investigating Boredom within The Context of Sixth-Grade Mathematics Classes

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ABSTRACT

INVESTIGATING BOREDOM WITHIN THE CONTEXT OF SIXTH-GRADE MATHEMATICS CLASSES
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Northern Illinois University, 2022
Elizabeth Wilkins, Director

This dissertation examined how the perception of the achievement-emotion of boredom impacted the academic agency of sixth-grade mathematics students. The study for this dissertation was completed during the Covid 19 pandemic. Through an explanatory sequential mixed methods study, sixth-grade mathematics student volunteers from a Midwest middle school responded to survey items on achievement-emotions as well as shared their perspectives about their perception of boredom in three mathematics settings: classroom, studying and/or independent learning, and testing. Eleven of the 69 sixth-grade mathematic students participated in three rounds of data collection: the AEQ-M Survey, homogenous focus group discussions, and individual interviews. A repeated measure within-subject ANOVA was used to analyze the quantitative data from the survey. The results of the focus group discussions and the individual interviews were coded and organized into themes of control and value.

The results show that sixth grade mathematics students perceived boredom in all three classroom settings: classroom, studying and/or independent learning, and testing. While discussing the perception of boredom, the sixth-grade mathematics students used descriptors of control and value, such as mathematics skills, executive functioning, intentional distractions, persistence of time, along with positive and negative appraisals. While discussing the perception
of boredom, the same students used descriptors of value, such as positive and negative appraisal as well as influencers, those people in a sixth-grade mathematics student’s life that influenced their beliefs about the value of mathematics. Different mathematics settings elicited distinct achievement-emotions, along with varying levels of perceptions of those achievement-emotions. Perceptions of boredom differed greatly as demonstrated by discussions comparing their ability to stay awake in class due to boredom and compared to persevering while studying independently. In this study, the perception of boredom was identified by the participants prior to, during, and/or after a test. The participants discussed patterns of behaviors consistent with control-value theory and with the process of self-regulation. These patterns worked together to create a triad for boredom agency—a course of action for sixth-grade mathematics students to pursue while striving to achieve academic goals, all while being confronted with the perception of boredom. This study identifies implications for future research, considerations for high stakes testing, as well as a reflection on how teachers of sixth grade mathematics students can help to scaffold the development of academic agency when their students are facing boredom.
INVESTIGATING BOREDOM WITHIN THE CONTEXT OF SIXTH-GRADE MATHEMATICS CLASSES

BY
TAMMY S. JUDKINS
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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF EDUCATION

DEPARTMENT OF CURRICULUM AND INSTRUCTION

Doctoral Director:
Elizabeth Wilkins
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DEDICATION

To my children: Michael, Crystal, Catherine, and Christopher
May your lives be filled with the potential, challenge, and enjoyment that life-long learning brings, in all its forms.

To my grandchildren:
All things are possible.
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A large timer is running on the SMARTboard at the front of the class. This Monday morning bell-ringer is called “Minute Math,” so upon arrival, the sixth-grade students in the class grab a bell-ringer worksheet from a box located by the classroom door. As is typical practice, the worksheet consists of 10 questions, addressing a variety of math skills the students have learned. This bell-ringer is labeled Minute Math #26, indicating it is the 26th week of the school year. The students are familiar with the format, and most questions are easily answered within the allotted time. Next, students enthusiastically volunteer to come to the board to demonstrate algorithms and alternative ways to solve each problem. The instructor encourages the students to self-correct their papers. A large majority of the class appears to be engaged in this activity. However, this activity signals a transition to a new task. The students know the teacher is going to introduce a new unit. A few students bristle. Some react to the new unit under their breath, while several others openly share their feelings with their tablemates. As is typical, one or two students loudly proclaim: “Math is boring,” a phrase every teacher dreads hearing from their students.

In Beyond Boredom and Anxiety from 1975, Mihaly Csikszentmihalyi wrote:

Chatting with acquaintances, pacing a room, whistling to oneself, reading a novel, biting on a pen, or baking bread are things people do not do because they expect to obtain something at the end of the activity but presumably because while they are doing it the structure of the activity, however tenuous, provides a respite from worry and boredom and an opportunity to merge action an awareness in a limited stimulus field. (p. 149)

