environment in her Advanced Math class as "beautiful" because she sees students of varying abilities working together and figuring things out.

> And then I look at my 7th grade Regular classes, and it's such a different dynamic and, I mean, what everyone is saying, my low kids are the ones with

> the behavior issues and I just feel like I'm always neglecting my middle set of students. (Ms. Murdoch)

Several teachers mentioned the higher level of drama in the Standard-level Math classes, which means that teachers have to spend much more time responding to social-emotional needs at the beginning of class than they do with their Advanced Math classes.

> I have some of my Regular students who like can't even make it in the *room* and we already have drama. And the whole class period it's like trying to help them deescalate their own dramas, and all this other stuff…. It seems like the students in my Advanced class, to a much larger extent, come in the room *ready* to learn." (Ms. Foster)

Teachers asserted that the difference in behaviors between Standard-level and Advanced does not mean that teachers have different classroom expectations for the different levels, at least not in theory. However, some teachers admitted that they can regularly count on their Advanced Math classes to meet expectations more quickly and with higher levels of compliance than the Standard-level classes. Ms. Hannon summed up her thoughts this way: "I guess I have the *same expectations*, in terms of like, rules, but I don't necessarily *assume* that my Standard-level kids will get to it as quickly." Ms. Murdoch said that she has "more *specific* expectations for [her] *Regular* kids versus [her] Advanced classes." For example, she requires her Standard-level students to write everything discussed in class in their notebooks, just to show that they are listening. She said this is not necessary with her Advanced

Math classes, because those students are more attentive and motivated to learn. Finally, Ms. Foster shared that she spends more time working through problems with her Standard-level classes, constantly checking for understanding, whereas with her Advanced classes, she expects the students to be more assertive and notify *her* if they do not understand something.

When asked how they would improve the math achievement and learning opportunities for Sagepond Middle School students, most of the teachers in the focus group recommended changing to mixed-ability math classes. Ms. Samuel recommended decreasing the offerings of core math classes to two levels instead of three, with a requirement that students in Advanced Math score at the 98$^{th}$ percentile or above on standardized testing. Ms. Ladd pointed out that mixing the students would mean "fewer lower-level kids per class." In such a scenario, according to Mr. Parker, Ms. Hannon, and Ms. Samuel, there would be more student leaders and peer helpers to model for and assist the struggling students. Mr. Parker talked about how this could improve the math program and students' experiences with math: "All those environments could be better, and I think everybody could have a better experience." Ms. Samuel pointed out that in mixed classes, "the cusp kids (those who are generally well-behaved but get thrown off-task when classmates misbehave)…could do totally fine," because the students around them would be more focused. Ms. Keys reiterated that the lower-achieving students would also be exposed to better, richer math conversations, and peers sitting near them might be able to help them get started on their work while waiting for help from the teacher.

***Emergent theme 3.*** Finding: All three stakeholder groups gave a negative overall portrayal of their experiences with the Standard-level Math classes.

The final theme to emerge from this study is one that was communicated during each and every focus group: the experiences these stakeholders have had with Standard-level Math *have not been positive.* Stakeholders point to a variety of reasons for their negativity, many of which have been described previously. However, it is worth pointing out that the common thread flowing through all conversations was the negative experiences that participants are having related to the Standard-level Math classes. It is also useful to review a brief description of the sources of that negativity.

*The stigma of Standard-level Math.* One source of negativity mentioned by both students and parents is the stigma attached to being in Standard-level Math. Graham voiced his displeasure with the fact that GT students have certain benefits that others do not. He said, "I don't understand why they have that… It makes no sense. If someone's in GT, everyone should be in GT. It makes people jealous." Ariana implied that being in the lower math group means you are not as serious about your education. Several parents commented on the stigma of the Standard-level Math class as well. Margaret expressed that the school should do everything it can to not label classes or students, in order to avoid that stigma. When asked whether she thinks students are aware of those labels, Beth responded immediately: "They *all* know [who is in which level]."

*Concentration of struggling students.* There was talk in all the focus groups

of the high concentration of struggling students in the Standard-level Math classes. Teachers commented on the high academic needs of those students, and the fact that there are very few student leaders or self-directed learners. This means that most students in those classes are dependent on the teachers to get any work done. According to Ms. Keys, "They all need one-on-one help… The low kids need one-on-one and there isn't enough one-on-one to go around." Teachers explained what often happens when students do not get the attention they seek: they start acting out in unproductive and disruptive ways. Some of the parents empathized with teachers about how demanding those classes must be. Julia suggested that the environment in Advanced Math is likely very different from that in Standard-level, because those teachers have probably not reached the same level of exhaustion. Some of the students also recognized that they often do not get the help they need in Standard-level Math because their teachers are always busy.

*Behavior issues.* One of the most significant causes of negativity surrounding Standard-level Math is the behavior of students in those classes. Students talked incessantly about their peers' misbehavior. A few parents acknowledged that they, too, have heard their children talk about how hard it is to focus in math, because of the behaviors of other students. Teachers described the stark contrast between the behaviors in the Standard-level Math classes versus the Advanced Math classes. In Standard-level, they spend much more time and energy controlling behavior and trying to engage the disruptive students.

*Ramifications of disruptive behaviors.* All three stakeholder groups spoke

about the negative effects of having so many students who struggle to control their behavior placed in the same math classes. Students mentioned how hard it is to listen or focus on their work in class because of the many disruptions. They also complained that their math class does not accomplish much, nor do students get much time to work independently, because time is wasted on behavior issues. Trevor and Chase talked about the many times their teacher has stopped teaching and required everyone in the class to put their heads down.

> We had to put our heads down for the rest of class cuz all the bad kids were talking and talking and she kept saying stop. She "tabbed them out." She gave them a warning. She sent them to Take-a-Break and they still weren't doing anything. (Trevor)

Several teachers, including Ms. Ladd and Ms. Samuel, spoke of how demanding the behaviors are of their time and energy. They admitted, with regret, that some students get very little help.

Another ramification of the misbehavior and wasted class time is that Standard-level Math classes are consistently behind in pacing. A subject area that students described as "confusing" and "hard," parents described as "too fast" and "too advanced," and teachers described as "too abstract" and "hard because it is not applicable" becomes even more confusing, difficult, and abstract if lessons are rushed and time to grasp concepts is limited.

*Frustrating interactions related to math.* A common word that emerged throughout the focus groups was "frustrating" or "frustrated." Students described the

classroom behaviors and ineffective classroom management on the part of the teacher as frustrating. Both parents and students recalled instances in which their attempts to work together on math have resulted in complete frustration. Carlee said, "I can't even tell you, like, the arguments and the frustrations that we've been through this year in math alone…has been epic." Parents spoke about how frustrated they get when their children seem stuck on "the teacher's way" to do math, implying that teachers are inflexible or impractical in their teaching. Teachers commented on how many of their students in Standard-level Math get frustrated, even hopeless, when they work on math, and their tendency is to give up easily. When students are so unmotivated or see little potential for succeeding in math, teachers admittedly become frustrated in their work as well.

*Advantages of mixed classes.* With the abundance of negative comments around the current state of the leveled math classes at Sagepond Middle School, most of the focus group participants began to conjecture about how things might be different if math classes were more heterogeneous. Students brought up how advantageous it would be to have classmates who were more serious about learning and helpful in group settings. Parents spoke of the elimination of the stigma of being labeled "low math" and the burden that would be lifted from teachers if their classes were more balanced. Teachers spoke of how much more students could learn if time was not so consumed by classroom management. They mentioned that having more student leaders spread throughout the classes would be helpful to low-achieving and high-achieving students alike. It would benefit all students to be exposed to many

different approaches to problem solving, as well as the different struggles their classmates have in making sense of math concepts.

**Summary of Results**

The results of this study can be organized and explained in terms of how they address each of the research questions and subquestions. Students, parents, and teachers all provided ample evidence and anecdotes to give educators a detailed firsthand depiction of life for middle school students enrolled in lower-level math classes. They also provided countless reasons for feeling the way they do. Students feel quite negatively about their current math situations at Sagepond Middle School. Although they place the blame for that negativity on a variety of factors, they certainly feel *most* negatively toward their peers, due to the environment they are creating within the math classroom. Students also expressed an overall sense of hopelessness around the idea of ever breaking that pattern or classification of "low math student." They are accustomed to not accomplishing very much in class and stuck in a cycle of low motivation, low confidence, and low performance, as depicted in Appendix G. They know the setting in which they are learning math is vastly different from the one being experienced by the Advanced Math students. They also feel that their math teachers do not hold them to the same high expectations. Parents project a similar degree of negativity about the math program in which their children are involved. They express a desire to be more helpful for their children in the area of mathematics, but they find their math-related interactions with their children to be frustrating and fruitless. They also feel unable to help because they do not fully

understand the methods or concepts being taught. Teachers understand the difficulties of their lower-level math students, and go to great lengths to provide the instruction and encouragement that they believe will help students achieve at higher levels. However, teachers largely feel the problems lie within the class structure, school system, or society as a whole, and that the solutions are beyond their control. If teachers had their preference, the math department at Sagepond would cease the practice of ability grouping or tracking.

The results of this study can also be described in more overarching terms. They can be presented by the degree to which they shine the light on the major problems outlined prior to commencing the study: student discontent with math, subpar math achievement, and the racial achievement gap. In the example of Sagepond Middle School, where conquering those three problems is a goal that goes unmet year after year, the current system does not appear to be working. Students in Standard-level Math are not happy. They are frustrated about their classes and have very little motivation or ambition in math. Their parents are mostly unenthusiastic about their children's middle school math experience as well. They do not see much connection to the math they learned when they were young, and therefore feel unable to help. They also question the soundness of the program as well as the approaches of the teachers. For their part, teachers of Standard-level Math acknowledge that some students may feel frustrated because their needs are not being met in the current system. For these students at Sagepond, who are among the students that should be making the biggest gains and receiving the best possible accommodations of their

needs, it appears that the current form of ability grouping is not helping. In fact, it appears to be further contributing to their negative attitudes and even impeding their progress.

In Chapter V, the major findings of this study are described in greater detail. Included are instances in which the findings coincide with previous research, examples that contradict past studies, and themes that break new ground. The chapter includes several important implications for educators to consider, at the classroom, building, and district levels. The chapter concludes with several recommendations for further research, followed by some closing remarks.

## Chapter V: Discussion, Implications, Recommendations

### Final Analysis

This chapter provides a synthesis of the major findings of all nine focus groups conducted during this phenomenological study. In addition, it identifies several significant implications for educators in their pursuit of improving math achievement while closing the achievement gap, particularly at the middle school level. Following a brief overview of the study, there is a discussion of the key findings obtained during data analysis. Those findings are organized by research questions (RQ1, RQ2), research subquestions (SQA, SQB, SQC), and emergent findings (EF1, EF2, EF3). There is also a Summary of the Findings, which pulls together the major themes to address the principle objectives of the study. The chapter continues with a section on important Implications for Educators, followed by Recommendations for Future Research, and a final summation of the study as a whole.

### Overview of the Study

**Review of the problem.** Many students in the United States, by the time they reach adolescence, have already exhibited both low rates of proficiency and low levels of interest in the area of mathematics. Furthermore, there are significant disparities in math achievement between White students and students of color. Both the low proficiency rates and the achievement gap have become central areas of focus for educators and schools across the country. At the national level, people are worried that the United States is not keeping pace with chief competitors around the

world. At the local level, schools and teachers search for ways to not only help students succeed in math, but also to nurture within students a positive attitude about math. The goal is to provide quality math education and motivation for *all* students, with a specific roadmap for giving students of color what has been lacking in their math education up to this point.

This is not an easy task. For years, educators have been grappling with the idea of raising math achievement for all, while at the same time eliminating the racial achievement gap. Some educators and strategies have been more successful than others, but there is still an absence of a clear-cut route to attaining that goal. There have been many attempts to pinpoint the reasons behind the low proficiency rates and racial achievement gap in math. One question raised in this study was whether schools employ certain practices or structures that actually make these problems worse. Perhaps schools and/or teachers are doing things that do not enhance all students' math skills, and actually dampen their interest and widen the divide between White students and other student groups.

Schools have different ways of determining and classifying the math abilities of their students. They also have various approaches of organizing and enrolling students in their math classes. Many schools still have tracked math classes, where students are separated by ability, despite research showing that it can be very detrimental, especially to students placed in the lower track (Horn, 2006; Kelly & Carbonaro, 2012; Newton, 2010; Yonezawa & Jones, 2006). Students in the lower track are often at the greatest risk of not reaching proficiency on state tests. They also

tend to be the students who think most negatively about math. The goal is to reverse these trends. It includes enhancing the learning experiences of these students and accelerating their pace of learning, so as to raise achievement levels and close achievement gaps. In order to turn that goal into action, it is necessary to identify the sources of the problem and the best methods for solving it. One way to do this is to take a close look at the academic math experience from the perspective of those very students who are struggling in math.

