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Self-Efficacy And The Transfer Of Collabortive Learning To Independent Assessments In The Mathematics Classroom

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SELF-EFFICACY AND THE TRANSFER OF COLLABORTIVE LEARNING TO INDEPENDENT ASSESSMENTS IN THE MATHEMATICS CLASSROOM

by

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CHAPTER ONE

Introduction

Overview

Entering middle school, students often exude an undeniable social energy. That energy, when appropriately channeled, can support enduring learning. The task of finding productive ways to channel that energy can be challenging, especially for new teachers. Teacher education programs as well as professional development workshops often promote collaborative learning as a best practice not only for capitalizing on that social energy, but also for boosting student learning. With research supporting the benefits of collaborative learning, many teachers have strived to incorporate more socio-centric activities into their lessons. Fortunately, there are countless resources for teachers to facilitate such activities.

As a middle school mathematics teacher, I can attest to the extraordinary power of cooperative learning experiences. I have witnessed an increase in student engagement when lesson activities support collaborative, rather than independent, work. Despite that increase in engagement, I have also observed a struggle to apply collaborative learning to independent tasks. That struggle has led me to the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?*

In this chapter, I give context to my research question through an overview of my personal and professional background. I then present my question and provide a rationale for further investigation.

Researcher Background

As someone who studied Literature and Art History as an undergraduate, I never expected to be a middle school mathematics teacher. I thought I would be immersed in the arts as either a researcher or a professor. I always preferred independent work and believed I learned better in isolation rather than in a group setting. While I still prefer working independently, my understanding of the learning process as well as my aims for the future have drastically changed over the last ten years.

That process of change started when I accepted a position with an AmeriCorps program, the Minnesota College Success Corps. Originally, I served as a reading and writing supplemental instructor and tutor, but soon felt like I could better serve students in a different content area. After one semester, I volunteered to work with students struggling in developmental mathematics courses. I found my niche. That experience, helping students better understand mathematics, launched my career in education. I enjoyed the challenge of transforming students' negative self-perceptions regarding math ability. Too often, students did not recognize their own potential to succeed in mathematics and consequently became trapped in a cycle of failure. I wanted to end that cycle and knew applying to the Master of Arts in Teaching program at Hamline University was the first step. Since then, I have earned my 5-12 mathematics license and worked in both K-12 and community college settings.

During my teacher education courses as well as my time in the classroom, it has become undeniably apparent that most students are social learners. That is, students benefit from activities that are socio-centric. Initially, the idea that students can learn better in a group setting was completely foreign to me. I always preferred working alone. Even the thought of working with a group invoked a feeling of anxiety. I worried about losing time because of off-topic conversations. I was also concerned about the quality of work and consequently took on more than my share. So, the idea that students can learn more in a collaborative setting seemed to contradict my personal experiences as a student.

It was not until two years ago, when I started working as a middle school mathematics teacher, that I actually began to believe in the power of collaborative learning. Many of my students did not meet state standards in mathematics. They entered the classroom frustrated and discouraged and, consequently, often resisted participating in teacher-centered activities. As a new teacher, I immediately questioned my practices in the classroom. I took their resistance personally, not realizing that many students simply did not understand the math. They were afraid of looking stupid and, to avoid humiliation, did not engage in the lesson. Once I had that realization, I became more aware of the drawbacks to a teacher-centered approach. Namely, that a teacher-centered approach reinforces the dichotomy of right and wrong, eliminating the space for students to think creatively about new problems. Ultimately, I knew that my approach had to change.

As a new teacher, I was afraid of losing control of the classroom and therefore avoided group activities. With the help of an instructional specialist at my school, I

began to address that fear and incorporate more opportunities for students to collaborate with their peers. I immediately witnessed more excitement to participate and learn mathematics. I observed an increase in student engagement. That observation was a stark contrast to the behaviors students exhibited during teacher-centered activities. Instead of avoiding work, they were excited to share their ideas, to be heard. I was especially encouraged when I saw some of the most disruptive students eagerly use ratios to explain why they preferred one pitcher of lemonade to another during a taste test. Although it was gradual, I noticed an increase in morale. More students began to view themselves as capable of being successful in mathematics. The greatest indicator of that change in self-perception was the fact that more students were asking questions.

Since addressing my fear, I have incorporated a variety of collaborative activities into my daily mathematics lessons. I have utilized various resources in an attempt to make those collaborative activities meaningful for students. In particular, I have combined investigation activities from the National Council of Teachers of Mathematics' (NCTM) *Illuminations* with instructional strategies from Sharroky Hollie's (2012) *Teaching and Learning: Classroom Practices for Student Success*. That combination of activities and strategies has allowed me to facilitate collaborative experiences that get students thinking and talking about mathematics. Together, students have been better able to reason through challenging problems and apply what they have learned in unfamiliar contexts.

Despite the undeniable benefits of collaborative learning, I have observed a struggle to apply that learning to individual assessments. Many times students

demonstrate proficiency in a group, but perform poorly on an individual task. This has led me to wonder if there is a difference in mindset when students work collaboratively compared to when they work independently or if there is an actual learning deficit. To address that wondering, I have implemented a variety of instructional strategies in my classroom. I have included opportunities for students to work in pairs and/or groups and to work alone in every lesson; however, there has been no notable increase in student achievement on individual assessments. Talking with other teachers, I have realized that this problem is not unique to my classroom.

Primary Question

My action research question is: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* I chose this question for my action research because of my passion for student learning. I want to improve my teaching practice so that I can empower students to reach their potential. Ultimately, I want students to view themselves as successful mathematicians.

To accomplish those aims, I will investigate how students respond to various instructional strategies. I will conduct this investigation both in my 6th grade mathematics classroom and in other secondary mathematics classrooms. By extending this investigation beyond my teaching environment, I will be able to obtain a more comprehensive understanding of effective instructional strategies, no longer limited to my personal experience as a new teacher. I will be able to see what works for other

teachers and gain additional insight into instructional strategies that boost student confidence.

This investigation will rely on qualitative methods. Specifically, I will observe student behavior during both collaborative and independent tasks, using a chart to record those observations. I will also keep a journal to document what I notice about student behavior in my classroom. The journal will provide a space for me to reflect on student engagement and self-perception during lesson activities. In addition, I will interview other secondary mathematics teachers about their ideas regarding student success and autonomy.

At the conclusion of this investigation, I would like to better understand what instructional strategies lead to greater confidence for students when working both collaboratively and independently. The goal of my research is therefore to improve students' self-efficacy.

Rationale

There are many reasons why I would like to investigate instructional strategies that promote the development of self-efficacy as students transfer collaborative learning to individual assessments. The aggregate of all of those reasons is that I want students to believe in their ability to do mathematics. I want them to experience success in mathematics, whether they are working alone, with a partner, or in a group. Too often, I have observed students perform proficiently in a group setting, but then perform poorly in an individual setting. In particular, I have listened to students talk through a problem with their peers, clearly demonstrating an understanding of key concepts and procedures,

and then evaluated those same students as not proficient on a test they take individually. Unfortunately, that has been a common observation not only in my classroom, but in the classrooms of other teachers as well. This places students at risk of low-achievement in mathematics and perpetuates a negative self-perception.

To boost student self-perception and ultimately achievement, it is therefore critical that I investigate best practices that support the growth of learners who are able to succeed both collaboratively and independently. It is undeniably the responsibility of the teacher to implement such practices so that students may experience success in a variety of settings. The teacher must construct opportunities for students to view themselves as learners, as mathematicians. Specifically, the teacher must facilitate activities that encourage students to build connections and bridge what they have learned in one context to a new context. That ability to build and bridge ultimately empowers students to become life-long learners.

Summary

In a rapidly changing world, it is imperative that students develop the skills to become flexible thinkers. Students must be able to transfer and apply their learning to new and unfamiliar situations. They must be able to work collaboratively and independently, recognizing the value of their ideas.

As a middle school mathematics teacher, I have worked with many students who are unaware of the value of their ideas, of their voice. That lack of awareness seems particularly pervasive among students who come from disruptive lives. While collaborative activities have encouraged more of those students to participate, many still

struggle to apply their learning on individual assessments. It seems that negative self-perceptions contribute to an invisible divide between collaborative and independent tasks, and I believe it is the responsibility of the teacher to bridge that divide. Consequently, this paper seeks to investigate the question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* By examining instructional strategies that allow for a more effective transfer of learning, teachers can better promote the growth of all students. They can facilitate experiences that allow students to experience success in mathematics and ultimately to view themselves as mathematicians.

The next chapter focuses on the research related to my action research question. It will include an analysis and synthesis of the current research in order to support later investigation. Specifically, it will discuss the effects of mindset and motivation on student success. In addition, the next chapter will address current best practices for both collaborative and independent mathematical tasks. An awareness of best practices will better equip teachers to facilitate meaningful learning experiences for all students. That is, learning experiences that promote self-efficacy and allow for a more effective transfer of learning. Through a review of current research, I will establish a foundation for transformative action in the classroom.

CHAPTER TWO

Literature Review

Introduction

"Because challenges are ubiquitous, resilience is essential for success in school and in life" (Yeager, 2012, p. 302). Educators must therefore facilitate the development of resilient learners who persevere as they face obstacles. In the mathematics classroom, that task can be particularly challenging since students often demonstrate resiliency when they work together, but that resiliency quickly fades during more autonomous tasks. Students who confidently share ideas with peers suddenly question their thinking and struggle to apply what they have learned to a new context. To address that discrepancy, my research question asks: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?*

Overview

Chapter Two establishes a foundation for further investigation through a review of literature. It examines important conceptual issues and instructional strategies related to the development of self-efficacy and the effective transfer of learning. The primary issues addressed are: student mindset, cooperative learning, and self-efficacy. This chapter also briefly discusses the racial barriers many minority students encounter. By

addressing these issues, it is possible to develop a deeper understanding of why there is a chasm between collaborative learning and independent tasks, particularly in urban schools.

The chapter concludes with a rationale for the research that aims to build connections among the primary issues addressed in the literature. Ultimately, it promotes further investigation of the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?*

Instructional Strategies

Instructional strategies are the methods that teachers implement to promote student success. When implemented with integrity, they can support learning that transcends a single content area. That is, effective instructional strategies can boost not only academic achievement, but can also encourage a better understanding of respect and equity (Boaler, 2006b). Research in instructional strategies is therefore crucial to an investigation for how to enhance student learning.

This section briefly discusses best practices in the secondary mathematics classroom. It highlights the impact of teacher practices on the development of self-efficacy as students work to bridge collaborative and independent learning. Finally, it establishes a foundation for later examination of instructional strategies related to motivation and mindset, cooperative learning, and self-efficacy.

Best practices.

Education is undeniably a dynamic field. To meet the needs of all students, educators must be flexible and adaptive. They must also be mindful of current

best practices. When a practice seems truly beneficial, it is critical that educators modify it to address the unique strengths and needs of students. Unfortunately, some best practices may be a source of unease for teachers. In particular, they may go against personal teaching style while presenting new opportunities for students to grow. Fennema and Nelson (1997) and Fullan (2001) suggest that the willingness of educators to adjust their teaching style largely impacts educational reform. Disturbingly, they claim that changing teaching style is one of largest barriers to progress in education. The challenge of changing teaching style is particularly apparent in the shift from a teacher-centered classroom (i.e. teacher delivers content through direct instruction) to a student-centered classroom (i.e. students discover and investigate content with guidance from the teacher). Fortunately, however, that challenge is within the educator's realm of control.