Short of “baking bread,” these behaviors are commonly observed in the classroom setting and can be expected as part of the aforementioned scenario. It is also common for teachers to look for external indicators, observable signs of engagement such as eye contact or fidgeting indicating disengagement as a way to identify achievement-emotions that can positively or negatively influence achievement (Balwant, 2018; Fredricks et al., 2004). Many researchers have voiced concerns about the need to investigate students’ feelings and emotions in the context
of academia (Goetz et al., 2007; Pekrun et al., 2006). With the exception of anxiety, the research field of emotions in academic domains is largely unexplored (Goetz et al., 2007). And yet researchers tell us that emotions add to the prediction of learning and achievement (Pekrun, et al., 2006). Pekrun (2006) has found nine specific emotions that impact learning and academic outcomes. They include anger, anxiety, boredom, enjoyment, frustration, hope, hopelessness, pride, and shame. The least frequently researched of the nine achievement-emotions is boredom (Brown, 2012; Story, 2013; Tze et al., 2015). However, the researcher of this study, along with two other sixth-grade teachers (Smith & Dallesasse, personal correspondence, January 4, 2020) have experienced students citing boredom as a frequently perceived emotion, specifically during mathematics instruction. These same teachers felt it was often difficult to understand what the students meant by boredom. Achievement-emotions in general are complex phenomena of cognitive appraisals, subjective feelings, expressive behaviors, physiological processes, and motivational tendencies individuals have about the relevance of an event and their connectedness to the event (Frijda, 1988; Pekrun, 2004; Schuman & Scherer, 2014). Achievement-emotions are the result of this complex equation of perceptions. Pekrun (2006) suggests that achievement-emotions originate from activities and outcomes tied to the theoretical framework of control-value theory. The achievement-emotion of boredom is induced by either too high or too low control combined with neutral or no value given to the activity or the outcome (Pekrun, 2006, Pekrun et al., 2005). Of the current studies, most focus on math achievement and boredom at the collegiate level (Tze et al., 2015). Research becomes even more sparse when narrowed to how boredom relates to the achievement of middle school students, specifically those in sixth-grade mathematics classes (Ahmed et al., 2013; Brown, 2012; Story, 2013). Therefore, this research
helps fill the gap in literature on achievement-emotions, specifically boredom in sixth grade middle school mathematics classrooms.

Understanding and then cultivating academic agency, the behaviors that help students successfully navigate academic demands, which include but are not limited to behaviors such as executive functioning and emotional regulation, are especially important to stakeholders as well as sixth-grade mathematics students. The age range of this group is approximately 11 to 13 years. During the sixth-grade year, middle school students are expected to progress through the emotional and cognitive developmental stages of middle childhood to adolescence, advance from being less dependent to more self-sufficient and proceed from concrete-operational thinkers to reasoning more abstractly (Eccles, 1993; McCormick, 2019; McCormick & Scherer, 2018; Piaget, 1957, 1970). It is also important for understanding and cultivating agency in achievement-emotions (Larson and Angus, 2011; Pekrun, 2006), specifically boredom. The voice and feedback of the lived experiences of this unique, yet underreported, age group are essential for stakeholders to guide future decision-making (Brown, 2012; Goetz et al., 2007; McCormick, 2019; Pekrun et al., 2014; Pekrun et al., 2006; Story, 2013; Tze et al., 2015).

Problem and Purpose Statements

Researchers agree that the middle school years are critically important for developing core mathematics skills (Cetinkaya et al., 2018; DeSilver, 2017; Yurt, 2015). The Pew Research Center (DeSilver, 2017) through the Trends in International Mathematics and Science Study (TIMSS) found an increase of adolescents who do not value academics in general and mathematics specifically. Furthermore, there is a growing trend of reported boredom in mathematics classes between grades five and eight (Ahmed et al., 2013; Larson & Richards,
1991; Tze et al., 2015). This demonstrates that research can and should be continued in this area. Boredom can negatively impact achievement in all core classes, but specifically in mathematics as a critical time in a student’s education. Moreover, as found by Tze et al. (2015), the boredom experienced in different academic situational contexts within mathematics classrooms has a greater negative impact on students’ academic outcomes when compared to boredom experienced while independently studying or taking tests.

In other words, of the students who perceive boredom in a mathematics classroom, the students who perceive the highest levels of boredom are those who are attending lectures in the classroom (Pekrun, 2006; Pekrun et al., 2005; Tze et al., 2015). However, current research shows that lecture is still the dominant form of instruction (Harris & Pampaka, 2016; LoPresto & Slater, 2016) and has been shown to lead to students dropping out of school in their later years (Finn & Voelkl, 1993; Fredricks et al., 2004; McCormick, 2019; Pekrun, 2006; Yazzie-Mintz, 2010). For this reason, it is important for stakeholders to identify when and where any achievement-emotions occur, including boredom, as a proactive strategy to optimize the learning environment (Marks, 2000; Pekrun, 2006; Pekrun et al., 2005; Shernoff & Csikszentmihalyi, 2009).