**Review of the purpose.** The purpose of this study was to hear from students who contend with the issues of low success rates in and negative attitudes about math on a daily basis. To begin to know how to meet the needs of students who are struggling in math and have negative feelings about math, it is necessary to let them speak. Students are not often asked to share their feelings, thoughts, or experiences. They are not accustomed to having a voice in making improvements in their own education, especially students in the lower academic tracks. This study has deviated from that pattern. It has given students a leading role in helping to identify practices and structures in their math education that have not served them well, and ultimately in determining how to better meet their needs.

The students in this study have experienced what it is like to be in Standard-level Math, or in other words, the lowest-ability math classes, at Sagepond Middle School. They can attest to what happens in that setting, how it has made them feel about their abilities in math, and how things could improve. This study also gave voice to their teachers and parents, who, for better or worse, can play a crucial role in

the students' math education. The purpose in hearing from all these stakeholders was to see the problems of low math proficiency and the math achievement gap from a different perspective. It was to reveal possible root causes and solutions that educators have not been aware of, or have perhaps overlooked. There is no one better to involve in solving an issue than the individuals most affected by it. In this case, those are the students in Grades 6-8 of Sagepond Middle School who know what it is like to be a student of Standard-level Math. The hope is that their insight will provide a springboard for educators in their endeavor to raise math proficiency rates for all students as well as close the racial achievement gap.

**Research questions.**

RQ1: How do middle school students who are typically classified as "low in math" describe their feelings about math?

RQ2: According to these students, what factors have contributed to their attitudes toward math?

**Research subquestions.**

SQA: How do these students personally feel about math and their school experiences in math class?

SQB: How do families influence their students' attitudes toward math?

SQC: How do the messages they get from teachers influence their attitudes toward and confidence-level in math?

**Review of the methodology.** The methodology used to gather and analyze data for this qualitative phenomenological research study consisted of a series of

focus groups with students, parents, and teachers associated with the Sagepond Middle School math program. This was a very appropriate method for hearing directly from stakeholders, in their own words, about their experiences with Standard-level Math. It was also a fitting structure to use as the researcher wanted information to flow smoothly and new ideas to come to light. It was also very effective for digging deeper into the thoughts of participants and seeking further elaboration on some of their answers. Without the ability to follow-up on statements, some answers might have been overly vague or would not have revealed either the core of the problems or ideas for improvement.

The researcher conducted all nine focus groups herself. The first five were with students from Sagepond Middle School. Following those, the researcher met with three different parent focus groups. The last focus group was with the math teachers of Sagepond. Each focus group lasted approximately one hour. The researcher used the questions in Appendices A-C as initial prompts, and expanded on them when necessary, to follow-up on or clarify previous responses. As described in Chapter III, the researcher briefly reviewed data from each focus group prior to conducting the next one. At the completion of the final focus group, the researcher transcribed all the focus group discussions and assigned pseudonyms to the participants. The researcher used numerous techniques during data analysis, including coding the data using the codes found in Appendix D, comparing her coding with that of a research assistant, listing the codes by frequency, constructing an idea map of major themes, creating an outline with the eight principal findings and

relevant participant comments, and recording in a spreadsheet some of the participants' shorter responses.

There are a few limitations to this study and its methodology. First, the study is limited to one school setting, which means the results cannot be generalized to broader populations of participants, inside or outside of Sagepond Middle School. Secondly, while the researcher attempted to recruit participants of diverse backgrounds, such that they would closely represent the population at Sagepond, the study was limited to participants who volunteered. The active involvement in this study may indicate that participants already held certain preconceived notions about math. Thirdly, the researcher had previous experience working at Sagepond Middle School and knew some of the participants. Conceivably, that could influence how they answered some of the questions or how the researcher presented their responses. Finally, there are limitations associated with focus group methodology. This methodology can overstate the opinions of some, while understating others. The researcher designed a focus group protocol to help ensure that all participants had ample opportunity to share their opinions. (See Appendices A-C.)

**Summary of the major findings.** Most of the findings revolve around the answers to the research questions and subquestions. Regarding students' feelings about math (RQ1), one interesting discovery was that students had a hard time admitting that they do not like math, but they could not hold back their negative commentary when it came to talking about the math classes in which they are currently enrolled. It is unclear why students make this distinction, but they clearly

see their middle school math classes as a source of discontent in their school experience. As stated in Chapter IV, Standard-level Math refers to the lowest of three core math classes at each grade level. Because students seemed to draw a clear distinction between the subject of math and their current math classes, the findings connected to Research Question 2, involving the factors which have influenced their feelings about math, also fall into two categories. Students did not talk much about why they remain generally upbeat about math. Instead, they continually brought the conversation back to what it is about their current classes that is so unappealing to them.

The findings related to the research subquestions were more specific to each of the three groups of stakeholders. The major finding around Research Subquestion A is similar to that of Research Question 1. Students have some very negative feelings about their middle school math experience in particular, and they make numerous suggestions for how that experience could be more positive and successful. Research Subquestion B addresses the influence that families have on students' attitudes toward math. Parents and students seemed to agree that parents communicate through their words that math is important. However, parents' lack of involvement related to their children's math learning seems to communicate a different message entirely, namely that math may not be as important as they lead their children to believe through their words alone. Finally, with respect to the messages students get from their math teachers (SQC), this study found that most students speak positively of the individual interactions they have with their teachers.

They mostly characterize their teachers as encouraging and helpful. The teachers in the focus group also indicated that they go to great lengths to encourage and support students as much as possible. However, both students and teachers agreed that time does not permit them to interact as much as they need to. Students desire much more one-on-one instruction from their math teachers than they currently receive. Teachers admit they cannot connect with all students needing help during every class period. Hence, despite the positive results of their one-on-one exchanges, teachers and students are not getting sufficient opportunities to have those meaningful interactions.

Over the course of this study, a few findings emerged that were not anticipated and do not have a specific link to the research questions. One of those was that teachers and students provided very similar descriptions of the actions and attitudes of the students within the Standard-level Math classes at Sagepond Middle School. However, the two groups seemed to attribute those actions and attitudes to different sources. Students seemed to blame their lack of effort, focus, and progress in math on their immediate surroundings: peers, teachers, and ineffective instructional strategies. Teachers, on the other hand, seemed to feel that students act the way they do because of insecurity around math, an unwillingness to work hard for anything, and a sort of learned helplessness in the area of math.

A second finding that emerged involved the opinions expressed by the teachers about the structure of the math program at Sagepond, namely the practice of ability grouping. They shared their own insights and experiences working with students at all levels. They unanimously spoke *against* ability grouping, and although

none of the research questions asked teachers to elaborate on their feelings about tracking, the opinions and anecdotes they shared could certainly serve to help improve the math experiences of all students at Sagepond Middle School.

The last emergent finding is really a summation of all the ideas expressed in the nine focus groups. After numerous reviews of the transcripts, it is impossible to ignore the one theme that extends throughout all conversations. All three groups of stakeholders described their experiences with Standard-level Math at Sagepond Middle School in very negative terms.

## Discussion of Findings

### Discussion of findings related to research questions.

***Research question 1.*** Question: How do middle school students who are typically classified as "low in math" describe their feelings about math? Finding: Students draw striking distinctions between how they feel about math as a general subject area versus how they feel about the math class they are currently taking.

Students generally feel pretty good about math, with a few exceptions. Most students spoke positively of math as a school subject. Eighty-eight percent said they like it. Ninety-six percent said they think it is important. Some talked about how they were good in math in elementary school, and how math class used to be enjoyable and engaging, and include fun games and cooperative learning. This general positivity about math was quite surprising, given how some research has shown that students in lower math tracks tend to feel pessimistically about their chances for success in math, and are disinterested in the subject as a whole (Cleary &

Chen, 2009; Rowan-Kenyon, Swan, & Creager, 2012).

It is difficult to explain *why* students feel so distinctly about math in general versus the math class in which they are currently enrolled. The research provides no real insight into this phenomenon. However, it is important to acknowledge the possibility that students who participated in these focus groups were telling the researcher what they thought she wanted to hear. As discussed in Chapter III, some of them had been her students in the past, and most knew that she had been a math teacher at Sagepond Middle School. They may have felt pressure to tell her something that would please her. It could also be that they thought by saying, "Yes, I like math," they were giving the supposed correct answer. They have likely heard from parents, teachers, and even other students throughout the years that math is a very important subject. They have heard that success in math can generate many advantages. Maybe they *want* to do well in math and *want* to like it. Any one of those motives could have caused them to declare that they like math, when indeed they do not.

Another explanation for students expressing such positive feelings about math in general is that they want to speak positively about something as wide-reaching and universal as math. It is hard to admit distaste of a subject that has always been part of their schooling and includes some basic skills necessary in real-life. However, when students reference specific activities, assignments, teachers, classmates, or anything associated with what is directly before them, it is easier to assign specific criticism. Students can point to individual annoyances or obstacles currently present in their

math classes. They can put the blame for their negativity on some*one* else, like teachers or peers, or some*thing* else, like the textbook or class structure. To declare a dislike for math in general would perhaps mean admitting that they have failed in some respect. Conversely, to negatively describe their current math class, while still claiming to like math as a whole, puts the blame on someone else. Someone or something else is causing them to hate math at the moment, but they really do like it.

On the other hand, these students may be speaking the truth. It could be as many of them say: math used to be fun and engaging, but not anymore. As stated previously, there are no clues in the research that point in any one direction. Maybe math truly *has* gotten bad since entering middle school. Perhaps the pacing has gotten too fast for these students, and the concepts too abstract. It is entirely possible that students currently feel negatively about math because it is not how they remember it to be, or how they think it should be. Maybe they are not masking their true feelings. They really do like math, but their experiences in their current math class have been unpleasant.

Whether students are sincere in their affection for math in general, or whether they just say they are, it is clear that nearly all of the students in Standard-level Math that participated in this study are unhappy with the classroom environment within their current math classes, as well as unsatisfied with their learning. Approximately eighty-seven percent of them gave negative descriptions of their current classes. Through their words and interactions, as well as the words of their parents and teachers, many of them exhibit characteristics typical of students in the low math

track that were cited in previous research: lower self-concept in math, disengagement, pessimism about their chance for success, negative attitudes, and denial that math has much relevance in their current lives (Choi & Chang, 2011; Cleary & Chen, 2009; Rowan-Kenyon, Swan, & Creager, 2012). The confidence level of some of the students is very low in math, to the point where they are unable to get started on their work without individual help from their teachers. Some students did refer to the fact that what they are learning in math is not relevant to their lives or useful in any other setting. Madeline expressed frustration at having to learn things in math that are not necessary in life, like "point-slope form…where am I going to honestly use that?" Whether it originated before middle school or not, several students articulated a lack of desire to exert effort in class or figure out math problems on their own. Wyatt stated that he tends to become disruptive in class when he gets "frustrated with the work…if [he doesn't] know how to do it."

Although some students did not characterize *themselves* in the ways depicted in the research (low in confidence, unsure about the relevance, or lacking motivation in math), many of them vividly described their Standard-level Math *classmates* in those ways. Skyler shared his impressions of his classmates: "I don't think they think [math is] very important, because sometimes, um, they're like always yelling about how it's not important… They say that this class is boring and stuff like that." Chloe said that her classmates in math are "never paying attention… They never get their like homework or worksheets turned in." Maxwell described the apathy of the students in his math class. "The loud kids are usually the ones that don't really care

about math. And so why would they pick the *harder* math if they don't really care about the *Standard* math?"

One revelation of this study is that many students in Standard-level Math are resigned to the fact that *this* is the math class in which they are destined to stay. Most students, when asked, said that the difficulty level of their current math class was "just right," and that they would likely register for Standard-level Math again the following year. They did not express motivation to change their current standing in the math program. Many seem to accept the fact that their identity in school is that of "Regular Math student," which has some negative connotations, including, as Bailey said, that they have "no potential." They claim to be different from Advanced Math students, and seem to be okay with that. They feel they are not expected to learn as much or try as hard in Standard-level as they would in Advanced. They feel static and resist investing much effort into something they feel will not matter, just as Schommer-Aitkens, Duell, and Hutter (2005) found in their research. Their acceptance of their standing in math may also reflect the findings of Gilpin (2010). They do not expect to succeed, therefore they choose to not try at all. While some students claimed their ability in math is not strong enough to be in Advanced Math and blamed that inability for their lack of ambition (Swinton, Kurtz-Costes, Rowley, & Okeke-Adeyanju, 2011), others stated that they believe they *are* good at math. That begs the question, "Why? Why do these students seem resigned to stay in Standard-level Math if they believe they have strong math skills?" Many have given up hope of ever being in a different math class or group. Some claim they are waiting

until high school to take Advanced Math. Unfortunately, unbeknownst to them, if they continually enroll in Standard-level Math in middle school, the higher-level math courses in high school may not be accessible to them (Stone, 1998), due to certain prerequisites. The gateway to college, as referred to by Stone, may close for these students while they are in middle school. It is unclear whether students understand the ramifications of staying in Standard-level Math year after year, or whether they give much thought to their future education. Somehow, students find themselves in this situation in which they do not expect to learn much in math, despite how important they claim it to be. It seems they have decided at a very young age, perhaps inadvertently, to limit the role that math will play in their future endeavors.