For educators willing to take on that challenge, making the choice of which best practices to implement can be overwhelming. Educators must therefore be intentional in their selection and committed to implementation. Schmidt, Shumow, and Kackar-Cam (2016) argue that the effectiveness of any classroom strategy depends on how well the created learning environment fits with the ever-developing needs and abilities of students. Their argument highlights the importance of making student learning the priority. Students should not just conform to a strategy; rather, a strategy should address the diverse needs of students. If a strategy does not appropriately address the particular needs of students in the classroom, then educators may need to adapt it or try a new strategy. Interventions that involve motivation and mindset as well as collaborative learning are particularly adaptive to any classroom, including the mathematics classroom.

Summary. When adapted to meet the unique needs of students, instructional strategies have the power to influence both student experience and achievement. Teachers must take advantage of that power, using research on best practices to inform their choice and implementation of instructional strategies. The following sections more explicitly discuss instructional strategies that support mindset, collaborative learning, and self-efficacy.

Student Mindset

Mindset largely influences achievement motivation; that is, the desire or need for success. In this context, mindset refers specifically to the beliefs individuals hold about themselves in terms of achievement and success. In "Boosting Achievement with Messages that Motivate," Dweck (2007) explains that the most motivated students are *not* the ones who believe they have a lot of innate intelligence; rather, the most motivated students are the ones who believe that they can develop their abilities through effort (p. 6). This supports the argument that motivation does not stem from prior experiences of success. Motivation is much more complex than that. It relies on a belief that one has the power to yield outcomes through effort. The most motivated and resilient students are therefore the ones who believe in their own potential to grow.

This section discusses achievement motivation and describes two distinct mindsets. It then explains the implications of those mindsets, particularly in the mathematics classroom.

Achievement motivation. Achievement motivation describes a complex, often dynamic, desire to succeed. According to Dweck (1986), the study of motivation is

especially fascinating since measures of students' actual competence are not strong predictors of their confidence for future success (p. 1043). This surprising fact highlights the unpredictable nature of students' motivational patterns when considering only prior experiences of either success or failure.

Dweck (1986) argues that competence goals, rather than experiences, are strong predictors of motivational patterns. She divides competence goals into two classes: learning goals and performance goals. Learning goals refer to an individual's aim to increase competency, to better understand a new concept or procedure. Essentially, goals that promote learning for the sake of learning. In contrast, performance goals refer to an individual's desire to receive favorable feedback or judgment regarding competency. These goals promote learning for the sake of positive, external outcomes (Dweck, 1986, p. 1040).

Each class of goals has a distinct impact on achievement motivation, particularly in the face of adversity. Ames contends that an adverse, or uncertain, situation affects the experience of exerting effort differently for students who have learning goals compared to those who have performance goals. Specifically, he claims students experience effort adversely if they have performance goals because concern for success overrides an inherent interest in the task (as cited in Dweck, 1986, p. 1042). His claim highlights the importance of promoting intrinsic motivation so that taking risks for the purpose of learning becomes worthwhile for students.

Unfortunately, in early adolescence, many students become more hesitant to take risks and exert effort in the classroom. Schmidt, Shumow, and Kackar-Cam (2016)

suggest that hesitancy is the result of children becoming increasingly self-critical of their ability to be successful in a range of domains, including mathematics. It is not surprising then that achievement motivation tends to decrease as children move through adolescence (Schmidt, Shumow, Kackar-Cam, 2016). That decrease in achievement motivation often translates into a lack of engagement, especially in the absence of extrinsic motivators. Students no longer want to engage in a task simply for the sake of learning and, as a result, are likely to exert minimal effort.

Consequently, it is imperative that educators support the development and sustainment of achievement motivation in students through an emphasis on learning goals. Educators must shift the focus of learning from the results to the process. They must value student thinking over the right answer. Specifically, assessments should require students to show their work and/or explain their process in addition to providing a final answer. Educators must also provide explicit mindset instruction, highlighting the differences between a fixed mindset and a growth mindset.

Fixed mindset. Too many students do not recognize their potential to grow. They are afraid to exert high effort because, to them, high effort equates to low ability. Such a fear poses a direct threat to learning and, ultimately, achievement since most worthwhile endeavors require sustained effort (Dweck, 2007, p. 6). The fear of exerting high effort stems from the adoption of a *fixed mindset* – a belief that one's qualities are pre-determined and unalterable (Dweck, 2008, p. 6). With this mindset, students typically feel the need to either prove their ability or to disengage, especially when they encounter a challenge. The fixed mindset has an especially harmful impact on minority students

and girls since they are often already working against negative stereotypes, especially in mathematics.

Nasir, McKinney de Royston, O'Connor, and Wischnia (2017) claim that middle school students are particularly vulnerable to stereotypical beliefs. Their increased awareness of negative stereotypes (e.g. African Americans and Latinos have lower intelligence) often leads to a fear that those stereotypes will be applied to oneself (p. 492). Viadero (2007) argues the manifestation of that fear takes different forms and the most concerning is avoidance of potentially threatening situations (p. 10). For example, a student who has internalized the belief that African Americans are not good at math may refuse to share her ideas about a problem and reply to prompts with either "I don't know" or "I don't care". Mindful of the stereotype threat, Boaler (2013) claims that a fixed mindset exacerbates the inequalities present in education by contributing to low achievement and participation (p. 149). Low participation is particularly problematic because it significantly reduces learning and growth.

Growth mindset. Unlike a fixed mindset, a growth mindset can actually boost learning. That is because it moderates a fear of failure with a desire to grow. Dweck (2007) suggests that a *growth mindset* is a belief that one's qualities are malleable. More specifically, students with a growth mindset believe that they can improve their abilities through effort (p. 7). They believe that their true potential is something to pursue rather than an innate truth about who they are. In a study involving several hundred 7th grade students in New York City, Dweck (2010) and others found that "students with a growth mindset focused on learning, believed in effort, and were resilient in the face of setbacks"

(p. 26). They did not view effort as a negative reflection on their ability; rather, they viewed it as an important part of the learning process. Ultimately, the study provides evidence for the positive implications of adopting a growth mindset. Paired with deliberate instructional planning, a growth mindset empowers students to take risks and engage in challenging tasks.

Implications. Undoubtedly, mindset can have an immense impact on student learning. Students with a growth mindset are more engaged in learning, demonstrating enthusiasm for challenges and persistence in the face of obstacles. In contrast, students with a fixed mindset believe intelligence is an unchangeable part of who they are. They often feel discouraged or even relent when presented with a challenging task (Boaler, 2013, p. 143). In a survey of all 10th grade students in Chile, Claro, Paunesku, and Dweck (2015) found that students' mindsets were as strong a predictor of academic achievement as family income or other economic indices. The implications of a growth mindset, especially when compared to those of a fixed mindset, should therefore move educators to take action in the classroom. By promoting a growth mindset, educators have an opportunity to boost motivation and transform the way students participate in the learning process.

Motivation and mindset strategies. Through an investigation of ways to increase student motivation, researchers have outlined various instructional strategies that incorporate growth mindset messages. Among those strategies, there are three common themes: brain education, mistake messages, and process feedback.

Dweck argues that the first theme, brain education, leads to increased motivation and improved grades because it directly teaches students about the power of adopting a growth mindset. A specific example of brain education is explaining to students that neurons in their brains form new connections whenever they exert effort to learn something new. Such an explanation emphasizes the fact that brains are malleable. It gives students a sense of control over the development of their intellectual abilities (*Educational Horizons*, 2013, p. 17).

The second theme, mistake messages, is an extension of brain education. Much research has shown that mistakes are critical to learning and growth. Unfortunately, many students view mistakes as a reflection of inability (Boaler, 2014). Boaler (2014) argues, "For mathematics to become a learning subject with room for mistakes and growth, teachers need to make students feel good about mistakes and comfortable with struggle" (p. 2). It is therefore imperative that educators address mistakes as opportunities to learn and form new connections in the brain.

One way to address mistakes is through process feedback, the third theme. According to Dweck (2006), educators are constantly sending messages to students that have either a beneficial or detrimental affect on motivation (p. 6). Consequently, she recommends praising processes rather than accomplishments. Too many students "don't think they are in math classrooms to appreciate the beauty of mathematics, to explore the rich set of connections that make up the subject, or even to learn about the applicability of the subject; they think that they are in math classrooms to perform" (Boaler, 2014, p. 1). Focusing on students' effort, focus, perseverance, or strategies rather than

performance encourages them to remain engaged in a challenging task while maintaining motivation and confidence (Dweck, 2006, p. 9). Instructional strategies that support a growth mindset undeniably shape student motivation. They make learning more accessible to all students, regardless of current ability.

Summary. In order to facilitate meaningful learning experiences, educators must consider how mindset influences motivation and participation. Students with a fixed mindset believe that intelligence and ability are innate, unchangeable qualities. That belief contributes to a fear of failure and inadequacy, which in turn has a detrimental effect on motivation. Students with a growth mindset, on the other hand, believe that they have the power to increase their intelligence and improve their abilities. They view challenges as opportunities and, consequently, demonstrate resilience and determination. This suggests that mindset has the power to either undermine or enhance motivation and impact academic achievement. The next section continues to explore mindset in the context of cooperative learning. It focuses on the benefits of cooperative learning, particularly in relation to motivation and academic achievement.

Cooperative Learning

Cooperative learning describes the process of students working together to construct and apply knowledge. That process is most effective when it is well structured and gives space for all students to have a voice and participate in a respectful exchange of ideas; otherwise, cooperative learning becomes a lost opportunity for student growth. Consequently, it is important to examine the factors of effective cooperative learning. This section will discuss the specific benefits of this teaching practice, including

promoting an understanding of equity and increasing student achievement. It will also describe specific instructional strategies to reap those benefits.

Benefits of cooperative learning. Cooperative learning is a teaching strategy that transforms the traditional, teacher-centered classroom into a dynamic space where students enhance each other's learning. This strategy, when implemented with integrity, has countless advantages. In their work, Boaler (2006a), Davies (2009), and King and Behnke (2005) highlight the following advantages:

- Students develop an appreciation for different viewpoints
- Students acquire a deeper understanding of concepts
- Students actively participate in learning
- Students are engaged in problem-based learning
- Students are better prepared for employment

While there are many more advantages referenced in the research, the five listed above represent common themes.

It is particularly interesting to consider the first point about different perspectives in the context of the mathematics classroom. Too often, students view mathematics as rigid, with problems having one approach to the correct solution; however, Boaler (2006a) argues that group work that involves open-ended problems (i.e. those that allow for multiple representations and have multiple solution paths) encourages students to consider different ways of thinking. Especially when paired with the expectation to share justification and reasoning, such work promotes equity and respect (p. 42, 44). By working cooperatively, students have the opportunity to gain a richer understanding of

the content and of each other. They have the opportunity to participate in a learning experience that transcends a single content area.