In the context of control-value theory (Pekrun, 2006), students who state they are bored can feel either high or low control over an academic outcome but experience no value from completing the mathematics task. Middle school students are no different, specifically sixth graders. Even with the direct persistence of the teacher, many students are willing to give only a few minutes of effort to solve a problem before giving up (Smith & Dallesasse, personal correspondence, January 4, 2020). In addition, these same students are reluctant to persevere and return to a difficult problem once they have perceived it to be completed, whether it has been
done correctly or not. This can negatively impact achievement. For example, Dweck (2006) and Wormeli (2018) found that middle school mathematics students are more likely to retain math strategies and skills when teachers allow them to redo assignments, quizzes, and tests. However, the tendency for many middle school mathematics students is to avoid the second effort (Boaler, 2013; Dweck; Smith & Dallesasse). This reluctance can lead to lower achievement in math (Boaler; Dweck; Wormeli).

The reluctance to persevere while avoiding effort appears to be a trend in the formative years, specifically during the transition from elementary to middle school when students begin to doubt the value of their academic work and feel uncertain about their ability to succeed in core subjects like mathematics (Rathunde & Csikszentmihalyi, 2005; Simmons & Blythe, 1987; Wigfield et al., 1991). In fact, researchers have found that boredom increases by 30% as students reach the middle school years (Fredricks & McColskey, 2012), while motivation and engagement decrease (Rathunde & Csikszentmihalyi, 2005). Researchers have also found that students become more disengaged by middle school (Fredricks & McColskey, 2012; Larson & Richards, 1991; Nett et al., 2010).

Although boredom is regularly experienced by all students from elementary grades through college, according to Tze et al. (2015), there have been no empirical studies examining the relationship between boredom and academic agency, for middle school students (i.e., sixth through eighth grade). It is common for research to use laboratory and field experiments to generate data on the basic mechanisms of emotions; however, experimental settings are artificial and “do not represent real-life settings” (Pekrun, 2006, p. 331). Pekrun contends that to capture the subjective context of an emotional experience, self-report is more reflective of perceptions than experimental research. Therefore, the purpose of this study is to examine the achievement-
emotion of boredom as a construct of control-value theory (Pekrun, 2006) as it relates to middle school mathematics students’ academic agency. The explanatory, sequential, mixed methods design involved collecting quantitative data first and then explaining the quantitative results with in-depth qualitative data (see Figure 1). In the quantitative phase of the study, responses to the Achievement-Emotion Questionnaire for Mathematics (AEQ-M; Pekrun et al., 2005) survey were collected from 69 sixth-grade mathematics students from the target middle school in northern Illinois to assess whether there is a significant difference in the perception of boredom among the academic settings of classroom instruction, independent learning, and test-taking. The qualitative phase was conducted as a follow-up to help explain the achievement-emotions sixth-grade students perceive through the lens of control and value in the sixth-grade mathematics academic settings: classroom instruction, studying and/or independent learning, and test-taking.

Although not considered as a mathematic setting, it is important to note this study was completed in a unique context. The researcher, a sixth-grade mathematics teacher, the students in this study, as well as students across the nation were experiencing academia under the strict social distancing guidelines dictated by the Covid 19 pandemic. Virtual instruction was used for the majority of the school year. Although the Covid 19 pandemic was not used in the analysis of the data analyses, it is part of the discussion in Chapter 7. Notwithstanding, the explanatory sequential mixed method design was followed with integrity within the parameters of the Covid 19 restrictions.

Figure 1 demonstrates the sequence of steps in the explanatory sequential mixed method design. It is this mixed method model that supports the collection of quantitative and qualitative data. Pekrun (2006) says is desirable to reflect the true perceptions of students. The sequential
design follows a linear path from the quantitative collection and analysis of data to the qualitative collection and analysis of data. The culmination of collection and analysis mixes and bridges the data to answer the research questions.

Figure 1: Explanatory sequential mixed methods for perceptions of the achievement-emotion of boredom.

Research Questions

The following overarching research question guided this study: How does the achievement-emotion of boredom relate to the academic agency of middle school mathematics students? The sub-questions are as follows:
1. Is there a significant difference in sixth-grade mathematics students’ perception of boredom between the academic settings of classroom instruction, studying and/or independent learning, and test-taking?

2. How do sixth-grade mathematics students describe their perceptions of achievement-emotions, specifically boredom, in the academic settings of classroom instruction, studying and/or independent learning, and test-taking?

3. To what extent do the qualitative results of focus groups and individual interviews explain, confirm or contradict the quantitative results of the AEQ-M survey?