***Research question 2.*** Question: According to these students, what factors have contributed to their attitudes toward math? Finding: Most students feel very negatively about their current math classes, due to the misbehavior of their peers, poor classroom management, and ineffective instructional practices.

As stated previously, students did not spend a lot of time talking about their overall views of math. Mostly, they claimed they like math, or do not *dislike* it, and are relatively good at it. From the little they did say, it appears that their parents have influenced those feelings. Clearly, parents are communicating to their children that math is important, and students seem to have received that message loud and clear. Most students also spoke fondly of their math experiences in elementary school. Some recalled being in different ability groups in elementary math, but for the most part, they just remembered a general "math class" which included lots of very fun

activities, games, and group work. Many spoke highly of their elementary teachers and bemoaned the fact that math has taken a turn for the worse in middle school.

Students tended to steer the conversation toward more specific factors that influence their feelings about math, like what is currently happening in their individual math classes. As can be expected from the literature, their teachers have a huge impact on how they feel about their math class. The many positive comments students made confirmed what research has shown. They like when teachers encourage them, believe they can succeed, and convince them that obstacles can be overcome (Furner & Gonzalez-DeHass, 2011; Geist, 2010; Taylor & Fraser, 2013). They appreciate when teachers recognize their successes and hard work (Levpuscek & Zupancic, 2009; Woolley, Strutchens, Gilbert, & Martin, 2010). They feel more motivated to do well when their teachers show that they care about them, support them, make efforts to relate math to their lives, and do not give up on them (Levpuscek & Zupancic, 2009; Woolley et al., 2010). Bryan confirmed the research of Woolley, et al. (2010), showing that teacher-student interactions are very important and teachers' words and manners matter. Students also articulated their preferred types of learning activities in math, which closely resemble activities cited in the research. They want more active learning opportunities, group interaction, math games, and activities that are novel, hands-on, and relevant (Dodd, 1992; Palmer, 2009; Rowan-Kenyon, Swan & Creager, 2012). They also appreciate the specific academic help that teachers are willing to give after school and during RTI.

Much of the criticism students directed at their math teachers also confirms

what research has shown. Students complained about how much their math teachers talk in class, which Boling (1991) found to be a real deterrent to learning. Several students also complained about how boring and repetitive their math classes are, and that they do the same types of activities every day. This illustrates what research has shown (Alvarez & Mehan, 2006): that lower-level math classes are often focused on rote, repetitive tasks, activities identical to what students have done in the past, and concepts which are below grade level. According to students in the study and prior research, math classes should instead focus on higher-order problem solving, cooperative group work, novel mathematical experiences, and applications to real life (Palmer, 2009).

A key criticism that students had was that their teachers fail to stem their classmates' misbehavior or provide an optimal learning environment for everyone. As shown by Newton (2010), a crucial focus for all middle school teachers, in order to facilitate learning and future progress for students, should be the consistent management of student behavior. Many students in the focus groups spoke of inadequate or ineffective measures their math teachers employ to maintain a positive classroom climate. Some described their teachers as wanting to control students, just as Kususanto, Ismail, and Jamil (2010) had found in their research. Students also spent a great deal of time talking about their teachers' failed attempts at classroom management. They stated that their teachers let things slide, overreact, leave the classroom, and repeatedly use discipline strategies that do not work.

What proved to be the most talked-about source of negativity for students in

Standard-level Math was something that was barely evident in the research, namely the misbehavior of their peers. Many students made a clear distinction between students in their math classes and students in their other classes, such as science and language arts. Most said their math classes were by far the *loudest* of all their classes, and that even their friends behave differently in math than in any other class. They described their math classes as environments in which it is very difficult to learn, primarily because of the behavior of their peers. They named several conditions that might allow them to be more successful: if they could actually listen in class; if they did not have to spend so much time with their heads down on their desks; if their teachers did not have to stop so often; if their teachers could get around to helping more students; if their teachers had better control of the class; if their classmates were more helpful in small groups; if their classmates arrived to class on time; and if their classmates stopped trying to be so funny. Some even questioned the reasoning behind having the separate classes of Standard-level, Advanced, and Double-advanced Math. They speculated that with a mixture of ability levels in each class, they would be able to get a lot more work done and rely on classmates for help.

Some students were very introspective about the reasons why their classmates act the way they do in math. They talked about their peers' lack of confidence, ignorance about how much math matters in their lives, and apathy regarding their academic outcomes. They described their peers in ways that were very well documented by much of the research, using words such as unmotivated, disruptive, and insecure in their own abilities (Gilpin, 2010; Ramentol, 2011; Rowan-Kenyon,

Swan, & Creager, 2012; Sparrow & Hurst, 2010). It is interesting that students were so eager to talk about the antics and disrespectful behaviors of their classmates, even attempting to diagnose the cause of their behavior. Yet very few of them pointed the finger at themselves. Mostly the students in this study framed it more as a problem of their peers than a problem that they also possess or need to change.

That again raises the question of whether students were accurately portraying their own behavior, or were simply telling the researcher what they thought she wanted to hear. Their portrayal of their own, angelic behavior must be viewed with some degree of skepticism. Is it really only their peers that contribute to the negative classroom environment, or do they play a role in that as well? Maybe they are finding that middle school math is very challenging. Perhaps they are really struggling in math for the first time, and their way of coping is to place the blame on their classmates and/or teachers. It is possible they are having a hard time in math this year, either academically, behaviorally, or both, and are looking for a way to explain why, without taking responsibility for it.

Whether or not the students in this study are also the cause of some classroom disruptions, it is clear that the disruptive behavior is taking a toll on most of them. Students described how difficult it is to listen, get help, or even learn in their math classes. This causes them to lose confidence in their abilities to solve math problems, and in their hopes of ever advancing to another level in math. The low level of confidence together with a general sense of confusion and helplessness in class makes them question the value of what they are learning. They question whether they will

ever really need to know some of this material later in life, which decreases their desire to even try in the class. They come to class unmotivated and find very little to inspire them once they are there. They lose interest, become disengaged, and find other things to occupy their thoughts and time. It is a vicious cycle. (See Appendix G.) This was what Cleary and Chen (2009) and Rowan-Kenyon, Swan, and Creager (2012) described in their research. Low confidence prompts students to doubt success and expect failure. That naturally triggers disinterest and a sense that math is not relevant in their lives. When students lose interest or any sliver of motivation, they continue to be unsuccessful in class, thereby starting the cycle of disengagement all over again. (See Appendix G for a visual depiction of the cycle.) This cycle can be induced by the students themselves, or it can be kick-started by negative, disruptive peer behavior. If, as the students in this study describe, classmates are preventing them from concentrating in class or getting their work done, or if they are holding them back by occupying a good portion of the teacher's time and energy, these students' confidence could be shattered, and this cycle put into motion. What results is a certain math identity. They are Standard-level Math students who lack potential, have no desire to break the cycle of disengagement, and are unaware of the ramifications of giving up in math. This emphasizes the importance of providing students frequent opportunities for success to ward off the initiation of the cycle, as was mentioned both in the research (Ramentol, 2011; Stuart, 2000) and by teachers in the focus group.

***Research subquestion a.*** Question: How do these students personally feel

about math and their school experiences in math class? Finding: Although students' feelings about math are generally positive, their experiences with math at the middle school level have been very unpleasant.

Contrary to what the researcher expected, most students do not appear to be harboring negative feelings about math from their elementary years. Their attitudes and feelings seem to have worsened during their time at the middle school, and students have no shortage of people or things to blame for their negativity: peers, teachers, the lack of help from parents, the inequitable structure of math classes, and the difficulty level of the math problems. This could be due to what Rowan-Kenyon, Swan, and Creager (2012) found, namely that many students begin to doubt the relevance or usefulness of math when they reach the ages typically associated with middle school. To some extent, it is surprising that students do not have more negative tales to tell about their academic experiences with math prior to middle school. Knowing how influential teacher language is in shaping students' self-confidence and effort in math (Dodd, 1992), and considering what some of the middle school teachers said about elementary teachers being "math-phobic," one might expect students who have had those teachers to look back on their elementary years with an air of negativity as well. However, that was not the case. Most of the students involved in this study spoke highly of their experiences in math at the elementary school. Thus, students did not have many recommendations for how their experiences in elementary school math could have been better.

When asked about school experiences with math, students focused almost

exclusively on what has happened since they started middle school. As discussed earlier, students had no shortage of criticism for their teachers and peers. Many of them said that their math class is by far the most disruptive of all their classes, and that even their friends behave differently in math than in any other class.

They also articulated some negativity toward the structure of the math classes, namely that students are separated into different classes by ability. Some students said that being in Standard-level Math means they have to be with all the students who do not care, complete their work, or behave in a respectful way in class. Someone even said that *if* students *cared*, they would not *be* in Standard-level Math. A few students speculated that teachers treat students in Advanced Math differently than students in Standard-level, echoing the opinions of the students involved in the focus groups of Yonezawa and Jones (2006). Students in both this study and the study conducted by Yonezawa and Jones seemed to believe that teachers' academic and behavior expectations are higher for Advanced students than for lower-level students. In both studies, students agreed that expectations should be consistent from class to class and student to student. Moreover, many of them shared their beliefs that students behave better, accomplish more, and gain far more skills in the Advanced Math classes.

Whatever their opinions about *how* the leveled math classes are different from each other or from other classes, most students are keenly aware that being in Standard-level Math bestows on them a different label. They are very aware that there is a certain status associated with each leveled math class. Some of the students

in Standard-level Math feel resentment toward the students in GT or Advanced Math, because those students "get extra privileges" and do not have to put up with so much disrespectful behavior. A few students questioned the fairness of having GT and Advanced Math, and wondered why they cannot *all* be classified as GT. Students talked about the frustration of sitting in a class where their peers do not help them, and they are forced to wait for the teacher. Dodd (1992) pointed to the importance of student-to-student interactions in math class, where everyone benefits from hearing the strategies used by others to solve problems. Students are able to help one another by explaining their mathematical approaches, which can spark others to see problems in new ways. This kind of student-student interaction does not appear to be happening much in the Standard-level Math classes at Sagepond Middle School, because students are so often confused and unable to initiate a problem. The students in this study shared experiences of when they have tried to collaborate with their math classmates. Bailey stated that asking her classmates for help is fruitless: "It's not like one of them are going to understand cuz I've asked them a million times." Trevor described what it is like to work in small groups in his math class: "One kid in our group is really bad and so he doesn't, he doesn't do anything… And then I'm like, 'Dude, Ms. Hannon's gonna get you in trouble, and then I'm getting in trouble.' And he's like, 'I don't care.'" Many students conjectured that things would be much improved if there were more Advanced students spread throughout the classes. Trevor, Eliza, and Willa pondered how much more helpful their classmates would be if there were Advanced students mixed in with Standard-level students. These

sentiments seem to contradict the research done by Trautwein, Ludtke, Marsh, Koller, and Baumert (2006), which found that students in low math tracks do not compare themselves to students in the higher math tracks. From the plethora of comments contrasting Standard-level and Advanced Math at Sagepond, it is obvious that students in this study are, indeed, comparing themselves to students outside of their own classes.

There was some confusion among the students in the focus groups about the differences in content and difficulty of the leveled classes. Some believed that students wanting to continue in Advanced Math needed to exceed a certain score on the Minnesota Comprehensive Assessment. Others believed that there was not that much difference among the levels, except that the Advanced levels move faster. Contrary to the research done by Yonezawa and Jones (2006), there was not the confusion about *how* students are placed in the different tracks, because at Sagepond students are allowed to select the classes they want, and the students in this study were aware that they had chosen Standard-level Math. However, there did seem to be a lack of understanding about where their current classes will lead them. Three or four students said they plan to take Advanced Math in high school, but they could not identify which class they would have to take next in order to do that. Some could not even remember which class they had registered for the following year. Hence, in the sense described by Yonezawa and Jones, *placement* in the lower-level class is not a mystery to students at Sagepond. However, there is considerable mystery surrounding the long-term implications of taking Standard-level Math in middle

school. The mystery is not about how they got in this track, but rather what it means to be in it. Students do not seem to have a vision of what they need to do in math at this point or beyond. They do not know which classes are required to get into those advanced courses in high school, or to be accepted into college. Finally, they do not realize the ramifications of continuing in the Standard-level Math track year after year.