Although the potential benefits of cooperative learning are undeniable, it is important to note that those benefits are not accidental; rather, they are the result of intentional planning. In "Cooperative Learning and Student Achievement," Slavin (1988) emphasizes the fact that simply working in a group does not boost student learning (p. 33). There must be an identifiable purpose and structure to the work students do together. Slavin (1988) further argues that *not* all forms of cooperative learning are effective (p. 31). Consequently, educators must examine those instructional practices that facilitate meaningful learning.

Cooperative learning strategies. To access the benefits of cooperative learning, it is essential for educators to first consider instructional practices that support effective implementation. Such consideration can be overwhelming since there are undeniably too many strategies and models for one educator to apply with integrity; however, there are three common themes that appear in many of those practices. They are group formation and regulation, group goals, and individual accountability.

Together, group formation and regulation provide a critical foundation for cooperative learning. Group formation refers to instructional choices regarding how to group students. Those choices send powerful messages to students, whether intentionally or not. In particular, when an educator implements ability grouping practices, students receive the message that ability is fixed and that some students have intelligence and skill while some do not. Boaler (2013) argues that such practices instill fixed mindset beliefs

and undermine future learning opportunities (p. 145). It is therefore important for educators to apply mixed-ability grouping practices. Unlike ability grouping, mixed-ability grouping research shows the malleability of the brain and the potential to develop intelligence and ability.

In addition to group formation, group regulation conveys important messages about how to collaborate with others. Group regulation generally refers to how students work together. It is critical that educators take the time to pre-teach collaborative practices and facilitate team building activities. Taking this time ultimately allows for the construction of a cooperative learning environment that is more productive (Nebesniak, 2010, p. 99). Both group formation and regulation require initial instructional planning, but ultimately lead to a more meaningful learning experience for students.

After establishing a foundation for cooperative learning, educators must facilitate the development of group goals and individual accountability. Slavin (1988) claims that group goals and individual accountability largely determine the extent to which cooperative learning boosts student achievement (p. 32). Group goals support a commitment to the success of the group while individual accountability supports a sense of personal responsibility. Together, they contribute to the construction of positive interdependence. They support the view that success of the individual and the group are inter-dependent (Sears, 2012, p. 248). Once students become aware that success depends on a collective effort, they are much more likely to engage in learning and construct lasting knowledge.

Summary. Cooperative learning goes beyond the task of simply allowing students to work together. It describes a framework for learning that relies on all participants actively engaging with content and each other. There are many benefits to the implementation of cooperative learning in the classroom, including building a sense of equity and developing a deeper understanding of key concepts. It is incorrect to assume, however, that the benefits of cooperative learning are readily accessible. Since cooperative learning is not innately beneficial to students, educators must be mindful of best practices. In particular, they must consider group formation and regulation, group goals, and individual accountability in order to promote student engagement and learning.

Self-Efficacy

Self-efficacy refers to an individual's belief in his or her ability to perform specific behaviors at a specified level (Bandura, 1997). Often, it reflects an individual's confidence in his or her ability. In the mathematics classroom, self-efficacy typically correlates with achievement levels. This section specifically examines the influence of self-efficacy as students complete independent tasks. It discusses how self-efficacy affects achievement in the mathematics classroom and then outlines ways to promote student confidence.

Self-efficacy and achievement. Self-efficacy reflects an individual's beliefs about his or her abilities and skills. Those beliefs, which are often context-specific, influence the decisions an individual makes to either pursue or withdraw from a task. In particular, students with high self-efficacy believe in their own potential to be successful and are therefore more likely to exert effort and persevere in the face of a challenge (Puklek

Levpuščcek et al., 2012, p. 530). This implies that perception of self-efficacy significantly impacts student achievement.

In fact, Pajares and Kranzler (1995) argue that self-efficacy is as strong of a predictor of academic success in mathematics as is cognitive ability. They further claim that self-efficacy is a more effective predictor than past performance in mathematics. With high self-efficacy, students are consequently more likely to demonstrate resiliency despite previous failures. In contrast, students with low self-efficacy are more likely to question their own abilities regardless of previous successes. Such questioning can lead to frustration or even hopelessness when given a challenging task. Greatly influencing future persistence and confidence, self-efficacy undeniably contributes to student achievement. Educators must therefore employ strategies to build and maintain high self-efficacy in all students.

Students with high self-efficacy demonstrate confidence in their ability and, as a result, more actively engage in the learning process. They ask more questions and talk with their peers about how to approach new problems. Importantly, they do not avoid challenges or view setbacks as a predictor of future success. Dweck argues that such an approach to learning allows students to fulfill their potential (*Educational Horizons*, 2013, p. 20). In order to provide all students with the opportunity to reach their potential, educators must therefore implement strategies to build high self-efficacy. In the mathematics classroom, researchers have found messages about mindset, exposure to mastery experiences, and homework to be particularly effective in promoting student confidence.

Self-efficacy strategies. Much research shows that student confidence begins with mindset. When students believe that they can grow intelligence and improve ability through hard work, they are more likely to put forth the effort necessary to overcome adversity and experience success. Blackwell, Yeager, Trzesniewski, and Dweck (2007) argue that even when students receive instruction on the intellectual and social skills necessary to be resilient, they may not employ those skills unless they believe in their own potential to improve. Their argument highlights the power of fostering a growth mindset in all students through intentional instructional decisions. Educators must look for ways to incorporate mindset messages in every lesson, whether through brain instruction, mistake messages, or process focused feedback.

To further support the growth of student confidence, it is important that educators pair mindset messages with mastery experiences. Mastery experiences refer to content-specific encounters that lead to feelings of success. In a study of how mathematics self-efficacy beliefs predict student achievement, Kitsantas, Cheema, and Ware (2011) found that mastery experiences encourage students to feel more efficacious when approaching mathematics content. They recommend that educators create lesson activities that allow students to begin with easy tasks and progress toward more difficult tasks (p. 333). Such a progression undoubtedly increases students' confidence in their ability to engage in mathematics content. It allows students to build on previous experiences of success.

Through homework, students have the opportunity to experience additional mastery experiences outside of the classroom. Bembenutty, Kitsantas, Zimmerman, Bonner, and Kovach all argue that homework can serve as a powerful tool to assist

students in the development of high self-efficacy since there is less direction from the instructor and more time for completion (as cited in Kitsantas, 2011, p. 310). Homework can therefore build students' confidence in their ability to complete mathematics problems independently. It is important to note, however, that student confidence does not inherently result from homework. Efficacy research suggests that educators must first confirm that students can solve the problems; otherwise, students are likely to feel discouraged and even quit, which reinforces beliefs about lack of ability (Kitsantas, 2011, p. 334). This fact highlights the importance of planning intentionally. Homework that effectively addresses current abilities ultimately reinforces the confidence-boosting messages students receive in the classroom.

Summary. Self-efficacy describes the beliefs an individual holds about his or her abilities. Student perceptions of self-efficacy are incredibly complex and varied. Notably, students' beliefs about their ability are not necessarily based on past experiences of success. More often, they are based on mindset. Specifically, students who believe that they can increase intelligence and improve ability are more likely to demonstrate confidence and pursue and persist in challenging tasks. In contrast, students who believe intelligence and ability are innate qualities are more likely to doubt themselves and experience feelings of frustration. With so much evidence supporting the influence of self-efficacy on student achievement, it is critical that educators employ strategies that promote high self-efficacy in all students.

Stereotypes and Self-Perception

To promote self-efficacy, it is essential that educators first know their students. They must have an awareness of the positive and negative factors that influence achievement for individual students. Especially in urban schools, educators must be aware of racial barriers that may hinder engagement and, ultimately, performance. Educators who look different than their students and who have had different cultural experiences must be mindful of racial stereotypes and the impact they have on student learning. They must consider the unique obstacles that students encounter and strive to offset those obstacles with opportunities for growth.

Racial stereotypes. Undoubtedly, stereotypes act as an obstacle for many students in urban schools. Racial stereotypes are connected to social processes that have the potential to impact individuals and/or entire groups of people adversely. They result from discriminatory and oppressive systems that promote social stratification (Nasir et al., 2017, 494). According to Nasir et al. (2017), stereotypes "support the maintenance of racial stratification by allowing inequality to remain unquestioned" (p. 495). They provide justification for inequitable practices that deny individuals the resources necessary to thrive. Perhaps even more detrimental, they provide justification for negative self-identity. For example, in the mathematics classroom, a student of color may believe the racial stereotype about the lower intelligence of African Americans. Consequently, she may be less likely to engage in lesson activities because she does not want to appear stupid. Such avoidance can perpetuate stereotypes, especially in mathematics, since success largely relies on effort and engagement. As the example illustrates, racial stereotypes can have a damaging effect on already at-risk populations.

Challenges Somali students encounter. In addition to racial stereotypes, many minority groups encounter further systemic challenges in the classroom. Somali refugee students, in particular, may have emotional trauma or post-traumatic stress disorder, interrupted or limited schooling, and/or difficultly communicating and learning in English (Roxas & Roy, 2012, p. 469). Exacerbating those challenges, many Somali refugee students "then face similar issues to their US-born peers in urban settings because they are often enrolled in schools with inadequate funding, discipline and attendance problems, and poor academic performance" (Roxas & Roy, 2012, p. 483). Combined with fixed notions of success and failure, those factors make academic achievement unattainable for many students; however, instead of blaming an inequitable access to resources, many students (and their families) blame themselves. They believe the only keys to success are intelligence and hard work. Such a belief ultimately reinforces a pervasive structure of failure. Educators must therefore strive to deliver content in a way that challenges those beliefs and makes success possible for all students.

Teacher practices. To counteract negative factors that impact student learning, it is critical that teachers act with an increased awareness. Nasir et al. (2017) argues, "Educators and researchers in and around urban schools in particular need to interrogate the relationships between racialized stereotypes, student identity, and academic engagement and achievement" (p. 520). They must support students in the construction of counter-narratives that question racial stereotypes and redefine academic success (Nasir et al., 2017). Teachers may provide that support by incorporating mindset messages and facilitating student-centered activities that give space for multiple ways of

thinking. It must be noted, however, that instructional strategies will only be effective if teachers first establish an environment of mutual respect.

Summary. Unquestionably, educators must strive to knock down racial barriers and replace them with a framework for success. To do that, it is imperative that educators know both themselves and their students. The white, female mathematics teacher, for example, must consider the unique experiences and challenges that impact students of color in her classroom. In particular, she must consider how racial stereotypes influence student self-perception and, ultimately, engagement. Such consideration is necessary to implement any instructional strategy effectively; that is, in a way that benefits all students.

Rationale for the Research

This literature review aims to provide a foundation for further investigation of the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* It specifically aims to uncover a link between self-efficacy and the transfer of learning in different contexts. In my classroom, I have witnessed a shift in confidence levels as students move from collaborative tasks to more autonomous tasks. I have observed previously engaged students shutdown on independent tasks because they feel either frustrated or overwhelmed. By examining current research, this literature review therefore seeks to better understand the cause of that shift. It highlights the connection between mindset and learning and then provides an outline of strategies to

support that connection. Ultimately, it seeks to guide continued research so that educators may facilitate the growth of more flexible, efficacious learners.