Framework

The theoretical framework for this study is Pekrun’s (2006) Control-Value Theory of Achievement-Emotions. Pekrun et al. (2007) explain that control-value theory addresses how achievement-emotions impact academic outcomes and provide a framework for analyzing emotions. Control-value theory maintains that when engaging with an object of focus, appraisals are based on control and value that elicit an emotion connected to achievement (Pekrun et al., 2002). “This central part of the theory can be summarized by the proposition that students experience emotions when they feel in control of or out of control of activities and outcomes that are subjectively important to them” (Pekrun, 2016, p. 132). An example of this is when students feel they have high control over an object of focus, such as learning a new math skill, and they value learning the new skill, they then expect to experience the achievement-emotion of joy. Table 1 illustrates the connections among control, value, and achievement-emotions.
Table 1
Control-Value Theory: Basic Assumptions

<table>
<thead>
<tr>
<th>Object of Focus</th>
<th>Appraisal Value</th>
<th>Control</th>
<th>Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (Success)</td>
<td>High</td>
<td>Anticipatory Joy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>Hope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Hopelessness</td>
</tr>
<tr>
<td></td>
<td>Negative (Failure)</td>
<td>High</td>
<td>Anticipatory Relief</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>Anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Hopelessness</td>
</tr>
<tr>
<td>Outcome/Retrospective</td>
<td>Positive (Success)</td>
<td>Irrelevant Self</td>
<td>Joy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
<td>Pride</td>
</tr>
<tr>
<td></td>
<td>Negative (Failure)</td>
<td>Irrelevant Self</td>
<td>Gratitude</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
<td>Sadness</td>
</tr>
<tr>
<td></td>
<td>Positive/Negative</td>
<td>High</td>
<td>Shame</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>High/Low</td>
<td>Anger</td>
</tr>
</tbody>
</table>

(Pekrun, 2006, p. 320)

This table is set up to cross-reference the appraisal antecedents with the attributes of Pekrun’s (2006) theory: control and value. An achievement-emotion occurs based on the intrinsic value, positive or negative, a student places on the action or outcome and the perceived amount of control, high or low, a student has over either initiating an action or the resulting outcome. This table shows that boredom is more nuanced than the other achievement-emotions. Boredom has neither positive or negative value, and it can occur when control is either high or
Meaning, a student can perceive boredom when s/he experiences high control or even low control because s/he does not value the outcome of the experience.

**Control**

Appraisals of control concern the perception of being able to master outcomes (Pekrun & Stephens, 2010; Story, 2013). Subjective control allows the student to exercise personal preference, while action control manifests itself in the student’s anticipation that an action can be initiated and performed (Pekrun, 1988; Pekrun, 2006). When engaging with the object of focus, prospective or retrospective control is perceived as high, medium, or low and, when paired with an appraisal value, will produce an achievement-emotion. In a situation in which the student is retrospective or reflective on the object of focus, control can become irrelevant (Pekrun, 1988, 2006). For instance, the achievement emotions of hope or anxiety are retrospective and are perceived by the student depending on what level of control the student has over the outcome. High control will produce hope, while low control will produce anxiety. For example, a sixth-grade student who has not mastered long division may perceive learning the skill of converting fractions to decimals anxiety provoking—a prospective achievement-emotion. Whereas, a student who has mastered long division may perceive hopefulness when faced with this same new skill. A second example includes two sixth-grade students who received the same score on a math test. One student perceived pride because s/he felt in control of the outcome. The other student perceived shame because s/he did not feel in control of the outcome. Just as a variety of achievement-emotions can be produced through the perceived amount of control a student has over an action or an outcome, the variety of achievement-emotions are contingent on the value given to the outcome by the student.
Value

Appraisals of value concern the linking of positive and negative subjective importance to activities and outcomes (Pekrun & Stephens, 2010; Story, 2013). Appraisals of value are positive, negative, or non-existent (Pekrun, 2006). A negative appraisal is associated with failure, while a positive appraisal is associated with success. When engaging with an object of focus (e.g., converting fractions to decimals), positive values can lead to achievement-emotions, including joy and relief (Pekrun). Conversely, negative values can lead to achievement-emotions that include anger, hopelessness, and frustration (Pekrun). When value is non-existent and control over the outcome is too high or too low, the achievement-emotion of boredom occurs (Pekrun). Here is a middle school mathematics example to illustrate this point. A sixth-grade student learning how to find the percent of a given amount in a unit called Taxes, Tips, and Discounts may perceive boredom. It does not matter if the student has mastered decimal operations or is struggling with this skill. If the student does not believe the unit is relevant to him/her, the student does not value what s/he is learning and thus may perceive the achievement-emotion of boredom.