***Research subquestion b.*** Question: How do families influence their students' attitudes toward math? Finding: Parents' intentions are to pass along to their children the idea that math is important. However, their actions and strong opinions may contradict their intentions.

The parents who took part in this study are clearly involved, committed, and well-intentioned when it comes to the education of their children. They did, after all, take time to participate in this study. They also demonstrated their positive intentions through poignant stories about encouraging their children to do well in math. Furthermore, a large majority of students stated that their parents believe math is very important for their futures, which could, in part, explain why so many students answered that question in the same way. It is important to keep in mind that, because the sample size of parents was small and limited to volunteers, the opinions expressed in this study are not representative of all parents of students in Standard-level Math. For example, it is unknown whether there was equal participation from parents of typically disruptive and typically compliant students.

It is questionable whether the support from most parents of Standard-level

Math students extends much beyond verbal encouragement. For example, many students made the case that going to their parents for help in math is a frustrating experience. In some instances, parents make excuses for not helping, while in others, they attempt to explain things in their own ways, which may be very different from the way students have learned in class. Parents also get frustrated in their attempts to help, because their children do not see their way of doing math as useful, helpful, or even correct. Parents in this study suggested that some of their frustrations are due to lack of information from math teachers.

> I think that would be like, you know, if they would just even give you something in the beginning…like just for parents…sending home a piece of paper that says… "This is the math we are going to be working on, and this is kind of how you do it." (Margaret)

These parent requests align with the research of Drummond and Stipek (2004), as well as Turner, Steward, and Lapan (2004).

Both students and parents acknowledged that parents have limited contact with math teachers, as well as limited involvement in math class placement at Sagepond Middle School. Most parents admitted that they have not tried calling their children's math teachers, even when things have gotten very confusing at home or when they see that grades are slipping. Just as the research of Drummond and Stipek (2004) suggested, some of the parents stated that they specifically refrain from contacting the teacher because they believe their children are old enough to advocate for themselves. Students also cited reasons for their parents' lack of involvement that

were mentioned in the research, namely limited educational background and language barriers (2004). Most of the parents were unable to name which math course their children were currently taking, or the class they had registered to take the following year. This indicates that they are likely unaware of the how the sequence of math courses works, or of any disadvantages that may be associated with being in Standard-level Math. This confirms the research conducted by Useem (1992), which showed that parent education level is a determining factor in students' placement in math class. Less educated parents are less aware of the advantages associated with higher-level courses, or that there even *are* different courses. They also tend to be less involved because they are less familiar with how school academic tracks work.

Students definitely pick up on the limited role their parents play in their math education, both with homework and communication with the school. Students can also sense their parents' opinions about school, simply by being around them. For myriad reasons, most of the parents spoke *very* negatively about the math program at Sagepond Middle School. They complained about the lack of flexibility of the teachers, failure to teach basic math facts, absence of a quality textbook, and inadequate afterschool programming. They also complained that their children were getting too much math, too young, and too fast, just as described in the research of Kadlec, Friedman, and Ott (2007). In further support of the findings of Kadlec et al., parents in this study did not appear to share teachers' sense of urgency or high expectations for their children in the area of mathematics. Parents also weighed in on the stigma or sense of meritocracy associated with the class structure of the math

department at Sagepond, which appeared to endorse the findings of Yonezawa and Jones (2006). Many of the parents also spoke of their own miserable experiences studying math when they were young. Messages such as "I hated math," "I was terrified of it," "I'm not a math person," and "I always preferred other classes–not math," are not only heard by their children, but possibly even adopted by them as their own attitudes and philosophies.

The degree to which parent attitudes are absorbed and adopted by their children was not a major focus of the research for this study. However, it is evident that the students participating in this study are exposed to a great deal of negativity about math on the part of their parents. To some degree, students notice their parents' inability to help, lack of involvement with school, negative commentary about Sagepond's math program, and personal stories about their own bad experiences with math. It is natural to wonder how much this exposure to their parents' negativity creates or compounds students' own negative feelings. It is also natural to conclude that, although parents say that math is important, their actions and attitudes may be conveying a very different message and making more of an impact on their children.

***Research subquestion c.*** Question: How do the messages they get from teachers influence their attitudes toward and confidence level in math? Finding: While many students indicated that their teachers encourage them when they interact one-on-one, there was a consensus among students, parents, and teachers that teachers are not able to give students sufficient time or attention to positively impact their attitudes toward math.

Based on the negativity with which students view their current math classes, one might expect to hear many students give examples of negative comments or words of discouragement they have received from their teachers. For example, one might expect some to say that their teachers do not express confidence in them, pay much attention to them, or care much about their learning styles or even who they are as people. As found in this study, that is generally not the case. Concerning the verbal messages that students receive from their teachers, the majority of students feel they are positive. While there were some outliers, like Bryan and Manny, most students reported that their math teachers encourage them and have confidence in them, which supports the recommendations of Alliman-Brissett and Turner (2010). In addition, teachers conveyed that they know how important their encouragement and positive relationships are for student success. Unfortunately, teachers and students agree that there is not nearly enough time in an average Standard-level class period for teachers to give students all the help they need.

> We stay after school with Ms. Samuel a lot. We do a lot of our homework and stuff with her and like, I think it's better after school for us because we don't have any of that noise, because, it's really sad, but like nobody stays after. (Scarlett)

> Like Ms. Hannon is like a good teacher and she teaches me, like if I can do it, like, I like realize that I have to stay after school any time that I can and stuff like that cuz like when I didn't, all of my grades have been a C in that class and I've tried and stuff. And she's like…I know, I know she's a good teacher

> and she can teach cuz she's really good at math, but she, like my class, it's just like, I can't be with the people that I'm with… It's just really bad and, like, I can't focus ever unless I'm in RTI or I stay after. And I haven't stayed after in a long time. (Bailey)

In spite of the positive interactions among teachers and students, it still does not appear to be enough to motivate students to strive for more, advance to a higher math level, or think about ways to use math in the future. Teachers named several ways to help their Standard-level students achieve more in math, which matched the research of Alliman-Brissett and Turner (2010), Levpuscek and Zupancic (2009), Ramentol (2011), and Woolley, Strutchens, Gilbert, and Martin (2010). Those ways included conveying confidence in their abilities, dividing their assignments into smaller chunks, and giving them opportunities to succeed, constructive feedback, and verbal recognition in front of the class. Teachers also shared some very vivid descriptions of the climate in their Standard-level Math classes: students have difficulty starting their work; students are very demanding of their time; and teaching Standard-level is often like playing a game of Whack-a-Mole. The situation is not setting students up for success. It is frustrating for students and teachers alike. Students have come to rely on their teachers for help, because neither their peers nor their parents are able to assist them. They would like more one-on-one attention, thorough explanations, and time to work through problems. Teachers would like to be able to get around to all students, ask high-level questions, give constructive feedback, and inspire students to the next level. However, time prevents this. Classes

are short. Behavior takes time and energy away from instruction. Students who are difficult to engage tend to consume the majority of teachers' time and energy. Teachers in the focus group talked about how helpful it would be to have more leaders in class. Students talked about how they wished more students in their math classes actually cared about math, and could help them do the work rather than disrupt them. What is interesting is that the teachers in this study did not express a need for more support, training, or tips for improving their own classroom management practices. They pointed instead to changes needed in the system and society at large.

**Discussion of findings that emerged from the study.**

***Emergent theme 1.*** Finding: Teacher perceptions of the middle school math experience for lower-level students confirm much of what students said, except that teachers frame it more in terms of a general attitude toward math as a subject area, rather than an attitude about their current math class.

Teachers appear to be just as frustrated as students with respect to the classroom climate of Standard-level Math. They confirmed the overwhelming degree of misbehavior, relating that much of their time and energy are spent either responding to misbehavior or going to great lengths to engage the disinterested students so that they will not get off task so quickly. Teachers attributed the difficulties students have in Standard-level Math to attitudes they have brought *into* this environment, rather than attitudes that have been created *by* this environment. In teachers' minds, over the years, students have acquired a sense of helplessness in

their approach to learning. Teachers spoke of how students lack confidence, shut down immediately upon seeing a math problem, and substitute effort in math with disruptive, attention-seeking behaviors. Teachers believe that many students in Standard-level Math are convinced they cannot do the work without a teacher next to them, validating their every mark on the paper. Students have come to understand math as an endeavor in which they are either right or wrong, there is only one way to solve problems, and there is not much point in using creativity to work with others to find solutions.

During the focus group discussions, several students confirmed the notion that they shut down when they do not get help from teachers or peers. However, they tended to attribute their lack of work completion to the fact that they simply could *not* figure it out. Teachers, on the other hand, characterized it more as a lack of effort. Nearly all the teachers present for the focus group stated that if students only believed in themselves more, applied what they know, and realized that with more effort they could succeed, they would indeed find success and satisfaction. Teachers even stated that students in Standard-level tend to not give themselves the credit they deserve. As Ms. Arndt said, "Students don't even realize how far they have come." Teachers seem to think that students attribute their low performance to low ability and lack of confidence. If that is true, it confirms the research of Gilpin (2010) and Swinton, Kurtz-Costes, Rowley, and Okeke-Adeyanju (2011) showing that students who feel incapable *expect* to fail, and then they give up all together. They see no point in trying and no chance of reversing course. It also underscores how important it is for

teachers to emphasize effort, perseverance, and resilience with students, and show them what it looks like and how it feels when they progress and/or succeed (Stuart, 2000). The teachers in this study continue to try to turn things around for their students in Standard-level Math. They talked about the efforts they have made to encourage students, make their work more accessible, give them opportunities to succeed, and feel the afterglow of that success. They also spoke of strategies they use in asking questions in class and building relationships with students so they can better learn how to motivate them. Contrary to research done by Alvarez and Mehan (2006), teachers of Standard-level Math at Sagepond Middle School are not resorting to incessant drill and practice of math facts. However, some of the teachers in this study did admit that they need to adjust or simplify the math curriculum for their Standard-level Math classes, thus changing some of the expectations, just as Welner (1999) asserted in his research.

As stated earlier, students blame their lack of success in math on aspects of their immediate surroundings, such as peers, teachers, and overall classroom climate. However, teachers believe the struggles that Standard-level Math students are having in math took root long before the students entered middle school. They discussed how families and society in general communicate directly or indirectly to students that it is okay to not strive for great heights in mathematics. Parents do this by saying things like, "I was never good at math." Society feeds into that by giving the impression that someone *is* or *is not* "a math person." According to the teachers in this study, part of the problem is the attitude of elementary teachers, who often do not

spend adequate time on math, exhibit creative problem-solving skills, or have a positive attitude about math because they, themselves, are math phobic.

The teachers in this study have ideas of how to improve students' math experiences prior to and during middle school. They discussed such things as having math specialists at the elementary level, encouraging students to think more flexibly and creatively about math, and ceasing the practice of ability grouping. What is interesting is that teachers, like the majority of students and parents in this study, find plenty of people and systems to blame for the current situation. That may be totally valid, but one must ask the question: With everyone directing blame at others and/or deficiencies in the system, how is this negativity in the Standard-level Math classes ever going to turn around? Perhaps teachers need to shoulder more of the responsibility for the unproductive, chaotic, and helpless climate within their classrooms, and acknowledge that their own ineffective classroom management strategies are likely part of the problem.

***Emergent theme 2.*** Finding: Teachers hold some very strong opinions about the effect that ability grouping has on Standard-level Math students.

The teachers involved in this study appear to be in agreement about the current status of the math program at Sagepond Middle School: that the organization of classes by ability group is not working, particularly not for the lower-level math students. This contradicts the findings of some of the research. The research of Welner (1999) contended that teachers often stand in the way of detracking reform, citing unruly behavior in *mixed-ability* classrooms as one of the reasons. Teachers in

this study reported the opposite: behavior is much worse in Standard-level classes, and it does not make sense to put all behavior challenges in the same class. For them, Standard-level Math classes present such extreme challenges to effective classroom management that it is nearly impossible for students to learn in those settings.

As described earlier, the teachers in this study painted a very detailed picture of their Standard-level Math classes: disruptive behaviors, low levels of effort and confidence, very little time for teaching, and a lack of seriousness on the part of many students. (See Appendix E.) The result of the class organization in the math department at Sagepond Middle School is a very high concentration in Standard-level Math of students who struggle with both math and behavior. Those same classes also have higher concentrations of English Learners and students with IEPs. Many of the teachers in this study have taught both Standard-level and Advanced Math, so they were easily able to compare the different classroom environments. According to most teachers, by any measure, the Advanced and Double-advanced Math classes are much more conducive to learning and achieving proficiency in math. Students are focused and motivated, help one another, listen to each other, and can be challenged with higher-order thinking. Furthermore, in the Advanced and Double-advanced classes, little time is wasted on responding to misbehavior, teachers have more time to work with students one-on-one, parents are usually more involved, and students uphold the rules and reach the teacher's expectations.