Summary.

With so many potential barriers to academic success, educators must support the development of persistent and resilient learners. Yeager (2012) suggests that educators often think that increasing the rigor of the curriculum and instruction will boost student learning; however, he argues that research more strongly supports the power of redirecting mindset in increasing achievement (p. 306). That is because students who have a growth mindset are often more motivated to exert effort. Well-structured cooperative learning experiences further support not only a sense of community, but also student mindset and motivation. They provide an opportunity to investigate challenging problems with the support of peers. Such an investigation in turn encourages a transfer of learning to new situations as students develop self-efficacy. With much evidence to support the impact of high self-efficacy, it seems that confidence is a key factor in successfully applying learning to more autonomous tasks.

Chapter 3 will describe the action research methods used to investigate the purpose of this study. That is, it will explore how instructional practices can support an increase in student success on both cooperative and independent tasks. The research will take place in secondary mathematics classrooms at four different schools with urban populations. Using the findings of the literature review, the research will examine how instructional strategies affect student confidence regarding mathematical ability. I will record observations about student behavior during various tasks and will interview other

mathematics teachers. The qualitative data collected from the study will then be analyzed to answer the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?*

CHAPTER THREE

Methodology

Overview

The purpose of this chapter is to explain the methodology used to investigate the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* Everyday, teachers select and implement various instructional strategies in order to promote learning and support student growth. Especially in student-centered classrooms, those instructional strategies often involve cooperative learning. Unfortunately, students frequently struggle to apply what they have learned in a collaborative setting to more autonomous tasks. They lack confidence in their ability to succeed when they do not have the support of their peers. The methods employed in this research study therefore seek to address that struggle and boost learning in the mathematics classroom.

The chapter opens with an explanation of the research paradigm. It then describes the setting and participants of the study in order to establish a foundation for investigation. Next, the chapter discusses the research instruments and the data analysis techniques. To address ethical considerations, the chapter concludes with an overview of the Human Subjects Review process.

Research Paradigm

Action research.

To investigate this research question, I engaged in action research. Mills (2014) explains:

> Action research is any systematic inquiry conducted by teacher researchers, principals, school counselors, or other stakeholders in the teaching/learning environment to gather information about how their particular schools operate, how they teach, and how well their students learn. This information is gathered with the goals of gaining insight, developing reflective practice, effecting positive changes in the school environment (and educational practices in general) and improving student outcomes and the lives of those involved. (p. 8)

The process of action research involves collecting, analyzing, and interpreting data and, finally, creating an action plan (Mills, 2014, p. 8). As a teacher researcher, the purpose as well as the process of action research directly appeals to my desire to increase student learning in the mathematics classroom. Action research provides a framework for a critical investigation of my research question.

Qualitative methods.

Within the action research framework, I specifically applied a qualitative approach. Such an approach seeks to explore and understand "the meaning individuals or groups ascribe to a social or human problem" (Creswell, 2014, p. 4). To collect qualitative data, I used three different approaches: documents, observations, and interviews. Throughout the study, I kept a journal to record my observations and impressions of student engagement during various tasks in my classroom. I also recorded observations of student behavior during both collaborative and independent tasks in other

secondary mathematics classrooms. Moreover, teacher interviews were critical to the research since they provided an additional perspective. By examining various data sources, it became possible to promote a deeper and more comprehensive understanding of the research question. Ultimately, a qualitative approach both examined the effectiveness of instructional strategies and honored the complexity of student experiences.

Research Instruments and Data Analysis Techniques

Personal journal.

As a qualitative tool, a personal journal supports alternative meanings while requiring reflection. Specifically, a journal reflects the meanings an individual assigns to a problem. It also obliges the researcher to reflect on her position and experiences, mindful of how personal biases and values may influence the direction of the study (Mills, 2014, p. 186). In order to ensure validity and reliability, I structured the personal journal according to the daily agenda of lesson activities.

During the study, I designated time at the end of each school day to keep a journal. I first outlined the agenda of lesson activities and then recorded my observations as well as thoughts and wonderings about student engagement during both collaborative and independent tasks. Additionally, I noted any modifications I made to instructional strategies, mindful of how my actions affected student behavior and learning.

At the conclusion of the study, I analyzed the journal entries and recorded common themes. To do that, I first read the entries. While reading, I looked for general ideas or trends, highlighted excerpts of text, and took notes in the margins. I then used a modified version of Tesch's steps for forming codes to obtain a more complete picture of

the data collected. In particular, I recorded the highlighted excerpts of text on index cards, noting the date so I could quickly identify the original context. Next, I organized those index cards into more specific lists of major, unique, and leftover topics from the journal entries. Grouping together cards with similar topics, I marked codes (i.e. abbreviations of topics) next to the appropriate excerpts of text. The codes ultimately facilitated in the creation of categories as I sorted the index cards according to major topics that appear. The categories then served as a structure for organizing and analyzing the data (as cited in Creswell, 2014, p. 198 and Mills, 2014, p. 135-136). With the data organized, I was better equipped to interpret and compare findings.

Classroom observations. Throughout the study, I acted as an observer in other secondary mathematics classrooms. The classroom teacher introduced me as a teacher researcher to the students. I recorded notes on student behavior during both collaborative and independent tasks, using observation charts (see Appendices A and B). The charts provided some structure for the notes in order to focus my observations in the classroom setting. For collaborative tasks, I recorded whether students used role assignments, communicated effectively, and completed the task. For independent tasks, I recorded whether students used strategies, were engaged (i.e. on task), and completed the task. The charts also provided space for additional observer notes.

Similar to the personal journal, I analyzed my observations by first examining the charts and reading the additional notes. I looked for overarching themes and patterns in my observations with particular attention to how individual students worked on collaborative tasks compared to independent tasks. Those themes and patterns guided the

process of forming codes and, ultimately, generating a description to use for interpretation.

Teacher interviews. After observing other secondary mathematics classrooms, I conducted face-to-face interviews with the teachers. I used open-ended questions to guide the interviews and to elicit ideas and opinions specifically related to the research question (see Appendix C). For instance, I asked about student engagement during both collaborative and independent tasks. I also asked about mindset messages and student success. While I had some prepared questions, the interviews were primarily unstructured so that the conversation could flow more naturally. I wanted to ensure that the teachers felt comfortable sharing their experiences and thoughts. To capture data, I took annotated notes during the interviews.

Immediately following each interview, I began the process of analyzing the interview data. I first read my annotated notes and recorded additional commentary when necessary. Once all of the interviews were complete, I then followed a process similar to that used for analyzing the journal entries and observations. In particular, I looked for major themes and ideas and used those to form categories for organizing data. Ultimately, the categories and the accompanying excerpts of text from the interviews supported a better understanding of the impact of teacher practices on student self-efficacy and learning.

Setting and Participants

School and classroom setting. The action research took place at four different schools (i.e. one K-8 school, two middle schools, and one high school) in an urban

district. All of the journal entries reflect my experiences and observations as a mathematics teacher in a K-8 school with roughly 610 students. The school offers a variety of programs, including an English Language Learner (ELL) program, Integrated Arts, NABAD (Somali Newcomer Language Program), and Advancement Via Individual Determination (AVID). To best meet the needs of students, the school has a bilingual staff that serves speakers of Somali, Amharic, and Oromo. There are also full-time AmeriCorps tutors who support students in the classroom and facilitate additional enrichment activities for students.

Within the K-8 school, I conducted the action research in two 6th Grade mathematics classes. There were 28 students in the morning class and 24 students in the afternoon class. Occasionally, there was one additional staff member present to provide additional support. Students sat at large rectangular tables with 3-4 other students. There was one table available for students who temporarily required more individualized seating or assistance.

For the classroom observations and teacher interviews, I visited two middle schools and one high school. At one middle school, I observed a 6th Grade mathematics class with 28 students. Students at this school sat at tables with 3-4 other students. At the other middle school, I observed an honors 8th Grade mathematics class (i.e. an Intermediate Algebra class) with 30 students. Unlike the other middle school, students sat in desks facing the front of the classroom. Finally, while at the high school, I visited two mathematics classes. The Intermediate Algebra class had 13 students while the International Baccalaureate (IB) Mathematics Standard Level (SL) class had 16 students.

In both classes, students sat in desks that were positioned in groups of four. After observing the classes, I then interviewed each of the teachers.

Student demographics. All four schools where I conducted action research are part of a large, urban district. The student population of the district is 36% African American, 34% White American, 20% Hispanic American, 6% Asian American, and 4% Native American. Within the district, 24% of students receive ELL Services and 14% receive Special Education Services. Lastly, 63% of students qualify for free or reduced lunch.

The K-8 school where I teach primarily serves a minority population reflective of the urban area. The student population is 84% African American, 7% Native American, 5% Hispanic American, 3% White American, and 1% Asian American. The designation of African American includes Somali-Americans and immigrant students from other areas of Africa and the African diaspora. Of all the students at the school, 58% receive ELL Services and 13% receive Special Education Services. Additionally, 95% of students qualify for free or reduced lunch.

The demographics of the two 6th grade mathematics classes at the K-8 school were largely reflective of the demographics of the entire school. Specifically, in the two classes, the vast majority of students were Somali-American or recent immigrants from other areas of Africa and the African diaspora. Some students have attended the K-8 school since kindergarten while others have had limited or interrupted schooling. Many of the students and their families have experienced turmoil caused by the Somali Civil War. There were students, for example, who have lived in refugee camps and have lost

family members due to the conflict in Somalia. Others were still waiting for parents and/or siblings to make it to the United States. Undoubtedly, those students arrived to the mathematics classroom with a range of experiences and a unique set of needs and strengths.

Teacher demographics. All four teachers whom I interviewed were female. Three of the teachers were White and one teacher was Black. Their years of teaching experience range from 7 years to 40 years. In particular, the 6th Grade mathematics teacher has taught for 40 years; the 8th Grade mathematics teacher has taught for 7 years; the IB SL teacher has taught for 12 years; and the Intermediate Algebra teacher has taught for 19 years. All four teachers have each spent the majority of their teaching career in an urban district.

Human Subjects Review

Prior to conducting action research, I received approval from the Hamline School of Education (HSE) Human Subjects Committee (HSC). That required registering the research project with Hamline University's Institutional Review Board (IRB) and then completing the appropriate application. The application required data about the research project and dimensions of the research study, which included identification of potential risks and benefits. Along with the application form, it was necessary to attach all consent forms, research instruments, and institutional permission slips (Hamline University School of Education, 2015). This process ensured the protection of vulnerable populations.

Summary

To examine how to best support students in the development of self-efficacy as they transfer collaborative learning to independent assessments, I employed a qualitative methods approach. Such an approach allowed for multiple access points for investigation and ultimately supported the validity and reliability of the study. It also allowed for an exploration of emerging questions. I gathered qualitative data through a personal journal, classroom observations, and teacher interviews. Thorough analysis of this data elucidated common themes and patterns and led to findings that support a plan for action.