Emotions

Emotions are ever present in school settings (Ahmed et al., 2013; Butz, et al., 2015; Goetz et al., 2012; Pekrun, 2006; Pekrun et al., 2005; Pekrun, & Linnenbrink-Garcia, 2012). Untangling/delineating which emotions activate or deactivate behaviors in school settings is crucial if educators want to address how emotions impact academic outcomes. We know this impact is tremendous and “emotions exert profound effects on students’ motivation, learning,
and achievement” (Pekrun, 2016, p. 131). Positive emotions are more often researched, as they help to shed light on how instructors can foster resiliency, encourage individual self-regulation, and guide behavior for academic achievement (Goetz, et al., 2008). However, in the same vein, negative emotions should also be considered, as they also impact resiliency and self-regulation while guiding behavior. Goetz et al. (2012) argued that the most direct way to secure certain student actions or academic achievement is by fostering emotions that promote academic success or fostering an environment that suppresses negative emotions or those that hinder academic success. Once an everyday emotion is connected to academic success or achievement, it is referred to as an achievement-emotion (Pekrun, 2006). Maladaptive emotions, like anxiety and boredom, are detrimental to academic achievement (Pekrun, 2016). Of the maladaptive emotions, boredom is the least researched in the middle school setting. And yet boredom is seemingly the most frequently cited achievement-emotion by sixth-grade students, who were the inspiration for this study.

Significance of the Study

This study is significant for three reasons. First, this study adds to past research while addressing a gap in the research. There has been much research on achievement-emotions (Frenzel et al., 2007; Goetz et al., 2008; Goetz et al., 2012; Pekrun, 1988, 1992, 2006, 2016). However, the research specifically on the achievement-emotion of boredom is limited (Ahmed et al., 2013). Brown (2012) and Story (2013) noted that studies on the boredom and middle school students are even more sparse. Therefore, this study about sixth-grade mathematics students will add to the dearth of research that exists.
Second, this study benefits those instructional stakeholders who want to understand how an achievement-emotion like boredom relates to agency. Data collected through the surveys, focus groups, and individual interviews will inform educators, policy makers, and educational researchers about boredom and how it relates to achievement so changes can be made to counteract boredom’s negative influences, such as a drop in achievement. The RAND Corporation (2015) suggests establishing a continuous improvement process that refines strategies for targeted support for students who struggle. As Brown (2012) explained, “Studying this area in mathematics … has not taken into account what the actual middle school students say about their experience learning mathematics in the middle school mathematics classroom” (p. 12). Moreover, it is important for teachers and administrators to identify and monitor student challenges and act to overcome them as prescribed by Every Child Succeeds Act (ESSA; United States Department of Education, 2015). ESSA adds that the organization has “an expectation that there will be accountability and action to effect positive change ..., where groups of students are not making progress, and where graduation rates are low over extended periods of time” (p. 1). Furthermore, educators armed with information about how achievement-emotions influence academic achievement should be able to directly help promote the success of those same students. For instance, educators of sixth-grade students will understand that when students feel high control over and high value in completing a task, the students will feel enjoyment and are more likely to be engaged, which leads to learning (Eccles & Wang, 2012; Finn & Zimmer, 2012). Counter to this are sixth-grade mathematics students frequently expressing the perception of boredom. Subsequently, those in the position of making instructional change will benefit from understanding the phenomenon of boredom. Understanding how and when sixth-grade students perceive boredom allows educators to make changes that will promote achievement-
emotions, such as joy, hope, and pride that have been shown to be linked to improved academic achievement (Pekrun, 2006; Pekrun et al., 2005).

Finally, students, particularly sixth-grade students, are rarely given an opportunity to voice their lived experiences (Brown, 2012; Creswell, 2009; Lincoln & Guba, 2000; McCormick, 2019; Trowler, 2010). Through the four focus groups and 11 individual interviews, this study captured the students’ perspectives. Focus groups reflect a natural social experience that occurs in most schools, as Krueger and Casey (2015) explain, “because participants are influencing and influenced by others--just as they are in life” (p. 7). A student’s peers provide a support system of shared experiences and interests (McCormick, 2019). On the other hand, the individual interviews allowed each student to share his or her personal story in a confidential setting. Using an interview is a way to gain insight into the meaning-making of sixth-grade students’ experiences in the mathematics classroom, specifically as they related to boredom (Seidman, 2019; Vygotsky, 1987).

Methodology

This study utilized a mixed-methods approach. A sample of sixth-grade mathematics students was asked to volunteer to take a survey, participate in a focus group, and participate in individual interviews. Pekrun et al.’s (2005) AEQ-M survey was used to collect quantitative data about boredom in mathematical contexts: classroom learning, individual learning, and testing. Qualitative data were collected from the focus group using a guided set of core questions based on the research of Csikszentmihalyi, et al. (1997) and McCormick (2019) and the constructs of the control-value theory (Pekrun, 2006). A select set of sixth-grade students, who represented a cross-section of demographics and academic achievement, was asked to share
their personal lived experiences in the mathematics classroom by participating in individual interviews.