In the minds of these teachers, doing away with ability grouping in math seems to be the logical course of action. They agreed that the current tracking system

at Sagepond is not serving the students in Standard-level Math well. It may be what the students of Advanced Math want, or more accurately, what their parents want, but it continues to put lower-achieving students at a disadvantage. For students who are already feeling confused and insecure about their math abilities, lack self-control, or simply have a hard time concentrating, being in a classroom full of misbehavior and disruptions makes it difficult to contain their own behavior and nearly impossible to learn. As mentioned earlier, many students in Standard-level Math do not have parents who advocate for them because of their own limited education or because their first language is not English. This study confirmed Welner's (1999) research that teachers often blame parents for the continued practice of tracking. Both Patrick (parent) and Mr. Parker (teacher) expressed the belief that the tracked system favors students with parents who are educated, involved, and familiar with the system. According to Ms. Arndt and Ms. Keys, school officials worry about keeping those families happy, because of competition from other districts. Mr. Parker believes that in a diverse population, such as the community within and surrounding Sagepond Middle School, this is a type of institutional racism. Math classes are segregated, and as long as parents who advocate for their children get access to higher-level classes, while students without involved parents get placed in the Standard-level Math classes, the imbalance and unequal learning environments will continue. Teachers do not appear to fault the parents of their Standard-level students for their minimal involvement, but they do seem to blame other parents for the tracked classes, namely the parents of the Advanced Math students.

***Emergent theme 3.*** Finding: All three stakeholder groups gave a negative overall portrayal of their experiences with the Standard-level Math classes.

It is impossible to overlook the continual thread of negativity that extends throughout all focus group conversations. Of course, that may be the nature of focus groups. When given the opportunity to provide input on an experience, especially an experience related to school, about which everyone seems to have an opinion, participants may want to focus on their complaints. Still, it is striking that in the more than nine hours of conversation with various stakeholders about the middle school math program, there were *very few* positive words used to describe how things are going in the Standard-level Math classes at Sagepond Middle School. It is safe to say that, overall, the experiences of all three stakeholder groups associated with Standard-level Math can be described as *not positive*. Moreover, all three groups, to some degree, expressed that having mixed-ability math groups would be preferable and more beneficial to all students.

Students, parents, and teachers alike all spoke of various negative aspects of the Standard-level Math classes. Much of what they shared confirms what has been found in previous studies, while some of their accounts contradict it. All three stakeholder groups referenced the different status associated with being in Standard-level Math. They claimed there is a stigma connected to the lower math group and a sense of elitism held by students and parents of the Advanced Math classes, similar to the findings of Yonezawa and Jones (2006). All three groups also attested to the fact that the Standard-level Math classes have a higher concentration of students who

struggle not only with math concepts, but also to stay on task and control their behavior. This is a contradiction to the claim by teachers in some studies that detracking, rather than ability grouping, leads to greater behavior problems (Welner, 1999). The concentration of those behavior problems in the Standard-level courses is the third major source of negativity for participants in this study. Such an abundance of behavior issues in one class makes it very difficult for students to focus and learn. It pulls many students into the misbehavior who would otherwise be making efforts to get their work done. This results in wasted time, which in turn leads to instruction that is abbreviated or rushed. Either way, the instruction is less effective. The ultimate result is that students in Standard-level Math accomplish less during any given class period, fall even further behind their peers, and achieve at lower levels on state assessments, thereby prolonging the achievement gap. While the research cited in this study does address a lack of motivation and cycle of disengagement that is common among lower-ability math students (Gilpin, 2010; Ramentol, 2011; Sparrow & Hurst, 2010; Turner, Steward, & Lapan, 2004), it does not generally attribute students' disengagement to the misbehavior of their classmates. The fourth main source of negativity for students, parents, and to some extent teachers, was the frustration they feel when trying to work together on math. For students, it is frustrating that their parents cannot help them more; for parents, the frustration comes from a lack of familiarity with the strategies being taught in school; and for teachers, it comes from trying to help students who do not realize they have to exert effort in order to achieve success. The research does not speak to students' interactions with

their parents, but Kadlec, Friedman, and Ott (2007) asserted that parents have difficulty helping their children in math, due to how it has changed since they were in school. Furthermore, Swinton, Kurtz-Costes, Rowley, and Okeke-Adeyanju (2011) found that when students doubt their capacity to solve a problem, they resist exerting much effort, which supports Ramentol's (2011) recommendation that teachers help students see the value of persistence. A final source of negativity for the participants of this study was about how the math classes at Sagepond Middle School are organized. Nearly every focus group addressed the possible benefits of having mixed-ability math classes, rather than the separate classes they currently have. They mentioned the advantages of having a classroom where all students are exposed to rich dialog, different approaches to problem solving, and the open expression of misconceptions. These were all elements cited in the research of Dodd (1999). Having mixed-ability math classes would also satisfy the obligation of teachers and schools to challenge students of all backgrounds with the same levels of rigor, as prescribed by Alvarez and Mehan (2006), Walker (2007), and Woodward and Brown (2006). The research of Alvarez and Mehan (2006), Boaler and Staples (2008), and Corbett Burris, Heubert, and Levin (2006) provides examples of schools in which the heterogeneous grouping of students has actually resulted in increases in achievement and participation in advanced courses by *all* students.

**Summary of findings.** As a reminder, the purpose of this study was to hear from students, parents, and teachers associated with the Standard-level Math classes at Sagepond Middle School with respect to their feelings about math. Part of the goal

was to uncover why some students harbor such negative feelings and insecurities about math, as well as to explore possible ways to change that. The hope was that once the feelings and their sources were identified, educators could find ways to counteract their effect, which would in turn raise proficiency levels in the lower-level math groups, while simultaneously narrowing the achievement gap. Hearing from students, teachers, and parents may shed some light on why math achievement is so low and the gap so wide. It might also shed light on some practices within math education that need to be altered or eliminated altogether.

Students, parents, and teachers provided a very clear picture of the math program at Sagepond Middle School. They outlined the contrast between Standard-level and Advanced Math classes. (See Appendix E.) This comparison leaves no doubt about *who* benefits more in that type of system. The conclusion it leads to is also quite clear. If educators are to improve students' performance and attitude in math, as well as narrow or even close the achievement gap, this tracked course structure appears to not be the optimal way to achieve that goal. Ability grouping in math, such as that being practiced at Sagepond Middle School, is giving different levels of students strikingly different experiences in math. With such a contrast in learning environments, which by any measure gives clear advantage to the students in Advanced Math, how could anyone ever expect the gap to close? The Advanced students are getting a quiet learning environment, cooperative classmates, teachers with time and energy to help, exposure to other ways of thinking, more time on task, and greater exposure to rigorous concepts. Furthermore, very few students in

Standard-level Math feel like they can go to their parents for help. Thus, if students in this system are ever going to break the pattern, significantly raise their achievement levels, or close the gap, it is up to the teachers or students themselves. After careful review of the stories and descriptions of the participants in these focus groups, this system does not appear to be equitable by any definition of the word.

**Implications for Educators**

The purpose of this phenomenological study was to get at the heart of what students, teachers, and parents think and feel about low-ability math groups. One goal was to hear participants describe their attitudes and experiences related to math, with the hope of discovering clear patterns among all three types of stakeholders. A second goal was to identify factors that contribute to the feelings and attitudes that students, parents, and teachers have about math. The ultimate goal of this study was to expose the ramifications of certain educational practices, prescribe ways to change or improve those practices, and eventually raise math proficiency rates and narrow, if not eliminate, the racial achievement gap in math. This careful analysis of the thoughts, feelings, and experiences of students, parents, and teachers about the lower-ability math group has revealed several significant implications for math educators and school systems.

**Analyze and evaluate how the structure and sequence of mathematics courses in the school are or are not working.** The comments of nearly all focus group participants disclosed a negative attitude about the current state of the math program at Sagepond Middle School, particularly the Standard-level Math classes.

Students, teachers, and parents enumerated various issues confronting students in Standard-level classes. Those included the stigma of being labeled "low in math," a hopelessness about ever succeeding in math, low teacher expectations, disruptive behavior in class, a sense of apathy among classmates, minimal time on task, limited assistance from teachers and peers, a class environment devoid of student leaders and productive math talk, class instruction that is rushed and not tailored to their needs, parents who are unable to help at home, parents who do not generally advocate for their needs in math, and a school system that is not preparing them for future high-level study of mathematics. In some cases, students and parents made assumptions that the conditions in the Advanced Math classes are much more conducive to learning. Some of the teachers shared their firsthand experiences teaching both the Standard-level and the Advanced-level classes.

If a school system is genuinely striving to give students a level playing field, provide equitable learning opportunities, and avert some of the negative aspects associated with lower-ability math classes, a careful analysis of the structure of its math program is warranted. Schools such as Sagepond Middle School, which separate students by math ability, should closely examine how well their system is working. This includes studying and comparing the different leveled classes in terms of student achievement, demographic make-up, climate-related issues, and student descriptions of their experiences. Depending on what is found, schools should consider their options for moving forward. The options could include anything from maintaining the status quo to completely detracking their math courses.

Before rushing into a decision, it is recommended that school leaders and teachers conduct further research on the different options. Although it appears from this study that students in the lower-ability math classes are adversely affected by tracking, it is impossible to know, based on this study alone, whether their experiences would necessarily be any more positive in mixed-ability classes. It is also important to consider how students in the higher-level math classes would be impacted by detracking, which was not addressed in this study. One recommendation for schools is to become familiar with the research on the pros and cons of tracking and detracking, including the work of Alvarez & Mehan (2006), Boaler and Staples (2008), and Corbett Burris, Heubert, and Levin (2006). Another is to study how some schools have undergone the process of detracking, and more specifically, whether they have seen improvements. A third recommendation for schools to consider in the analysis of their mathematics programming is how to keep students' doors open for advanced study of math in the future, no matter which class they choose to take in middle school.

Regardless of the decision made about the structure of their math program, schools need to make constant and deliberate efforts to evaluate how well their program is working, for all students. If they decide to detrack their classes, either completely or partially, they should compare pre-detracking data to post-detracking data. If they decide to organize classes by ability, they should compare trend data from all leveled classes over the span of several years. In any case, the data should be both quantitative and qualitative. Moreover, regardless of the decision about class

structure, there are additional steps schools can take to improve the math experience of students who are considered "low in math."

**Find out why students are so unhappy in lower-ability math classes.** Clearly, the majority of students in this study are quite unhappy with their current math classes. That should not be allowed to continue. Teachers need to search for the root causes of that negativity, and take steps to turn things around. They should ask themselves crucial questions, like, "Why have students had a distaste for math since coming to middle school?," "Why have students stopped caring or trying?," and "Why do students have such low expectations for themselves?" Teachers could get this information through classroom discussions, surveys, one-on-one conversations, or even focus groups such as the ones conducted in this study. Once the sources of the negativity are known, teachers, administrators, parents, and students need to adjust conditions in order to reverse the negativity. A specific strategy teachers should employ is to continually emphasize effort and persistence, while showing students the rewards attained through hard work (Dweck, 2008).

**Be intentional about counteracting the three big negative effects of lower-level math: low confidence, lack of relevance, and decreased motivation.** This step involves avoiding the cycle of disengagement that was referenced in the research (Cleary & Chen, 2009; Sparrow & Hurst, 2010). Many students in this study shared instances in which they have been unmotivated, insecure, or just generally withdrawn during math class. They also shared stories of similar attitudes among their classmates. It is common for students in lower-level math classes to lack confidence

in their ability to do the math in front of them. That lack of confidence may stifle their motivation or even prompt them to misbehave. It is also common for students in these math classes to question the relevance of what they are learning, thereby creating no incentive to complete the work. Whatever the case may be, low-confidence can breed lack of motivation, which leads to failure in math, which lowers the students' confidence even more. Likewise, the sense that something is useless can breed apathy, which leads to incomplete work, poor grades, and low self-concept, which starts the cycle anew. Teachers need to be aware of this cycle. (See Appendix G.) They need to continually strive to keep students actively engaged, by using the suggestions students gave in this study: hands-on activities, more movement in class, and math games. They also need to emphasize effort, hard work, process, and growth (Dweck, 2008), as well as provide students with frequent opportunities to experience success (Newton, 2010; Ramentol, 2011; Stuart, 2000). It is exhausting work, but teachers need to constantly analyze what it is that their lower-level math students need at any given time. They should ask questions like, "What would help improve students' confidence?," "How could I make math more relevant to students' lives?," and "What will it take to motivate students?" It may feel like an uphill battle against societal norms, adolescent behavior challenges, and time constraints, but it is critical that teachers work to prevent the negativity or cycle of disengagement from ever getting started.