In the next chapter, I will discuss the proceedings and findings of the research study. That discussion will include a detailed description of the collected data and common themes. It will then present possible interpretations of the results, identifying important relationships among variables and the research question.

CHAPTER FOUR

Results

Overview

This chapter chronicles an investigation of the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* Through an analysis and interpretation of data, this chapter aims to identify factors that promote student learning. Specifically, it seeks to identify instructional practices that encourage students to become more resilient in the mathematics classroom.

According to Dweck (2010), "For the educator with a fixed mind-set, learning is the students' responsibility. If students don't have what it takes, so be it. But for the educator in a growth mind-set, learning is a collaboration in which the teacher has great responsibility" (p. 28). This chapter therefore appeals to those educators with a growth mindset. It assumes that it is the responsibility of the teacher to guide students in the development of self-efficacy as they bridge learning from one context to another.

Ultimately, this chapter describes and analyzes the data collected from a personal journal, classroom observations, and teacher interviews. It first presents the findings according to major themes that appeared. Specifically, the findings from the personal journal are organized according to student engagement and student mindset; the findings

from the classroom observations are organized according to collaborative tasks and independent tasks; and, finally, the findings from the teacher interviews are organized according to instructional practices and mindset messages. After presenting the findings thematically, this chapter then discusses the implications of the findings for both educators and students in the mathematics classroom. Finally, it concludes with a summary of findings from the research study.

Findings: Personal Journal

The personal journal serves as a qualitative tool that captures my ideas and wonderings regarding student learning in an urban 6th Grade mathematics classroom. In particular, it reflects the meanings I assigned to problems observed in my specific teaching environment over the course of three weeks. According to Ortlipp (2008), "Rather than attempting to control researcher values through method or by bracketing assumptions, the aim [of the personal journal] is to consciously acknowledge those values" (p. 695). That is, the personal journal supports reflection. For this research study, it specifically reveals the personal beliefs and goals I carry with me into the classroom.

To analyze the personal journal as qualitative data, I adapted Tesch's steps for forming codes. I read each journal entry and highlighted excerpts of text that most related to my research question. I then recorded those excerpts, along with the date, on index cards so that they would be more fluid as I looked for common themes. Ultimately, the themes of student engagement, student mindset, student persistence, and teacher actions appeared. To further organize and consolidate the data, I created a table with four

columns, one for each theme. In each column, I entered the corresponding excerpts from the journal entries. That process allowed me to further narrow the themes to student engagement and student mindset. (I recognized an overlap in the data collected for student engagement and teacher actions as well as for student mindset and student persistence.)

In order to confirm the prevalence of those two themes, I used an online word cloud generator to identify words that appear most frequently in the journal entries. (By using the online generator, I was also able to remove any personal bias that may have been present in the previously described process.) As *Figure 1* (see List of Figures) shows, the words "students" and "activities" appear most often; however, the words "struggled," "frustrations," "challenge," "eager," and "mindset" also appear in the cloud. Those specific words highlight the primacy of student engagement and student mindset in the journal entries.

Student engagement. Unquestionably, the main topic of each of my journal entries was student engagement. I was most focused on how students responded to various lesson activities, constantly in search of ways to boost participation. Every entry begins with a brief recollection of what I observed during the Do Now. In 10 of the 15 entries, I describe a struggle for students to begin working as soon as they enter the classroom. Many students wanted to socialize with their peers and tried to work while talking. Some of their conversations were about the problems posted on the board while others were off-topic. It was particularly interesting to note that, given the same expectations and types of problems (e.g. calculate the area of a triangle), students

responded differently on different days. For example, one day, I wrote that only "a few students responded to the questions" and that "the rest either seemed unsure or disengaged" (4.17); however, the next day, I explained, "Many students were eager to discuss their answers with each other, debating who was right" (4.18). This was puzzling to me since I believed that I was clear and consistent with my expectations and that the problems were accessible to the majority of students. So, I wondered what I could do to increase engagement at the start of class. I tried different strategies, like stamping the notebooks of students who were working, but nothing proved entirely effective. This was particularly frustrating to me because I felt like it set the tone for the remainder of the lesson.

In many of the journal entries, I wrote about the social energy of students. I further described the challenge of capitalizing on that energy. Constantly searching for ways to increase participation, I struggled to present the content in a way that motivates all students. In one entry, I wrote, "Many students are more engaged when I present activities as a competition or challenge." Students were clearly motivated by the excitement of a challenge, by the possibility of looking like a "winner" in front of their peers. Unquestionably, those types of activities did not appeal to all students so I also tried to other activities, such as taking Cornell Notes or doing small group investigations.

Significantly, without the hook of a competition, I observed that students were more engaged in direct instruction (e.g. taking notes) than in cooperative tasks. In one entry, I reflected on that observation, wondering: "With so many students craving social interaction with their peers, why do they appear more engaged while taking notes than

during partner or group activities?" (4.21) That wondering permeated my final journal entries as I started to question my ideas of what engagement actually means in the mathematics classroom. What does it look like? What does it sound like? How does it feel? I began to think that educators – including myself – too often confuse compliance for engagement.

Student mindset. Despite nebulous ideas of what it means to be engaged, my journal entries highlight the firm belief that mindset impacts engagement. In one entry, I described how a few students used needing help as a reason to not work and distract their peers. They waited for me to provide a one-on-one explanation instead of asking other students or consulting the formula sheet. I further remarked, "It seemed like I was the only person they trusted to have the information/support necessary for them to be successful" (4.17). Their lack of trust seemed indicative of a fear of failure and, ultimately, a fixed mindset.

During a discovery activity, it became increasingly apparent that some students held a fixed mindset. The activity required students to use a protractor to measure the angles formed by two intersecting lines. While I modeled the activity, students, especially in the first class, were vocal about how "hard" it is to use a protractor. I wrote, "They recalled trying to use one in 5th Grade and voiced frustrations before they even started" (4.18). Their frustrations manifested in work avoidance, with most students talking and waiting for one-on-one help. Such avoidance led me to question whether students recognize the value in making mistakes and persisting. For most students, it

seemed that the task was worthwhile only if it allowed them to experience success. That is, they did not want to participate unless the task validated their intelligence.

Findings: Classroom Observations

Before conducting the classroom observations, I created a concept map to display visible signs of student engagement (see *Figure 2* in List of Figures). The concept map allowed me to focus my notes as I observed student behavior in each of the four secondary mathematics classrooms. It provided clearly defined markers of engagement. To record my notes during the observations, I used the observation charts for both collaborative and independent tasks (see Appendices A and B). The charts also made it possible to compare the number of students engaged in collaborative tasks versus independent tasks. Those numbers for each of the four classrooms observed are shown in *Figure 3* (see List of Figures).

As I organized and consolidated the data, I followed a process similar to the one used for the personal journal. Namely, I recorded excerpts of text on index cards and shuffled the cards to identify themes. I initially identified collaborative tasks, independent tasks, and teacher actions as major themes; however, I reduced those themes to just collaborative tasks and independent tasks after creating a table. When entering the excerpts into the table, I color coded the data so that I could more easily identify the context. (I used red for the 6th Grade mathematics class; blue for the 8th Grade Intermediate Algebra class; orange for the high school IB SL mathematics class; and green for the high school Intermediate Algebra class.) I later translated those colors into shorthand to represent the four classrooms observed. Specifically, A corresponds to the

6th Grade mathematics class; B corresponds to the 8th Grade Intermediate Algebra class; C corresponds to the high school IB SL mathematics class; and D corresponds to the high school Intermediate Algebra class. This shorthand is used throughout the following sections.

Collaborative tasks. Examining the observation charts and notes, collaborative tasks quickly emerged as a major theme. Notably, collaborative tasks took on a different form in each of the four classrooms, both in teacher approach and student engagement. For instance, two teachers facilitated collaborative tasks for the majority of the time while the other two designated only a few minutes for students to work together. The physical space of the classrooms also varied, reflecting the instructional philosophy of the teachers.

Of the four classrooms I visited, it was apparent that Class A was more intentionally structured around group work. Posted on the wall, there were student descriptions of what "Group Work Looks Like". The descriptions primarily reflected the expectations that students help one another and respect each other's ideas. Near those descriptions, the teacher posted specific student roles for group work. Namely, the student in Chair 1 is the facilitator, Chair 2 is the resource manager, Chair 3 is the recorder/reporter, and Chair 4 is the harmonizer. It is important to note that the students were seated at tables, not desks, with one piece of paper.

For the lesson observed, students looked at pictures of everyday objects and estimated the amount or length of the objects. They had to record their estimates along with their thinking on the one piece of paper at their table. It was not enough to have

only a number for an answer. At all of the tables, students were talking about math. Occasionally, the conversations veered off-topic, but all groups were on task the majority of the time. The teacher held students accountable for their work by having the person in Chair 3 – the reporter – present the group's thoughts and answers to rest of the class. At the end of each presentation, other students as well as the teacher asked the reporter clarifying questions.

In the two high school classes I observed, group work was also part of the lesson activities; however, it was not as prevalent as in Class A. Students in both classes sat in desks that were arranged in groups of four – an arrangement definitely intended for collaborative learning. Despite the similar seating, the two teachers had different approaches to utilizing that arrangement. The teacher of Class C undeniably planned for students to work together for most of the class period. Specifically, she reminded students to check their work with each other during the Do Now and, after a quick homework check, had students work in groups to write cosine equations that represent amplitude changes. Some students worked together while others choose to work independently. It was apparent that those students who decided to work with their peers preferred processing information aloud. In Class D, the teacher gave students only 5 minutes to work with a partner to complete a Desmos activity on a shared iPad. Most pairs had a dominant partner; that is, one person who did all of the work. There was little talking between partners. Clearly, students saw more value in completing the task than in talking about the graphs with each other.

Finally, Class B had no structured collaborative tasks. Students talked with each other during both the Do Now and the designated work time. The teacher gave students the task of correcting mistakes on their graded unit test, and students could choose to work alone, with a partner, or with a group. There were no defined expectations for this work time. Most students used their peers as a resource. Some students asked questions for understanding while others asked only for the answers. The room was filled with conversations about various topics. Especially for those students who quickly finished their corrections, the conversations were not about math. Undoubtedly, these observations combined with the observations in the other three classes reveal that there is a vast range of teacher approaches and student responses to collaborative tasks.

Independent tasks. Alongside observations of collaborative tasks, it is interesting to consider student engagement during independent tasks. In particular, in Class A, where all students engaged in conversations about math, fewer students engaged in independent tasks. Students were quiet as the teacher presented key vocabulary and did an example problem. The expectation was for students to take notes, and, while most did, it was clear that there were varying levels of engagement. One student, for example, doodled in his notebook for a couple of minutes and then put his head down. Another student listened and asked questions, but did not take notes. Unquestionably, the majority of students were still on task; however, it was less than during the collaborative activity.

Students in the two high school classes showed similar engagement during the independent tasks as during the collaborative tasks. In Class C, that was due primarily to

the fact that the teacher encouraged students to work together on all lesson activities. So, it was interesting to observe those students who decided to work independently. Notably, the four students who were seated in groups of two worked alone, asking only the teacher for help. Two of those students quickly completed the task and then went on their phones while the other two alternated between working and using their phones. This contrasted with the groups of three and four, where students worked with their peers the entire class period.