A repeated measures (within-subject) ANOVA (Gravetter & Wallnau, 2014) was used to compare variables to identify significant correlations between mathematical settings and the achievement-emotion of boredom. Transcripts of the focus groups and interviews were coded for particular combinations of the constructs of control and value with the sub-themes of skills, executive functioning, intentional distractions, time, appraisal values, and influencers in mathematics settings. The resulting combinations were refined to better explain the sixth-grade students’ lived experiences.

Definitions

The following terms are defined to provide clarity on how they are used in this study.

**Academic Agency**: The ability to set and achieve scholarly goals (Larson & Angus, 2011)

**Achievement-Emotions**: These are emotions that relate to learning activities or academic outcomes such as success or failure (Pekrun, 2004, 2006; Pekrun et al., 2005).

**Affective Learning**: “The dimension of learning that is concerned with the reactions, feelings, and emotions of the learner” (Buchanan & Hyde, 2008, p. 312).

**Attitude**: “A predisposition to respond to a certain object either in a positive or negative way” (Martino & Zan, 2010, p. 28).

**Boredom**: “An achievement-emotion with components of unpleasant feelings, capable of altering the perception of time, and reducing the physiological feelings of arousal” (Pekrun et al., 2010, p. 532).
Emotions: The complex phenomena of cognitive appraisals, subjective feelings, expressive behavior, physiological process, and motivational tendencies individuals have about the relevance of an event to his or her concerns (Frijda, 1988; Pekrun, 2004; Schuman & Scherer, 2014).

Engagement: This attribute, which is associated with academic achievement, has a multifaceted makeup encompassing behavioral, emotional, and cognitive domains (Fredricks et al., 2004). Engagement is reflected in participation, positive and negative reactions, and the effort necessary to comprehend difficult tasks (Fredricks et al., 2004; Waggett et al., 2017).

Executive Functioning: The conscious control of thoughts and actions in pursuit of goal-directed practice and performance (McCormick & Scherer, 2018).

Mathematics Beliefs: What students see as true in mathematics, in the classroom, and within themselves (Op’T Eynde et al., 2002).

Self-regulation: The role of an individual to adapt personal behavior rather than the influence of peripheral factors imposed on the individual by others (McCormick & Scherer, 2018).

Valence: The subjective value or perceived importance, either positive or negative, of activities and outcomes (Pekrun, 2006).

Organization of Dissertation

Chapter 1 provides an overview of the study. Chapter 2 includes a comprehensive review of literature including but not limited to control-value theory, achievement-emotions, trends in adolescent development, boredom, and engagement. Chapter 3 describes the procedures for carrying out the study, including the research design, participants, data collection, data analysis, and limitations. Chapter 4 presents the findings of the quantitative analysis. Chapters 5 and 6
present the findings of the qualitative analysis: focus groups and individual interviews, including descriptions of each student. The last chapter provides a discussion of the findings, implications, recommendations, and limitations.
CHAPTER 2
LITERATURE REVIEW

Introduction

Students can experience a variety of achievement-emotions—but in particular, boredom—not only throughout their academic career but even within a singular academic setting. There is no comprehensive, unified way to determine if an activity or an academic setting will induce the perception of boredom because it is based on the individual’s perceived control and subjective value of the activity and/or outcome. Research and literature on boredom, particularly experienced by sixth-grade students are limited, with the few studies focusing what boredom is, a combination of control and value attributes (Pekrun, 2006), or what it is not, a lack of flow (Csikszentmihalyi, 1975; Shernoff, 2013). Further research, quantitative to compare AEQ-M results along with qualitative, focus groups and interviews, is necessary to better understand the lived experiences and perceptions of boredom of sixth-grade students as they pursue academic agency in their mathematics classrooms.

The following chapter reviews current literature on how achievement-emotions relate to academic outcomes. The review begins with a description of Pekrun’s (2006) control-value theory, delving into the theory’s constructs of control and value, achievement-emotion antecedents of retrospection and prospection, and outcome expectancies of activation or deactivation. The literature review brings these attributes together to show achievement-emotions are a manifestation of a student’s perceived control and value of an object of focus. In
this study, the object of focus is sixth-grade mathematics. After this, the literature review focuses on one specific achievement-emotion, boredom, as well as an explanation of engagement because for most educators, this is a surface indicator of academic achievement and the opposite of boredom (Finn & Zimmer, 2012; Fredricks & McColskey, 2012; Waggett et al., 2017). Finally, the review explores how trends in adolescent development connect to middle school students’ perceptions of achievement-emotions in the middle school mathematics classroom.