**Give students in lower-level math classes more one-on-one time with their math teachers.** If math classes are to remain homogeneous by ability level, the

teachers of those classes will continue to face serious time limitations. A common theme among students in the focus groups was that they do not get enough individual assistance from their math teachers. It also appears that the whole-group lesson and work time are frequently rushed. If students are finding it difficult to even start a problem, and they cannot turn to their classmates for help, they likely need more one-on-one or small-group instruction with the teacher. At Sagepond Middle School, most class periods are 45-50 minutes long. That may be sufficient for a classroom of engaged, compliant, self-sufficient students who listen to the lesson and get right to work. However, in a class in which many students are distracted, have low confidence, lack motivation to do much work, and rely on repeated instructions from the teacher, 45-50 minutes is not enough. Several students shared that they need to stay after school or attend RTI if they really hope to master a skill in math. Schools should look at extending the class periods of Standard-level Math, to allow for longer, more thorough explanations, more wait-time, more small group learning opportunities, and longer stretches of time to explore problems on their own. Undoubtedly, because students depend on teachers to get started, it is also imperative to provide extra support in those classes, in the form of co-teachers, specialists, or para-professionals. It is also recommended that the Standard-level Math classes have smaller student-to-teacher ratios than the more advanced classes.

**Address the notion that some students believe they have higher status than others.** Educators in schools that employ ability grouping or tracking have to realize that there are often certain labels or levels of status associated with each track.

This is hard to avoid and even harder to change once it is in place. This should be a topic of conversation among staff at the school, along with efforts they plan to utilize to neutralize those tendencies and eliminate those attitudes among students. This could involve renaming classes, although that is not always effective, because students ascertain which level is which, despite the names of the courses. It could involve more social-emotional instruction throughout the school, so that such stratification is unacceptable in the school's culture. Whatever method a school chooses to counter the notion of status, this process has to involve a change in mindset (Dweck, 2008). It must emphasize among all students and staff that each person at school is at a different place in the learning process, learns at a distinct pace, and possesses unique strengths.

**Make improving classroom climate a priority.** From the accounts of nearly all focus group participants, the climate within most Standard-level Math classes at Sagepond Middle School is alarming. Students attested to that, as did teachers. Whether a school opts for a tracked system or a detracked system, there will likely be some degree of student misbehavior in math class. That must be addressed. Teachers need to find ways to engage all students, especially those who feel unmotivated, insecure about their own abilities, and tempted to misbehave to avoid work. They need to prevent students from getting off-track, help them build their confidence, and ensure that they are mastering grade-level standards. The situation as it stands at Sagepond is not acceptable. Teachers are ignoring certain disruptive behaviors, consuming class time disciplining entire groups of students, and reacting to some

behaviors in ways that really leave an impression on their students (red face, yelling, leaving the classroom). For schools like Sagepond Middle School, investing in professional development around classroom management for teachers and assistants is a must, especially for those teaching lower-level math students. The training should include strategies for identifying the reasons behind students' misbehavior, as well as strategies for engaging them and getting them back on track. One option is to train teachers in a classroom management approach such as Developmental Designs, which focuses on meeting the social-emotional needs of adolescent students, as well as providing engaging and effective instruction for students of various abilities and learning styles (*Developmental designs 1 resource book*, 2012).

**Provide more counseling for students and their parents around math programming options.** Students and parents need to be more informed about the different course offerings in math, as well as the path they can choose to follow as they complete middle school, attend high school, and pursue a career or post-secondary education. They need to be able to see how their choices can play out down the road. Math teachers and school counselors should advise students about the ramifications of continuing to take Standard-level Math, including the limitations to their options in the future. Even in schools without tracking, students benefit from knowing the paths they can follow regarding their coursework in middle school, high school, and beyond. Teachers and counselors need to be especially vigilant of students who knowingly or unknowingly are already giving up the idea of ever pursuing higher-level math courses. The counseling being provided to students may

also need to include efforts to reverse negative attitudes about math or any other subject that may be preventing students from achieving their potential.

**Make efforts to get parents more involved in registration.** Parents of Standard-level Math students seem quite out-of-the-loop with regard to class registration, at least in the area of math. Consequently, their children tend to not challenge themselves to take a higher-level class or break with what they have always done. Parents need to be more familiar with the system. This requires teachers, counselors, and administrators to reach out to parents during the registration process, provide information about current and future courses, and encourage them to consider all options for their children. These efforts to involve parents must accommodate the different needs, schedules, educational backgrounds, and languages of the parents. Everyone should feel welcome and consider themselves an important part of the registration process.

**Provide a proper bridge from the elementary math experience to the middle school math experience.** Students generally seem to have good memories of elementary math, but for some reason, they become disenchanted with math in middle school. Teachers need to explore the reasons for this. They should ask themselves questions like, "What has changed in math since elementary school?," and "How can the strategies that seemed so successful in elementary school be incorporated into middle school math?" Middle school math teachers would benefit from talking with teachers of the elementary schools that feed into their school. That connection would not only help them identify strategies that have been successful, but also provide

valuable information on the strengths, weaknesses, interests, and prior learning of incoming students. It would also benefit the elementary teachers, because they could see which math concepts students need to know in the future, and take steps to build a more solid foundation at the elementary level. Additionally, given the research on the math anxiety of elementary teachers (Beilock, Gunderson, Ramirez, & Levine, 2010), school districts should take a close look at the attitudes and quality of instruction at the elementary level. They should address any possibility that elementary teachers are inadvertently swaying students' views on math, increasing their levels of anxiety, or stifling their creativity or problem-solving skills.

**Continue to implement the practices that students notice and appreciate.** Throughout the student focus groups, students provided insight into what they prefer in terms of teacher demeanor and instructional practices. Students appreciate teachers who are strict, but caring, calm, and nice. They like receiving recognition, feedback, and one-on-one help. They prefer hands-on activities and opportunities to have fun, move, and work with friends. They also find it very helpful when teachers work with them after school or during intervention block. It would therefore behoove math teachers in any school setting to follow these suggestions, as well as closely monitor the types of activities that receive the most positive response from their current students.

**Put more effort into meeting the needs of students with exceptional needs and provide the tools necessary to personalize the learning of all students.** No matter the structure of the math program, it is extremely important to ensure that the

needs of all students are being met. It is preferable that specialist teachers be assigned to co-teach math classes, in order to meet the needs of English Learners and Special Education students. Math teachers also need to pay close attention to the barriers that may be standing in the way of learning for some students, and provide the accommodations, scaffolds, re-teaching, or language supports that are necessary. Teachers also need to be very aware of the language they are using in class and make sure it is understood by all students.

**Set high expectations for all students.** Regardless of the setting, students really pick up on the fact that teachers hold different students to different standards. Teachers need to be cognizant of the expectations they have for students. Instruction must be differentiated, but all students should be expected to reach a high academic and behavior standard. At Sagepond Middle School, in addition to the academic differences, there are distinct behavior expectations for students in the different math levels. Some students are expected to come to class with materials, but others are not. Some students are expected to be ready to start class right away, but others are not. When there are inconsistencies such as these, teachers need to do their best to mitigate them. Rather than lower expectations to accommodate the least willing, teachers should raise expectations for everyone, knowing that it may take some longer to get there, but providing the scaffolds needed to ultimately reach those same high goals.

**Take steps to make math less frustrating for parents.** Parents of the students in Standard-level Math at Sagepond are clearly frustrated with the math

education their children are receiving. They do not understand new methods for solving problems. They wonder why certain concepts or skills that they once mastered are not being taught to their children. They are confused by the work that students bring home. They feel helpless when trying to assist their children, and find the school's resources to be ineffective. Teachers need to go to greater lengths to engage parents in their children's math education. This includes teaching them about the strategies, skills, and concepts being covered in class, clarifying expectations for homework and "showing their work," describing the classes that are offered during registration, and providing ideas of how they can encourage and extend math learning at home. All this can be done in multiple ways, including Parent Information Nights, Family Math Nights, newsletters, personal emails, telephone calls, invitations to visit class, focus groups, surveys, and the sharing of useful resources, such as web sites, videos, and math manipulatives.

**Help all stakeholders recognize that math education is in a constant state of flux.** As in any educational discipline, change is inevitable. Just as advances are made in technology and new skills demanded at the workplace, schools need to adjust the mathematics instruction they provide. Academic standards evolve to reflect changes in society and improve what has not been successful in the past. As standards and skills evolve, so does the accompanying curriculum. It is important for everyone to recognize that the way math is learned by one generation may be totally different for the next generation. Finally, it is very likely that the mathematics community will always be searching for ways to achieve more and provide more for

students. By no means has the silver bullet of math education been discovered. If stakeholders are prepared to face new demands and find innovative ways to respond, the misunderstandings and negativity encountered in this study can be reduced.

**Recommendations for Future Research**

This study has shed light on many important aspects of math education in the United States, especially at the middle school level. As with any research study, it has also raised new questions and provided the impetus for further investigation. There are various directions researchers and educators could take to expand upon the findings in this study. In some cases, future research could drill deeper into the same themes investigated here. In others, it could take on themes that surfaced during this study but were not the main areas of focus.

**Compare attitudes of students and parents from different demographic categories.** Initially, there was hope that this study might provide information on the different feelings students, teachers, and parents have, according to different subgroups, such as ethnicity, gender, grade level, first language, or socio-economic status. For example, it would have been very interesting to see if there were differences in motivation levels in math depending on a student's particular economic background or ethnic heritage. That endeavor became difficult in the current study due to the small number of participants from some of the demographic categories. It was also not the chief purpose of this study. However, it would be very valuable for researchers and educators alike to try to identify whether certain populations of students are more susceptible to becoming apathetic or negative about math, or are

more adversely affected by ability grouping. Future research on this subject would also be enhanced if there were greater representation from people of color within the parent focus groups, at least to the extent that the parent focus groups were more closely representative of the diversity within the student body of the particular school setting.

**Conduct focus groups of students in all math classes.** As students in this study described the scene within their Standard-level Math classes, questions arose about whether students in the Advanced Math classes would tell similar stories, or if their comments would be drastically different. As mentioned previously, it is recommended that schools study how well their math program is serving the needs of all students. In addition to hearing from students from the lower-ability classes, it would be advisable to conduct the same type of focus groups with students of the higher-level math courses. Subsequently, those findings could be compared with the findings in this study. One might expect to hear vastly different answers to the same questions. It would indeed be interesting to see if there was anywhere near the level of negativity about math with the Advanced Math students as was discovered in the Standard-level Math students. It would also be interesting to contrast the learning environments of the different levels to verify if the Advanced Math students are being afforded a much calmer, easier setting in which to learn. It would be worthwhile to study whether the education of the Advanced Math students is actually enhanced by tracking, and whether detracking would impact them more negatively than it would the Standard-level students.

**Study the attitudes and experiences students have had in tracked and detracked classes.** One of the major findings of this study was that students and teachers of the Standard-level Math classes, and the parents to a lesser degree, hypothesized about how much better these students would do in math if their classes were not organized by ability. As described earlier, participants provided many arguments in favor of detracking the math classes at Sagepond Middle School. Although based on research and their personal experiences in Standard-level Math, which have been far from successful, these participants can still only *imagine* how things might be better for students if math classes were of mixed ability. They have not actually experienced mixed-ability math classes to be able to attest to their efficacy. It would be quite beneficial to conduct a study with students who have experienced both types of situations, perhaps students who have been in a school that has detracked its math program. The lower-ability students could share how things felt for them in a class of students of similar abilities, and contrast that with how they felt with a more balanced class. That would provide valuable firsthand insight into the pros and cons of detracking.

An alternate research study could involve comparing students' experiences in tracked classes to their experiences in mixed-ability classes of *any* subject area. For example, many students in this study compared the classroom climate of their math classes (which are tracked) to their science or social studies classes (which are mixed-ability). It would be interesting to do a more thorough analysis of students' descriptions of the behavior, motivation, effort, and attitudes of their classmates in

those other classes compared to their math classes. It would also be worthwhile to examine how students compare their ability to learn in the different environments.

**Examine how students may subconsciously embody their parents' attitudes about math.** One theme that surfaced during data analysis was the degree to which parents' attitudes about various aspects of their children's school experiences may be detected and adopted subconsciously by their children. This question arose as it became clear that students *hear* their parents say that math is important, but *see* their parents resist helping them with math or getting involved with the math program at school. In addition, the parents involved in this study have some very strong, negative opinions about the math program at Sagepond Middle School. That begs the question: "Which is more influential on their children's own feelings about math, that parents *say* math is important, or that parents *demonstrate* through thoughts and deeds that they have significant negative opinions about the math their children are studying?" It would be very interesting to dig deeper into this question. Specifically, it would be insightful to investigate how children embody the attitudes demonstrated by parents, even when parents intend to communicate the opposite. A thorough investigation of prior research, along with more specific conversations with parents and students, could shed light on how parents' attitudes unwittingly seep down to and are embodied by their children. It would be very interesting to see the degree to which this phenomenon may generally be real, as well as the degree to which it happens in math compared to other academic subjects.