In Class D, students worked independently on the Do Now. Most students worked quietly and completed the problems, a few others waited for help, and one student went on her phone. Following the Do Now, the teacher presented information about graph transformations and gave directions for the next activity. Approximately half of the students showed that they were listening by looking at the board and/or asking questions. Once it was time for students to work, the same patterns emerged as during the Do Now. In particular, most students started working on the task and raised a hand for help as needed; however, one student was more hesitant to get started. Instead of asking for help, she went on her phone. She did not attempt the problems until the teacher sat down next to her and guided her through the steps. It was apparent that students in this class saw the teacher as their main resource.

Unlike the other three classes, Class B had a more flexible structure. Students could choose to work either alone or with their peers on both the Do Now and the test corrections. The classroom was filled with students talking; however, most students worked independently, occasionally checking answers with each other. This type of

independent work (i.e. where students complete tasks alone, but still talk to their peers) contrasted with the independent work I observed in the other three classes. Namely, instead of working silently, students remained social.

Findings: Teacher Interviews

According to Agar (2008), "observation and interview mutually interact with each other, either simultaneously or sequentially" (p. 158). In the case of this research study, they interact sequentially. By conducting the interviews immediately following the observed classes, I was able to follow up on ideas and wonderings from the observations. I was also more equipped to understand the context and to ask questions in the moment, which allowed the interview to feel more like a conversation than a formal procedure. To further support the feeling of a conversation, I used my pre-determined interview questions as a guide rather than as an essential script.

To analyze the data collected during the teacher interviews, I followed a process similar to the processes used for the personal journal and classroom observations. After each of the interviews, I typed up my notes, replacing shorthand with the words actually spoken. I then highlighted key excerpts of text and recorded those excerpts on index cards. To identify major themes, I shuffled and reshuffled the index cards until the themes of instructional practices, mindset messages, and student engagement appeared. As with the data collected from the other research instruments, I created a table with a column for each major theme and entered the excerpts into the appropriate column.

I again used colors and letters to identify the context. (Red and A correspond to the 6th Grade mathematics class; blue and B correspond to the 8th Grade Intermediate

Algebra class; orange and C correspond to the high school IB SL mathematics class; and green and D correspond to the high school intermediate algebra class.) This process ultimately revealed similarities and differences in the ways the four teachers approach teaching secondary mathematics.

Instructional practices. Unquestionably, all four teachers are intentional in their approach to planning lessons and evaluating students; however, the specifics of their approaches vary dramatically. For example, Teacher A takes a more holistic approach to planning and evaluating. She considers the social pull of early adolescences and creates a plan for how she wants students to work together in order to master the learning targets. Teacher D, on the other hand, focuses more on the pace and the standards she needs to teach. Notably, the differences in the way the four teachers plan are reflected in the way that they evaluate students. They each have different ideas of what student success looks like.

Early in each of the interviews, I asked the teachers about their approach to planning. Specifically, I asked, "When you plan a lesson, what long-term goal(s) do you have in mind?" Teacher A explained that she writes a philosophy / action plan in the summer. (For the 2016-2017 school year, she used Elizabeth Cohen's *Designing Groupwork: Strategies for the Heterogeneous Classroom* as a guide.) She then establishes groupwork goals, identifying desired outcomes and student expectations related to both behavior and academics. Additionally, Teacher A uses learning targets based on state standards as more immediate goals for student learning. With a similar focus on learning targets, Teacher B explained, "I backwards plan. Start with the

benchmark and unit outcomes, then work through how I want students to achieve the goal." Her explanation suggests an emphasis on performance; that is, on academic achievement. Teachers C and D were more general in their responses. In particular, Teacher C said, "I try to have students do more, less teacher talking". Her response reveals a desire to have a more student-centered classroom. Clearly, she aims to provide less direct instruction and more opportunities for students to explore the mathematics. Similar to Teacher B, Teacher D shared her specific approach to planning, stating that she meets with other teachers weekly to plan for upcoming classes and units.

Those differences in long-term goals used for planning are reflected in how each of the teachers evaluates students. Namely, Teacher A, guided by her philosophy / action plan, believes that it is important to evaluate students on various criteria. For instance, she evaluates groups based on whether everyone is included and respectful. When groups present their work, she does not look for the right answer; rather, she looks for groups who can defend their thinking, even if they are wrong. On unit assessments, she evaluates mastery of each learning target and allows students to do a retake if they get a C or lower. When explaining how they evaluate students, Teacher B, Teacher C, and Teacher D all explained that they use standards-based grading. They focused more on evaluation in terms of summative assessments; however, Teacher B added, "Student success for me is when they are struggling with a problem, but they persist." Although her statement seems significant, she did not describe any ways that she evaluates students based on their persistence.

Mindset messages. While all four teachers emphasized the importance of content standards, they gave significantly less weight to mindset messages. For example, Teacher A never explicitly discussed the use of mindset messages during the interview; she was more enthusiastic about her approach to groupwork. Nonetheless, the fact that she has students present their work, even when they are wrong, shows that she values a growth mindset. Teacher C more directly explained that she does not incorporate mindset messages because "there is so much to cover". Teacher D also expressed pressure to maintain a rigid pace, but explained that she does address mindset messages through community building activities at the beginning of the school year. With the motto that "effort equals ability," Teacher B undoubtedly believes in the power of a growth mindset. She constantly tells students "success is largely dependent on your persistence and perseverance." Although that message is important for students to hear, Teacher B does give evidence to support why that is true. Ultimately, the four teachers do little to promote a growth mindset, primarily because of a perceived lack of time.

Student engagement. During the interview, I asked all four teachers to describe student engagement during both collaborative and independent tasks. *Figure 4* (see List of Figures) shows how the teachers' responses overlap with the signs of engagement I previously defined in the concept map (see *Figure 2* in List of Figures).

Teacher A explained that she knows students are engaged in collaborative tasks when they are talking with their peers and including all group members. She encourages students to do that by giving groups only one piece of paper to record their thinking and their answers. For independent tasks, Teacher A described engagement in terms of task

completion. She frequently gives students three problems, and they must chose two to complete. The first problem is the same as an example, the second is similar to an example, and the third is an extension. While they work on the problems, she expects them to remain quiet and to use their notebooks as a resource.

For Teacher B, there is not such a clear distinction between engagement in collaborative tasks and engagement in independent tasks. She knows that students are engaged in collaborative tasks when they are working together, concentrating on the given problem(s), asking questions, helping each other and explaining their reasoning. Sometimes, it is noisy; other times, it is quiet. In her classroom, engagement in independent tasks looks similar. The only difference is that students rely more on themselves than on their peers to complete the given task. Teacher B further explained that engagement could look different depending on what is happening in a student's life. She said, "Students are resilient in their personal lives. Some of our students have very difficult home lives and they still show up – sometimes a mess, but they continue to show up and they really want to be successful." She believes that she needs to maintain high expectations for all students while also recognizing that sometimes engagement means just making it to class.

Teacher C and Teacher D had similar responses when I asked them to describe engagement during collaborative tasks and independent tasks. Both gave a general response that it varies, depending on the student. Teacher C explained that students like to process information differently. Specifically, some prefer to think aloud with their peers and others prefer to work alone. Teacher D suggested that engagement varies

because “some students are resilient while others are not.” Teacher B similarly claimed, “Some shut down when tasks are challenging; it depends on their personality.” Ultimately, both teachers expressed the belief that engagement largely depends on the student regardless of whether the task is collaborative or independent. Despite that belief, they acknowledge that students are most engaged when the task is “at the right level”. That is, when they have access to the problem(s).

Summary

Mills (2014) explains, “Data analysis is an attempt by the teacher researcher to summarize collected data in a dependable and accurate manner” (p. 132). For this research study, I used a modified version of Tesch’s steps for forming codes as a guide in that attempt. I began the process of consolidating and organizing data by first reading and highlighting key excerpts. I then wrote the key excerpts on index cards and shuffled them until I was able to identify major themes. Those themes later served as column labels in tables where I again recorded the excerpts. Examining the tables, I was able to narrow the major themes as I recognized an overlap in the data. The data collected from the personal journal fell under the themes of student engagement and student mindset; data from the classroom observations fell under the themes of collaborative tasks and independent tasks; and the data from the teacher interviews fell under the themes of instructional practices, mindset messages, and student engagement.

The next chapter highlights key learnings from this research study. It revisits the literature review and discusses new connections and understandings that arose from an

investigation of the data. It then describes possible limitations and proposes future research projects related to this study.

CHAPTER FIVE

Conclusions

Overview

At the start of this research study, my aim was to identify specific instructional strategies that boost student self-perception and ultimately achievement. I sought to answer the research question: *What instructional strategies best allow middle school students to develop self-efficacy as they transfer collaborative learning to individual assessments in the mathematics classroom?* I wanted to better understand how to bridge student learning from one context to another, recognizing the power of mindset. After collecting and analyzing data, I found that themes related to student mindset, student engagement, and instructional practices emerged.

This chapter presents the key learnings and implications of my research study. It revisits the literature review, highlighting important connections and understandings. Next, it discusses the limitations of the study and its findings. The chapter concludes with a brief description of future research projects related to this study.

Learnings and Implications

Personal journal. After analyzing the data collected from the personal journal, I revisited the literature review and found the sections on cooperative learning and student mindset to be most relevant. Throughout the journal, I expressed frustrations with the

way students worked together. Sears and Pai (2012) explain: "Studying together does not guarantee increased learning. When people work together some of their attention must be devoted to the task and some to the social interaction" (p. 247). In both 6th Grade mathematics classes, I felt that students spent too much time socializing. Ultimately, they struggled to balance the task with social interaction. That observation, when paired with the literature, made me increasingly aware of my responsibility to teach students how to work together. Simply assigning roles is not enough. Students need to encourage and respect the contributions of each group member. Consequently, it would be valuable to explore additional literature on social and emotional learning in order to promote positive working relationships among students.

I also observed that social interactions were a barrier to the successful completion of more independent tasks. In the journal entries, I wondered if students were simply trying to avoid work by socializing with their peers. I frequently noted that students would talk to each other while they waited for me to provide a one-on-one explanation. Such avoidance, especially during unfamiliar and/or challenging tasks, seemed indicative of a lack of confidence in mathematical ability. According to self-determination theory, autonomy, competence, and relatedness are necessary for individuals to feel motivated to pursue opportunities for growth (Ryan and Deci, 2000, p. 68). But what if students do not feel competent? According to the literature review, that is when mindset comes into play. Students must understand that intelligence is not innate and that mistakes are a critical part of the learning process.

Yeager and Dweck (2012) argue "[…] if students can be redirected to see intellectual ability as something that can be developed over time with effort, good strategies, and help from others, then they are more resilient when they encounter the rigorous learning opportunities presented to them" (p. 306). As the journal entries reveal, I frequently attempted to redirect students by explaining how the brain grows when you pursue a challenging task; however, those attempts were often unsuccessful. Reflecting on the data collected and revisiting the literature, it became apparent that strategies were missing from my practice. That is, strategies for students to quiet a fear of failure and approach a challenging task. It would therefore be interesting to further examine research on how to support the development and/or maintenance of a growth mindset in the mathematics classroom.