Control-Value Theory

Ravitch and Riggan (2017) explain that the relevance and rigor of research are sustained through a strong framework. Therefore, the theoretical framework chosen for this study is the control-value theory, which was developed and refined by Pekrun and several colleagues (Pekrun, 2000; Pekrun et al., 2007; Pekrun et al., 2002), who were researching achievement-emotions. Control-value theory (Pekrun, 2006) offers relevance and rigor as it is an integrative framework “for analyzing the antecedents and effects of emotions experienced in achievement and academic contexts” (p. 316), which closely aligns to the purpose of this study. Control-value theory maintains that when engaging with an object of focus, such as sixth-grade mathematics, appraisals are based on students’ perceptions of control and value that elicit an emotion connected to achievement (Pekrun et al., 2002). Pekrun (2016) notes that “students experience emotions when they feel being in control of, or out of control of, activities and outcomes that are subjectively important to them” (p. 132). In this respect, achievement and emotions are directly connected to each other.
The application of control-value theory explains the fundamental attributes pertaining to academic outcomes and achievement-emotions (Pekrun, 2006). First, control-value theory begins by addressing the subjective appraisal antecedents of control and value. The theory then progresses into breaking control into outcome expectancies such as situation and action. Control-value theory then considers how value threads through the relationship of both action and outcome to connect with achievement-emotions. The following explains each step in the process.

Subjective appraisals are important and assumed to mediate students’ responses to situational contexts, such as learning in a mathematics classroom, and are proximal determinants of human emotions (Pekrun, 2006; Scherer et al., 2001). Subjective appraisal of control occurs when a student believes his or her actions will lead to either success or failure (Pekrun, 2006; Skinner, 1996). An example of this is when a student believes practicing a new mathematics concept, such as distributive property, will lead to a successful demonstration of this skill on an exam. The subjective appraisal of value determines the importance the student places on demonstrating distributive property on the aforementioned test (Pekrun, 2006; Roseman, 2001; Roseman et al., 1996; Scherer, 2001). These subjective appraisals can lead to three types of outcome expectancies.

Outcome expectancies are determined by action, or a lack thereof. For instance, situational-outcome predicts a positive outcome without any action taken on the part of the student or a negative outcome if no counter step is taken (Bolles, 1972; Heckhausen, 1977; Pekrun, 2006). One example of a positive situation-outcome is when an individual, student or otherwise, knows that without any effort on their part Friday night signals the beginning of a weekend. An example of a negative situation-outcome is when an individual, student or
otherwise, recognizes that a virus will spread without countermeasures put into place. However, there are situations when an individual has control over an action or control over an outcome. When a student expects they can initiate and perform an action, this is referred to as action-control expectancy (Bandura, 1977; Pekrun, 1988, 2006; Skinner, 1996). For instance, by the time a student is in sixth grade, he or she should be able to initiate and perform the foundational mathematical operations of addition, subtraction, multiplication, and division. On the other hand, “action-outcome expectancies imply that one’s own actions will produce some positive outcome, or will prevent, reduce, or terminate a negative outcome” (Pekrun, 2006, p. 318). In this instance, a sixth-grade mathematics student should understand that studying for a test will produce a better grade, prevent making corrections, and reduce the time needed to scaffold learning for the next new skill. These appraisals, positive or negative, of outcome expectancies, situational or action controlled, lead to achievement-emotions along with when they occur prior to the event or after. In the previously mentioned situation in which the student believed practicing the newly acquired skill of distributive property, the anticipated achievement-emotion is pride after the student is finished practicing. In the positive situational outcome of anticipating Friday signaling the end of the week, the student would perceive joy. Finally, the student who studies for a test may perceive the achievement-emotion of hope for producing a better grade, preventing making corrections, and reducing the time needed to scaffold learning for the next new skill. After studying, if the student is successful, he or she may perceive the achievement-emotion of joy or pride. If the student is not successful, he or she may perceive the achievement-emotion of shame or anger.

Pekrun (2006) argues that the appraisals made by students in academic contexts become linked to achievement-emotions, and in turn, achievement-emotions become connected to
Control value theory is then a cyclical pattern of antecedents and achievement-emotions. In an attempt to describe achievement-emotions, Pekrun classified them as prospective, retrospective, and/or activity achievement-emotions. “The control-value theory implies that prospective outcome emotions, retrospective outcome emotions, and activity emotions are determined by different appraisal antecedents” (p. 319). Achievement-emotions such as hope and anxiety are prospective emotions. In considering a prospective outcome, sixth-grade mathematics students will make an appraisal about the likelihood an action initiated by him or her will obtain success (hopefulness) or avoid failure (anxiety).