**Analyze the motivations behind students' and parents' class choices in a**

**self-select system.** To some degree, school leaders at Sagepond Middle School have grappled with the inequities of the tracked math classes for a while. That is why they instituted the new "self-select" policy at the start of the 2015-16 school year. Prior to that, students had been assigned to math classes by teachers, school counselors, and administrators, based on test scores and previous math performance in school. In an effort to be more open and fair, they made that change and allowed students and parents to choose the classes they preferred. Now that that policy is in place, it would be very interesting to study the process that parents and students follow to make that decision. What are the motivations of students and parents when they select one class over another? Do those decisions seem to follow any particular patterns, or break down according to ethnicity, education level, socio-economic status, or any other factor?

**Investigate the stigma associated with lower-level classes.** A theme that was raised by parents was the idea that there is a stigma attached to being in Standard-level Math at Sagepond Middle School. It was not possible to follow up on this with students, because the parent focus groups occurred after the student focus groups. A future study could dive into the question of stigma associated with different academic tracks.

**Study to what degree negative classroom climate can be attributed to students versus teachers.** Over the course of this study, there was much mention of the high occurrence of misbehavior in the Standard-level Math classes. The assumption made by teachers was that the disruptive, chaotic classroom climate is

due to the high concentration of students who tend to misbehave. However, it is unclear whether the teachers should bear more of the responsibility for the negative climate. It would be interesting to study to what extent the misbehavior is owed to students' tendencies versus teachers' inabilities to employ effective classroom management techniques.

**Conduct a similar study with the same sample of students during or after high school.** Finally, it would be very enlightening to speak with these same students in a few years. Considering the attitudes that many of them expressed about not having much potential in math, in addition to the lack of motivation exhibited by many in their math classes, it would be very interesting to find out if they reversed course at some point. It would certainly be helpful for teachers to see if their former Standard-level Math students continued to be as unmotivated and negative about math for the years following middle school. It would be beneficial to know if what students begin to feel in middle school gets better or worse in subsequent years.

**Concluding Remarks**

Prior to commencing this study, the researcher spent many years doing what countless other math educators across the country were doing: searching for ways to improve the math achievement of her middle school students, especially those who had been relegated to "the low math class." She had also seen first-hand the inequities within the math program at the schools in which she worked, as well as the disparities between the achievement of White students and students of color. For years, she questioned whether her colleagues and she were doing what was best for

students by separating them into math classes based on ability. Despite the many strategies implemented, proficiency rates remained low and the achievement gap persisted. Moreover, students in the Standard-level classes did not appear to consider themselves strong math students, or even students who *liked* math. For the researcher and many other math teachers, the years leading up to this study have been frustrating, to say the least. The struggles the researcher experienced are what sparked this study and forced her to look at things from a different perspective.

No matter the effort put forth by teachers and administrators to change the trends in math achievement, *students* are the ones most affected by what is happening in the classroom. They *know* why they do not like math. They feel worse than anyone when things do not go well. Therefore, they should have a say in the changes needed to improve their learning, in math as well as other subject areas.

This study has demonstrated the value of hearing directly from students. Students have a lot to say; they have a wealth of ideas; and they rarely get a chance to speak. Allowing them an opportunity to solve the issues most affecting them can accelerate the improvement process and give students a sense of empowerment.

This study also showed how beneficial it is to involve parents and teachers in the discussion of school improvement. Parents can provide a window into who their children are as learners and what they do at home, as well as the attitudes and ideas to which they are exposed. Teachers can provide another perspective into what is or is not working for their lower-level students.

Talking to all three groups of participants has revealed certain notions about

lower-ability classes in middle school math. While these results pertain to one particular school and cannot be generalized to all similar settings, they are significant and deserve careful consideration by all middle school educators. Students in the low-ability group at Sagepond are indeed unenthusiastic about math, at least currently. They do not demonstrate much motivation to change their status or class placement. In their current classes, they report having trouble focusing, minimal time to learn, and little help from their teachers. Many of them maintain that their math classes are boring and the concepts irrelevant. Both the research and enrollment numbers at Sagepond indicate a disproportionate number of students of color in the lower-level math classes (DeSena & Ansalone, 2009; Newton, 2010). Teachers described the environment within Advanced Math as much more favorable to learning. If it is more difficult to learn in the lower-level classes, *and* if those classes disproportionately enroll students of color, it is logical to wonder if the tracked math classes contribute to the achievement gap.

That leaves educators with some very important questions. The first is, how does their system, tracked or not, affect the feelings and attitudes of their students toward math? The second is, how does their system affect the achievement gap in their school? Thirdly, if some of their students express negative opinions similar to those of the lower-level math students at Sagepond, do they really want to continue the current system? In other words, do they want to continue a system in which students may determine during their middle school years that they have little potential in math? The final question is, if careful analysis of their system reveals disparities in

results or displeasure with the status quo, how willing are they to change to a system that is more favorable to all students? Until they are ready to confront these questions, efforts to achieve equity and close the achievement gap may have little success. These are questions which could spark enormous change in schools. That change could make a huge impact on students who may otherwise never have imagined being successful in math.

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Appendix A

Focus Group Protocol 1

STUDENT FOCUS GROUP(S):

I. Welcome, introductions, and acknowledgements

II. Ice breaker

III. Explanation of the purpose of the focus group

IV. Review group guidelines/ground rules

A. WE WANT YOU TO DO THE TALKING.

i. We would like everyone to participate.

ii. I may call on you if I haven't heard from you in a while.

B. THERE ARE NO RIGHT OR WRONG ANSWERS

i. Every person's experiences and opinions are important.

ii. Speak up whether you agree or disagree.

iii. We want to hear a wide range of opinions.

C. WHAT IS SAID IN THIS ROOM STAYS HERE

i. We want folks to feel comfortable sharing when sensitive issues come up.

D. WE WILL BE AUDIO- AND VIDEO- RECORDING THE GROUP

i. We want to capture everything you have to say.

ii. We don't identify anyone by name in our report. You will

remain anonymous.

(Items A-D taken from Guidelines for conducting a focus group, 2005)

E. AT ANY TIME, YOU MAY CHOOSE TO END YOUR PARTICIPATION IN THIS GROUP.

V. Focus group questions

A. Students' current placement in math

Main questions:

A.1. What math class are you currently in?

A.2. Why do you think you are in that class?

Possible subquestions:

a.1. How do you feel about being in that class?

a.2. How long have you been in that level class (since which grade)?

a.3. How would you describe the students in that class?

B. Math identity

Main questions:

B.1. Do you like math?

B.2. Are you good at math?

B.3. Do you think math is important?

Possible subquestions:

b.1. How is your mood during your math class?

b.2. Do you feel like your math class is challenging enough?

b.3. Do you feel like your math class is too hard?

b.4. Do you think you'll use math in the future?

C. Relationship with math teachers

Main questions:

C.1. What do you think are your math teachers' opinions about you and your math ability?

C.2. What are some things your math teacher does to help you to do better in math?

Possible subquestions:

c.1. Does your math teacher know when you need extra help?

c.2. Does your math teacher offer additional help in math when you need it?

c.3. Do you let your teacher know when you don't know how to do something or don't understand something in math?

c.4. Does your math teacher make you feel smart in math?

c.5. Do you think your math teacher believes that you can solve hard problems?

c.6. When you have needed extra help in math, what has been the most helpful?

c.7. When you have needed extra help in math, what has been the least helpful?

D. Family perceptions of math

Main questions:

D.1. How good are your family members at math?

D.2. Do your parents think math is important? How do you know?

Possible subquestions:

d.1. Do your parents use math in their jobs?

d.2. Do your parents help you with your math homework?

E. Exit question

Main question:

E.1. Is there anything else you would like to say about math?

VI. Conclusion of focus group – Thanks

VII. Questions/prompts added after first student focus group:

A. Compare the environment in your math class to your other classes.

B. Have you heard your friends or peers talk about the Advanced Math classes? If so, what have they said?

C. How do you think the Advanced Math classes might be different from your math class?

Appendix B

Focus Group Protocol 2

PARENT FOCUS GROUP(S):

I. Welcome, introductions, and acknowledgements

II. Ice breaker

III. Explanation of the purpose of the focus group

IV. Review group guidelines/ground rules

A. WE WANT YOU TO DO THE TALKING.

i. We would like everyone to participate.

ii. I may call on you if I haven't heard from you in a while.

B. THERE ARE NO RIGHT OR WRONG ANSWERS

i. Every person's experiences and opinions are important.

ii. Speak up whether you agree or disagree.

iii. We want to hear a wide range of opinions.

C. WHAT IS SAID IN THIS ROOM STAYS HERE

i. We want folks to feel comfortable sharing when sensitive issues come up.

D. WE WILL BE AUDIO- AND VIDEO- RECORDING THE GROUP

i. We want to capture everything you have to say.

ii. We don't identify anyone by name in our report. You will

remain anonymous.

(Items A-D taken from Guidelines for conducting a focus group, 2005)

E. AT ANY TIME, YOU MAY CHOOSE TO END YOUR PARTICIPATION IN THIS GROUP.

V. Focus group questions

A. Math identity

Main questions:

A.1. Do you like math?

A.2. Are you good at math?

A.3. Were you good at math in school?

A.4. How would you describe your experience with math in school/growing up?

A.5. Do you think math is important?

Possible subquestions:

a.1. What math group were you in during grade school or middle school?

B. Involvement with child's math work at home

Main questions:

B.1. How do you help your child with math homework?

B.2. How do you describe your own math abilities when interacting with your child?

B.3. What do you say to your child when he/she is struggling with math work?

Possible subquestions:

b.1. Do you usually understand your child's math homework?

b.2. Do you communicate to your child that math is important?

C. Perceptions of and interactions with school

Main questions:

C.1. In what level math group is your child placed in this year?

C.2. Describe your child's abilities in math.

C.3. Does your child like math? How do you know?

C.4. How do you feel about the math being taught to your child?

C.5. How do you communicate your concerns to the school or teacher?

Possible subquestions:

c.1. Do you ever think that your child is not being challenged enough?

c.2. Do you ever think that your child is not helped enough in math?

D. Exit question

Main question:

D.1. Is there anything else you would like to say about math?

VI. Conclusion of focus group – Thanks

VII. Questions/prompts added after student focus groups:

A. How has your child described his/her current math class?

B. What are your opinions about the current math program at Sagepond Middle School?

Appendix C

Focus Group Protocol 3

TEACHER FOCUS GROUP(S):

I. Welcome, introductions, and acknowledgements

II. Ice breaker

III. Explanation of the purpose of the focus group

IV. Review group guidelines/ground rules

A. WE WANT YOU TO DO THE TALKING.

i. We would like everyone to participate.

ii. I may call on you if I haven't heard from you in a while.

B. THERE ARE NO RIGHT OR WRONG ANSWERS

i. Every person's experiences and opinions are important.

ii. Speak up whether you agree or disagree.

iii. We want to hear a wide range of opinions.

C. WHAT IS SAID IN THIS ROOM STAYS HERE

i. We want folks to feel comfortable sharing when sensitive issues come up.

D. WE WILL BE AUDIO- AND VIDEO- RECORDING THE GROUP

i. We want to capture everything you have to say.

ii. We don't identify anyone by name in our report. You will

remain anonymous.

(Items A-D taken from Guidelines for conducting a focus group, 2005)

E. AT ANY TIME, YOU MAY CHOOSE TO END YOUR PARTICIPATION IN THIS GROUP.

V. Focus group questions

A. Students' attitudes about math

Main questions:

A.1. How would you describe the attitudes that students in the lower math groups have toward math?

A.2. How motivated are those students to do well in math?

Possible subquestions:

a.1. Why do you think students have positive and/or negative feelings about math?

a.2. What is the biggest contributor to students' positive and/or negative feelings about math?

B. Teacher actions

Main questions:

B.1. What do you do to motivate students who are struggling in math?

B.2. How do your instructional strategies differ among the different levels of math classes?

B.3. How do your expectations for students differ among the different levels of math classes?

Possible subquestion:

b.1. How does the language you use with students differ among the different levels of math classes?

C. Teachers' attitudes

Main questions:

C.1. How do you feel about the ability grouping that is done in your school in math?

C.2. If you could change anything about the way your students have been brought up to understand and "do" math, what would you change?