Classroom observations. Entering the four secondary mathematics classrooms, I was definitely primed to focus on student behavior during both collaborative and independent tasks. So, it is not surprising that I identified collaborative tasks and independent tasks as the major themes of the data collected. Within those themes, it was particularly interesting to examine and compare the data on student engagement and learning. The data undeniably suggest greater success in some classes than in others, especially during cooperative tasks. Slavin (1988) argues, "[T]he success of cooperative learning in increasing student achievement depends substantially on the provisions of group goals and individual accountability" (p. 32). The data seem to support that argument as I observed more students engaged in the class where the teacher had clearly

defined expectations of what group work should look like. Students had defined roles, used one piece of paper, and presented their work to the class.

Ultimately, the literature on cooperative learning proved most valuable as I examined the data collected during the classroom observations. Slavin's research, in particular, offered interesting insights into the data. Notably, Slavin (1988) stated, "There is no reason to expect that if teachers simply allow students to work together or reward them based on a single group product or task, they will learn more than will students taught traditionally" (p. 33). The data from the classroom observations seem to support that statement. Specifically, in the three classes with no clearly defined expectations for group work, I observed either equal engagement or more engagement during independent tasks when compared to collaborative tasks (see *Figure 3* in List of Figures). Both the data and the literature emphasize the importance of structuring collaborative learning. Such learning is not inherently rich.

Teacher interviews. Analyzing the data collected during the teacher interviews, I identified the themes of instructional practices, student mindset, and student engagement. While the literature supports a better understanding of those themes, I would like to examine additional literature on teacher mindset. It seems that teacher mindset affects instructional choices and, perhaps most significantly, student mindset and engagement.

During the interviews, it was obvious that all four teachers want their students to be successful; however, only two of the four teachers expressed confidence in their students' potential to achieve success. Specifically, the two middle school teachers seemed optimistic while the two high school teachers seemed more resigned to the idea

that some students would not reach their potential. That resignation was particularly evident in their comments about the resiliency of students. Both high school teachers claimed that some students simply are not resilient when presented with a challenging task; that is, some students "shut down" rather than persevere. Although they were not explicitly communicating that belief to students, it likely influenced their interactions and instructional choices.

Dweck (2007) explains, "As educators, almost everything we say to our students sends a message. Some messages enhance students' motivation, but other messages undermine it" (p. 6). It is therefore critical that educators are mindful of both the spoken and unspoken messages that they send students. Educators must constantly examine and question their own beliefs and the impact of those beliefs on their instructional practice. Boaler (2006a) argues that sometimes those beliefs limit opportunities for success so that "some students rise to the top of classes, gaining good grades and teacher praise, as others sink to the bottom, with most students knowing where they are in the hierarchy created" (p. 42). Such a hierarchy can act as an additional barrier for already at-risk students. Consequently, Boaler (2006a) encourages educators to create many ways for students to be successful. Providing more opportunities for success makes students "aware of the different practices that are valued and they feel successful because they are able to excel at some of them" (Boaler, 2006a, p. 42). Ultimately, by increasing opportunities for success, educators are able to support the development of self-efficacy as students begin to identify themselves as capable of achieving in the mathematics classroom.

Limitations

Despite my aim to ensure the validity and reliability of this research study, there were undoubtedly limitations. For the personal journal, in particular, the data collected would have been more reflective of my classroom if I recorded observations, thoughts and wonderings earlier in the school year instead of in April. I actually began writing journal entries at the end of November; however, that process was interrupted when I unexpectedly left for maternity leave in early December. I returned to my classroom 14 weeks later, after three substitutes who had no experience teaching mathematics.

Additionally, to get a more accurate idea of what instructional practices best support the development of self-efficacy, it would have been beneficial to expand the setting and demographics. Specifically, instead of visiting four classes within the same district for only one class period, it would have been valuable to visit (and re-visit) both urban and suburban schools. By observing schools within the same urban district, it became unclear if some of the issues that arose were due to underlying causes outside of the realm of my research question.

Future Research

Following the formal process of this research study, I intend to continue to act as a teacher researcher. Specifically, I plan to further investigate explicit strategies for supporting a growth mindset and student collaboration. Over the course of this research study, I became increasingly aware of the superficiality of my support. That is, I often use only words – not tangible actions – to encourage a growth mindset and collaboration.

Just telling students that their brain grows when they make mistakes is not enough. I need to *show* them that mistakes are a valuable part of the learning process.

This research study also made me aware of the importance of teacher collaboration. Observing and interviewing other teachers was such a powerful learning experience for me that I think it would be a disservice to both myself and my students if I did not pursue those opportunities in the future. Consequently, I plan to seek colleagues and mentors who will engage in observations and conversations that aim to improve instructional practices and boost student learning.

After gaining more teaching experience, I would like to pursue other research projects that support new teachers. For one, I would like to explore how the mindset of a new teacher impacts student mindset. Additionally, I would like to outline achievable steps for facilitating collaborative work in urban schools with an at-risk student population.

Conclusion

This research study began as an attempt to better understand how to support students as they transfer collaborative learning to independent assessments. What it revealed, however, was that clear expectations and mindset largely impact student success, regardless of the task. Notably, collaborative tasks are not innately beneficial to students. Such tasks must be highly structured while also giving space for students to take risks. They must provide multiple opportunities for students to experience success. It is through those experiences that students develop self-efficacy and become more resilient in the mathematics classroom.

BIBLIOGRAPHY

Allen, K. C. 1., (2012). Keys to successful group work: Culture, structure, nurture. *Mathematics Teacher*, 106(4), 308-312.

Amidon, J. C., & Trevathan, M. L. (2016). Supporting mathematics instruction through community. *Mathematics Teaching in the Middle School*, 21(5), 288-294.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman.

Blackwell, L. A., Trzesniewski, K. H., & Dweck, C. S. (2007). Theories of intelligence and achievement across the junior high school transition: A longitudinal study and an intervention. *Child Development*, 78, 246-263.

Boaler, J. (2006). How a detracked mathematics approach promoted respect, responsibility, and high achievement. *Theory into Practice*, 45(1), 40-46. doi:10.1207/s15430421tip4501_6

Boaler, J. (2006). Promoting respectful learning. *Educational Leadership*, 63(5), 74-78. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eft&AN=507867629&site=ehost-live

Boaler, J. (2013). Ability and mathematics: The mindset revolution that is reshaping

education. *FORUM: For Promoting 3-19 Comprehensive Education*, 55(1), 143 -152.

Boaler, J. (2014). The mathematics of hope: Moving from performance to learning in mathematics classrooms. *YouCubed.* Retrieved from http://youcubed.org/teachers/2014/the-mathematics-of-hope/

Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through Creative math, inspiring messages and innovative teaching*. San Francisco, CA, US: Jossey-Bass.

Claro, S., Paunesku, D., & Dweck, C. S. (2015). *Mindset equals income as a predictor of achievement*. Unpublished manuscript, Stanford University, Stanford, CA.

Corey, M. (2016). Immigrant influxes test U.S. schools. *Education Week*, 35(24), 1-11.

Davies, W. M. (2009). Groupwork as a form of assessment: Common problems and recommended solutions. *Higher Education*, 58(4), 563-584. doi:10.1007/s10734 -009-9216-y

Dekker, R., & Elshout-Mohr, M. (2004). Teacher interventions aimed at mathematical level raising during collaborative learning. *Educational Studies in Mathematics*, 56(1), 39-65. doi:EDUC.0000028402.10122.ff

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, 41(10), 1040-1048. doi:10.1037//0003-066X.41.10.1040

Dweck, C. S. (2007). Boosting achievement with messages that motivate. *Education Canada*, 47(2), 6-10. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ771007&sit

e=ehost-live

Dweck, C. S. (2008). *Mindset: The new psychology of success*. New York: Ballantine Books.

Dweck, C. S. (2010). Mind-sets and equitable education. *Principal Leadership*, 10(5), 26 -29. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ894640&si e=ehost-live

Fennema, E. & Scott Nelson, B., eds. (1997). *Mathematics Teachers in Transition.* Mahwah, NJ: Lawerence Erlbaum Associates.

Fullan, M. G. (2001). *The New Meaning of Educational Change*. 3rd ed. New York: Teachers College Press.

Genç, M. (2016). An evaluation of the cooperative learning process by sixth-grade students. *Research in Education*, 95(1), 19-32. doi:10.7227/RIE.0018

Gropper, G. L. (2015). Inclusive instructional design: Creating a "learner" version of instructional design that fosters active learner engagement. *Educational Technology*, 55(3), 3-13.

Hollie, S. (2012). *Culturally and linguistically responsive teaching and learning: Classroom practices for student success*. Huntington Beach, CA: Shell Education.

Jansen, A. (2011). Listening to mathematics students' voices to assess and build on their motivation: Learning in groups. *Part of a Special Issue: Motivation and Disposition: Pathways to Learning Mathematics*, 73, 201-213.

Kelly, A. M., Gningue, S. M., & Qian, G. (2015). First-year urban mathematics and

science middle school teachers. *Education and Urban Society, 47*(2), 132-159. doi:10.1177/0013124513489147

King, P. E., & Behnke, R. R. (2005). Problems associated with evaluating student performance in groups. *College Teaching*, 53(2), 57-61. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=16467997&site=ehost-live

Kitsantas, A., Cheema, J., & Ware, H. W. (2011). Mathematics achievement: The role of homework and self-efficacy beliefs. *Journal of Advanced Academics*, 22(2), 310-339. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ919063&site=ehost-live

Lemov, D. (2010). *Teach like a champion: 49 techniques that put students on the path to college*. San Francisco: Jossey-Bass.

Levpuscek, M. P., Zupancic, M., & Socan, G. (2013). Predicting achievement in mathematics in adolescent students: The role of individual and social factors. *Journal of Early Adolescence*, 33(4), 523-551.

Lilijedahl, P. (2016). Building thinking classrooms: Conditions for problem solving. *ResearchGate.* DOI: 10.1007/978-3-319-28023-3_21

Mills, G.E. (2014). *Action research: A guide for the teacher researcher.* Boston: Pearson.

Nasir, N. S., McKinney de Royston, M., O'Connor, K., & Wischnia, S. (2017). Knowing about racial stereotypes versus believing them. *Urban Education, 52*(4), 491-524.

doi:10.1177/0042085916672290

Nebesniak, A. L., & Heaton, R. M. (2010). Student confidence & student involvement. *Mathematics Teaching in the Middle School*, 16(2), 96-103.

Ortlipp, M. (2008). Keeping and using reflective journals in the qualitative research process. *The Qualitative Report, 13*(4), 695.

Poortvliet, P. M., & Darnon, C. (2014). Understanding positive attitudes toward helping peers: The role of mastery goals and academic self-efficacy. *Self & Identity*, 13(3), 345-363. doi:10.1080/15298868.2013.832363

Rattan, A., Savani, K., Chugh, D., & Dweck, C. S. (2015). Leveraging mindsets to promote academic achievement: Policy recommendations. *Perspectives on Psychological Science*, 10(6), 721-726. doi:10.1177/1745691615599383

Roxas, K., & Roy, L. (2012). "That's how we roll": A case study of a recently arrived refugee student in an urban high school. *The Urban Review, 44*(4), 468-486. doi:10.1007/s11256-012-0203-8

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78. doi:10.1037//0003-066X.55.1.68

Schmidt, J. A., Shumow, L., & Kackar-Cam, H. Z. (2016). Does mindset intervention predict students' daily experience in classrooms? A comparison of seventh and ninth graders' trajectories. *Journal of Youth and Adolescence*, doi:10.1007/s10964-016-0489-z

Sears, D. A., & Pai, H. (2012). Effects of cooperative versus individual study on learning

and motivation after reward-removal. *Journal of Experimental Education*, 80(3), 246-262. doi:10.1080/00220973.2011.602372

Slavin, R. E. (1988). Cooperative learning and student achievement. *Educational Leadership*, 46(2), 31. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=8878823&site=ehost-live

Slavin, R. E. (1996). Research on cooperative learning and achievement. *Contemporary Educational Psychology*, 21(1), 43.

Viadero, D. (2007). Experiments aim to ease effects of 'Stereotype threat'. *Education Week, 27*(9), 10-10. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eft&AN=50801129&site=ehost-live

Watanabe, M., & Evans, L., (2015). Assesments that promote collaborative learning. *Mathematics Teacher*, 109(4), 298-304.

Williams, R. L., Carroll, E., & Hautau, B. (2005). Individual accountability in cooperative learning groups at the college level: Differential effects on high, average, and low exam performers. *Journal of Behavioral Education*, 14(3), 167-188. doi:10.1007/s10864-005-6296-3

Winheller, S., Hattie, J. A., & Brown, G. T. L. (2013). Factors influencing early adolescents' mathematics achievement: High-quality teaching rather than relationships. *Learning Environments Research*, 16(1), 49-69.

Yeager, D. S., & Dweck, C. S. (2012). Mindsets that promote resilience: When students

believe that personal characteristics can be developed. *Educational Psychologist*, 47(4), 302-314. doi:10.1080/00461520.2012.722805

APPENDIX A

Observation Chart for Collaborative Tasks

Observation Chart for Collaborative Tasks

Group	Role Assignment	Effective Communication	Task Completion	Notes

APPENDIX B

Observation Chart for Independent Tasks

Observation Chart for Independent Tasks

Student	Strategy Use	Task Engagement	Task Completion	Notes

APPENDIX C

Teacher Interview Questions

Teacher Interview Questions

1. Describe your teaching career. How long have you been teaching? Where have you taught?

2. Describe a typical day in your classroom. What are you doing? What are students doing?

3. When you plan a lesson, what long-term goal(s) do you have in mind?

4. How do you evaluate student success? What does student success look like? Sound like?

5. Describe student engagement during collaborative tasks.

6. Describe student engagement during independent tasks.

7. How do you incorporate mindset messages into your lessons?

8. Would you describe your students as resilient? Why or why not?

9. Complete the statement: Students learn best when….

10. Complete the statement: Students perform best when…

LIST OF FIGURES

Figure 1. Personal journal word cloud. This figure displays the words that appeared most often in the personal journal. The size of a word shows the frequency of its appearance.

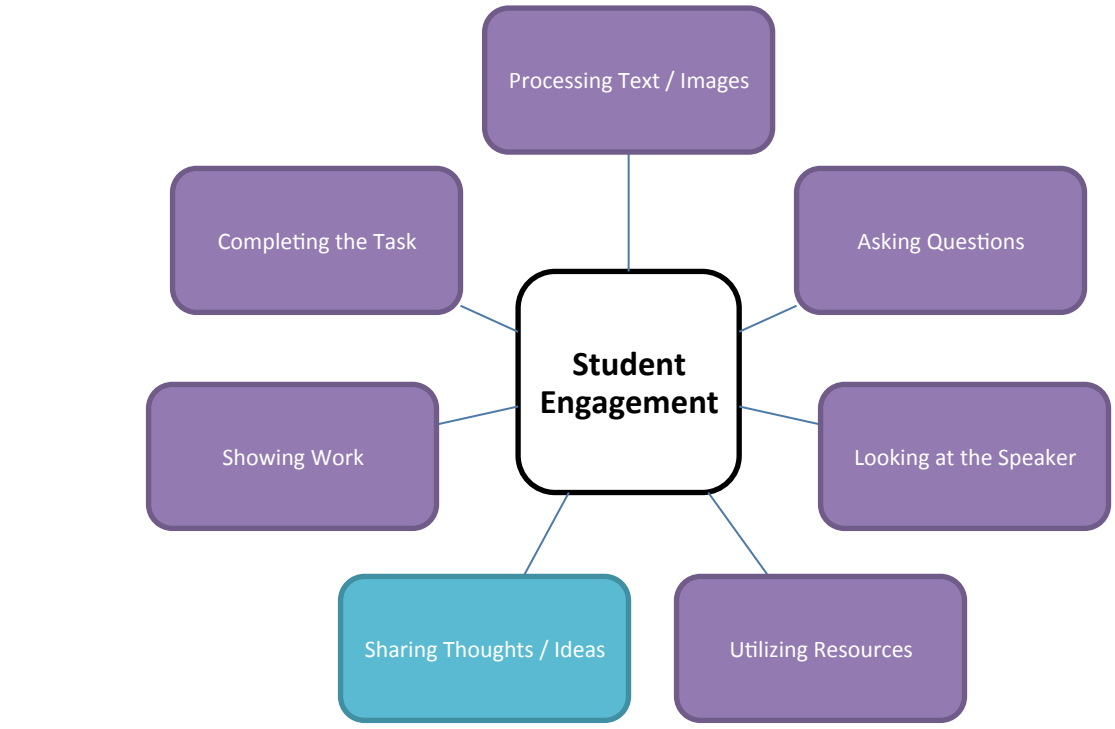

Figure 2. Visible signs of student engagement. This figure presents student actions that indicate engagement in lesson activities.

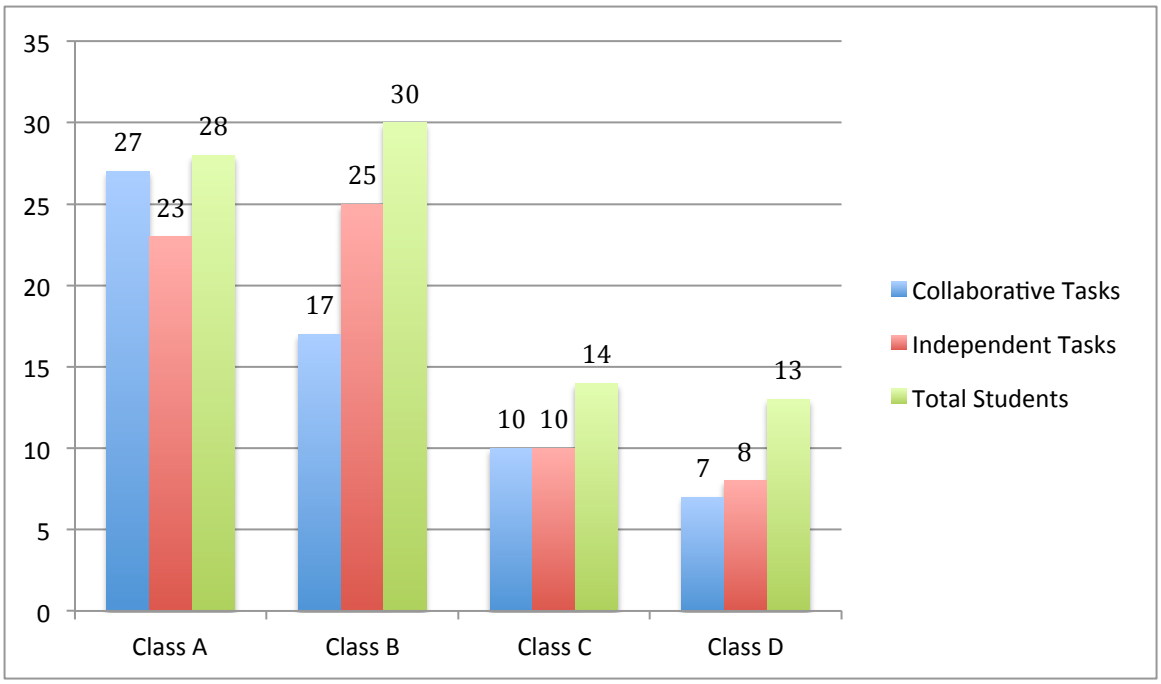

Figure 3. Observed student engagement. This figure shows the number of students engaged in collaborative tasks and independent tasks alongside the total number of students in the class.

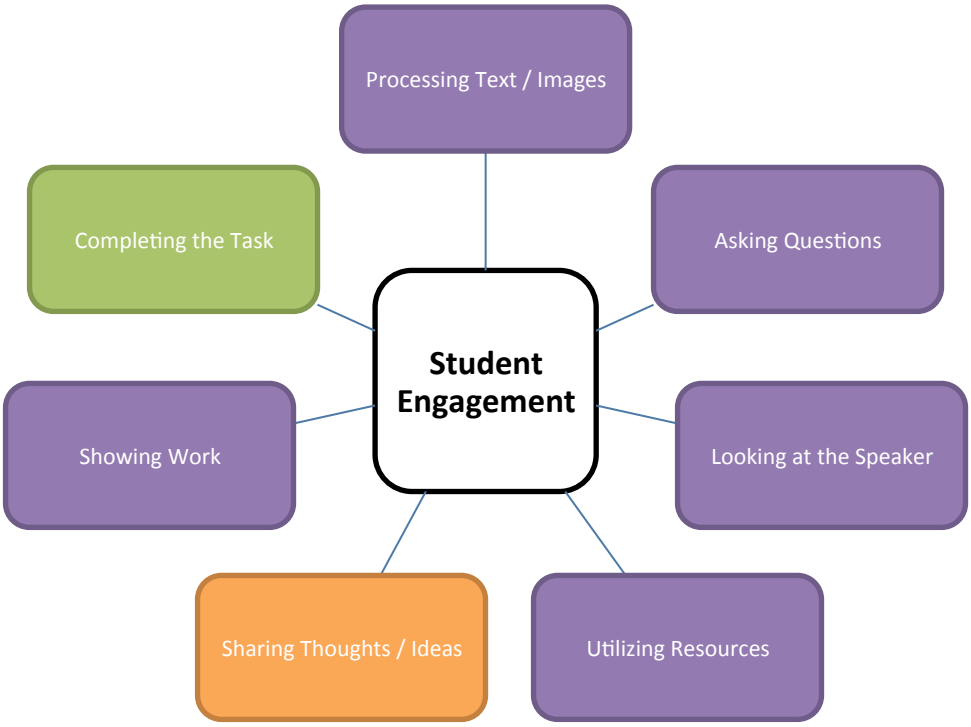

Figure 4. Teacher identified signs of student engagement. This figure presents the student actions mentioned during the teacher interviews.