C.3. Do you believe it is possible to turn around a middle school student who struggles with and dislikes math? If so, what is the key?

Possible subquestions:

c.1. How do you think teachers might contribute to the overall negativity students have toward math?

c.2. How do you think teachers might contribute to the overall positive feelings students have toward math?

D. Exit question

Main question:

D.1. Is there anything else you would like to say about math?

VI. Conclusion of focus group – Thanks

VII. Questions/prompts added after the student and parent focus groups:

A. What are the biggest challenges you face when teaching Standard-level Math?

B. Compare the environment in your Standard-level Math class(es) to your other classes.

## Appendix D

### Coding/Categories

Codes Developed Prior to Data Collection and Analysis:

| | |
|---|---|
| RQ1 | Pertains to Research Question 1 (students' feelings about math) |
| RQ2 | Pertains to Research Question 2 (factors that have contributed to feelings) |
| SQA | Pertains to Research Subquestion A (students' impressions about school experience in math) |
| SQB | Pertains to Research Subquestion B (how students' feelings are influenced by family) |
| SQC | Pertains to Research Subquestion C (messages students receive from teachers) |
| UXT | Unexpected theme that came up in the research |
| APLOE | Apathy and lack of effort (student) |
| DIFLEV | Perceived difficulty level of current math class (student) |
| FAMAB | Family members' math abilities |
| FAMATT | Family members' attitudes toward math |
| GENNEG | General feelings of negativity about math (student) |
| LOWSW | Low sense of self-worth and self-efficacy in math (student) |
| NOTFUN | Math class not fun for student |

| | |
|---|---|
| OTHPEERS | Treatment & opinions of other peers toward students in low ability math classes |
| PEERSSAME | Characteristics of students in the low-ability math classes (as perceived by student) |
| P-SINTER | Parent-student interactions related to math |
| TQUAL | Teacher quality as perceived by student |
| T-SINTER | Teacher-student interactions related to math |
| UNIMP | Perceived unimportance of math (student) |

Codes Developed Subsequent to Data Collection

| | |
|---|---|
| ANX | Feelings of stress or anxiety |
| ATTN | Paying attention in class |
| BEHISS | Behavior issues in the same class |
| CLACT | Activities done in math class |
| CONFU | Confusion |
| ELEM | Experience with math in elementary school |
| EXP | Expectations |
| FRUS | Frustrated or frustration |
| FUT | Future plans involving math |
| GIVEUP | Students give up |
| GRADES | Grades as a reason for taking class or motivator |
| GT | Gifted and Talented |

| | |
|---|---|
| IMP | Math is important |
| LOWCONF | Low confidence in math |
| MAKEUP | Composition of students in the class |
| MATHPROG | Math programming at Sagepond Middle School |
| MOTIV | Motivation in math class |
| NEWMATH | What parents refer to as "New Math" |
| OTHBEH | Behavior of students in other classes |
| OWNBEH | Students' own behavior |
| PARHELP | Parents' degree of help in math |
| PARINV | Parents' degree of involvement with anything related to math at school |
| PEEREFF | Effect that peers have on learning |
| PERABL | How students perceive their own ability in math |
| P-TINTER | Parent-teacher interactions related to math |
| TDISC | Teachers' discipline practices |
| THELP | The help teacher provides in class |
| UNDLEV | How students understand the different levels of math classes |
| WHY | Why students registered for current math class |

Appendix E

Side-by-side Comparison of Focus Group Participants' Descriptions of

Advanced and Standard-level Math Classes

| Advanced & Double-advanced Math Classes | Standard-level Math Classes |
|---|---|
| According to Students | |
| Students behave better | Many behavior issues |
| Students try harder | Students do not care |
| Teachers have higher expectations | Teachers have lower expectations |
| Classroom climate is calmer | Classroom climate is loud |
| More homework | It is difficult to focus |
| Course moves at a faster pace | Students do not get sufficient help from teachers |
| | Lots of wasted time in class |
| | Instruction is rushed |
| | Students are sometimes tested on material they have not learned |
| | Teacher often gets upset |
| | Teacher's energy & time spent on behavior management |
| According to Teachers | |
| Students listen | Many behavior issues |
| Richer conversation | Students do not listen to each other |
| Students come to class prepared | Students do not bring materials to class |
| Parents advocate for their children | Students have learned helplessness |
| Students need fewer directions | Students all need individual attention |
| Students are motivated | Students come to class late |
| Peers are able to help each other | Students cannot get help from peers |
| Students benefit from hearing other students' thinking | Students are constantly disruptive; "Whack-a-mole" |
| Teachers can use a variety of instructional strategies | Teachers say certain instructional strategies do not work in these classes |
| | Teacher's energy & time spent on behavior management |
| | Lesson is rushed; teachers cannot allow much wait-time for student responses |
| According to Parents | |
| Learning environment is better | Students are taught too much, too fast |
| Classroom not as noisy | Classroom is loud |
| Teachers not as tired | Teacher is not very helpful |
| Elitist attitude among students | Teacher is frustrated and discouraged |
| Privileged parents advocate for these classes | Students are frustrated and discouraged |

Appendix F

Student Answers to Focus Group Prompt:

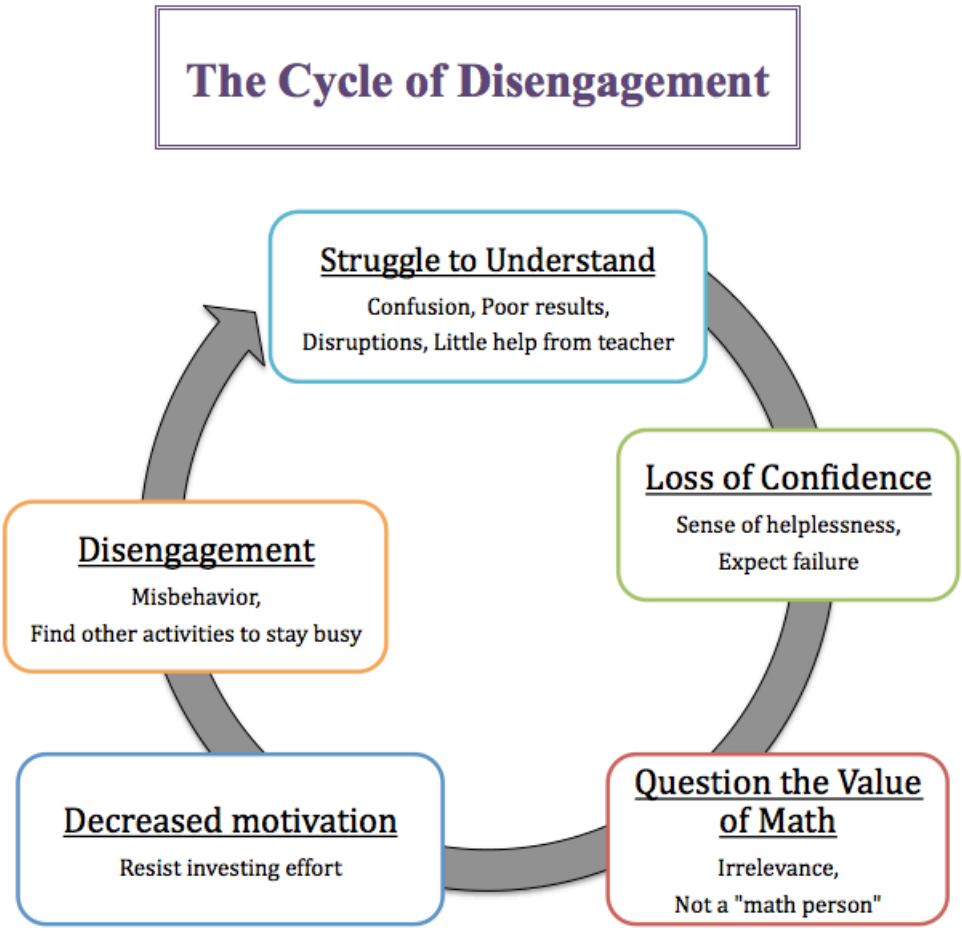
"Describe the students in your math class."

| Student Name | Description of Classmates |
|---|---|
| Andrew | Loud; lots get sent to TAB and TAB-Out; holding us back; they're lowering the expectations; we don't get much done in math; dancing; very little time to work |
| Anthony | Some are good, some are bad; don't say the right words; think they can do whatever they want; think they don't have to listen; stress me out because our teacher needs to keep stopping |
| Ariana | Some good; many are disruptive, don't listen, blurt out answers, loud; maybe they feel like they're not smart enough; less confident; no deeper meaning for education; prevent me from hearing; don't try; don't stay after |
| Ava | Distracting, don't listen to teacher; we could learn more if people would actually listen |
| Bailey | Disruptive; no one helps me; interrupt the teacher all the time; don't let me get anything done; not focused; think math is stupid; other people make math hard; demanding of the teacher's time |
| Bryan | Loud; cause teacher to stop a lot |
| Cecilia | Too smart (she's in the Advanced Math class); loud but smart; focused; finish their work; on task most of the time; respectful to teacher; listen |
| Chase | Lots of time-outs; too much talking; other people make math hard |
| Chloe | Most are never paying attention; never do homework or turn in work; we don't get much done in math; not many leaders |
| Colby | Loud; cause teacher to stop a lot; waste time |
| Darla | Some people are loud, but they usually quiet down when the teacher tells them to; don't even try; if group-mate isn't trying, I suffer |
| Eliza | They don't pay attention very well; don't listen until they get the worksheet; holding us back; we don't get much done in math; many arrive late; not many good leaders |
| Graham | Not right |
| Madeline | Loud, they don't bother me; cause teacher to stop a lot; never finish; instruction is rushed |
| Maisy | Too much talking; really distracting; off task; we don't get much done in math; I don't get the help I need; not many leaders |
| Manny | Annoying; irritating, destructive, dorks; they think math is unimportant |
| Martin | Real smart; argue a lot; distracting, make teacher stop class a lot |
| Martin | Real smart; argue a lot; distracting, make teacher stop class a lot roast; some are never focused; lots of time-outs; disruptions make teacher wait, wasting everyone's time; shout across room when they need help |

| | |
|---|---|
| Maxwell | Disrupt other students; don't pay attention; don't care about the subject of math; they're holding me back; we have to stay after the bell because of their behavior; yelling, trying to roast each other; some are never focused; loud, don't let us focus; don't care about math; loud kids = don't care about math; waste our time; it's the students that make math class hard |
| Nathaniel | Distracting; loud, make us stay after; we don't get much done in math; I don't get the help I need; not many leaders |
| Noah | Distracting; funny; we don't get much done in math; not many leaders |
| Oliver | Funny, fun; some are annoying; make fun of me; roast; some are never focused; make us put our heads down |
| Olivia | Really distracting; I think they think it's important, they just act up some days |
| Randal | Loud; very distracting; messing around; they're lowering expectations; we don't get much done in math; dancing; not many leaders |
| Renae | They always put the behavior problems in my math class; kids that struggle more with math; behavior issues; kids talk too much; kids out of control and off task; so many kids struggling with math in the same class; need constant assistance; no patience to wait for help; they give up |
| Scarlett | Purposely disruptive; seek attention; think they won't need math for the future; prevent me from concentrating; don't try; they slow me down; don't consider themselves privileged; don't see the point in school |
| Skyler | Loud; I don't think they think it's very important; they say math class is boring; roast; some are never focused; use their phones in class; waste class time, work time is very short |
| Sonia | Distracting; talking when teacher talks; make noise, slam desks |
| Spencer | Friendly; some are bad; war inside the classroom, throwing stuff, yelling, playing games, crazy, teacher screams; we don't get much done; teacher's face gets red, she starts yelling |
| Tess | Loud; talk and don't do the work; waste time of the whole class; don't listen to the teacher |
| Trevor | Distracting; disrespectful to teacher; trick teacher; stay in TAB-Out for whole class; yell out; they don't care about math; talk and talk and talk |
| Willa | Bad class; kind of off task; they've given up; they feel the lower expectations and think they don't have to do it; lots of talking then teacher just walks away; teacher doesn't get the chance to get to every student; not many leaders |
| Wyatt | Fun; we all get along; students get distracted easily; cause teacher to stop a lot |

Appendix G

The Cycle of Student Disengagement




The Cycle of Disengagement is a diagram created by Maria Kreie Arago, based on the research of Alliman-Brissett & Turner (2010), Cleary & Chen (2009), Dweck (2008), Gilpin (2010), Newton (2010), Ramentol (2011), Rowan-Kenyon, Swan, & Creager (2012), Schommer-Aikins, Duell, & Hutter (2005), Sparrow & Hurst (2010), Stuart (2000), Swinton, Kurtz-Costes, Rowley, & Okeke-Adeyanju (2011), and Turner, Steward, & Lapan (2004).