For instance, a sixth-grade mathematics student who has recently learned how to do order of operations may perceive the achievement-emotion of hopefulness when learning distributive properties, as it is an extension of the previously learned skill. Another sixth-grade mathematics student may perceive the achievement-emotion of anxiety in the same situation, as distributive property is yet another step in a convoluted series of steps. Conversely, while reflecting on an outcome, a sixth-grade mathematics student could perceive a retrospective achievement-emotion as they consider whether the outcome was caused by self (pride or shame) or external circumstances (gratitude, sadness, or anger). From the earlier scenario, the sixth-grade mathematics student who practices for an extra amount of time and is successful in mastering distributed property may perceive the achievement-emotion of pride, as their studying influenced the outcome. If the student did study but still did not master the new skill of distributive property, they may perceive the achievement-emotion of shame, as their actions did not improve the outcome. If a teacher helped in the studying process or a sibling tore up the sixth-grade mathematics student’s notes, these external circumstances could cue the perception of the achievement-emotions of gratitude or anger, respectively.
Finally, achievement-emotions can connect to the action taken rather than only the outcomes. For instance, a sixth-grade mathematics student can find the achievement-emotion of enjoyment in the process of learning, mastering the multiple steps in the order of operations (Csikszentmihalyi, 2000; Dweck, 2006; Pekrun, 2006). However, if a sixth-grade mathematics student finds no value in the outcome, no matter whether the control over the action is high or low, the student will experience the perception of boredom (Csikszentmihalyi; Pekrun). Pekrun explains that “if the activity lacks any incentive value (positive or negative), boredom is induced” (p. 324). The achievement-emotion is considered a deactivating emotion, resulting in sixth-grade mathematics students not initiating an action to achieve an outcome. The multiple combinations of antecedents, outcomes, and levels of activation can lead to a variety of achievement-emotions in a single classroom, thereby inspiring researchers to study how they relate to achievement.

This growing interest and exploration of achievement-emotions in various academic contexts is demonstrated by Niculescu et al.’s (2015) study of first year college students. Although these researchers refer to the emotions connected to learning as learning-related emotions, other researchers refer to them simply as emotions (Ahmed et al., 2013; Artino & Jones, 2012) and McCormick (2019) connects them to the way students engage in academic contexts, they all pay homage to the achievement-emotions studies by Pekrun and his colleagues (Pekrun et al., 2002; Perry et al., 2001).

In their study, Niculescu et al. (2015) collected data on four distinct learning-related emotions: enjoyment, anxiety, boredom, hopelessness. Data were collected from over 3,000 university freshmen enrolled in a business and economics program. Although the study lasted four years, each participant was surveyed twice at the beginning of their first semester, using the
Achievement Emotions Questionnaire (Pekrun et al., 2011), and achievement was measured through performance portfolios: math performance, statistics performance, and business performance. Data were analyzed through a Chi-square analysis, comparative fit index, non-normed fit index, and root mean square error of approximation.

Niculescu et al. (2015) found control played a crucial part in the development of the aforementioned learning-related emotions. These findings were consistent in part with Pekrun et al. (2002) and Perry et al. (2001), although Pekrun and his colleagues added value as an essential antecedent in the development of emotions tied to learning or achievement. Niculescu et al. acknowledged the study’s limitations in that they focused on retrospective appraisals and did not address how those appraisals could have changed throughout the course of a school year. The research conducted in the Niculescu et al., Pekrun et al., and Perry et al. studies emphasized the role control plays in emotions connected to achievement; however, those studies’ participants represented an older demographic of students than in the proposed study.

An earlier study by Ahmed et al. (2013) used a participant pool of 522 seventh-grade mathematics students. The study found “that the development of academic emotions has an important implication for sustained self-regulated learning and achievement” (p. 157). This study looked at four emotions connected to learning: anxiety, boredom, enjoyment and pride. The Motivated Strategies for Learning Questionnaire (Wolters et al., 2005) was administered to the students throughout one school year: in the fall, winter, and spring. The students’ math grades were collected at the end of each trimester as well as scores from the previous year’s national standardized test as indicators of academic achievement.

The researchers anticipated seeing a decrease in positive emotions, such as enjoyment and pride, coinciding with an increase of negative emotions, such as anxiety and boredom, over a
school year. They also proposed that self-regulated learning strategies – the ability to control one’s behavior, emotions, and thoughts while working toward a goal (Bandura, 1991; Molden & Dweck, 2006) were connected to these same emotions. Ahmed et al. (2013) looked for connections between positive emotions, such as pride, and an increase in self-regulation strategies such as studying more. Conversely, Ahmed et al. also looked for connections between negative emotions, such as hopelessness, and a decrease in self-regulation such as not making an effort to study.

Using a multilevel test for longitudinal change, Ahmed et al. (2013) did not identify the expected increase in anxiety but instead found it to be relatively stable. However, the participants did report an increase of perceived boredom, data that are supported by Larson and Richards’s (1991) research. Ahmed et al. found that participants’ perceptions of joy and pride decreased over the school year. However, more compelling was that the findings indicated an association between anxiety and boredom with changes in mathematics achievement, which is supported by Pekrun et al. (2010) and Zeidner (1998).

Several other studies using surveys (Ahmed et al.; Daniels et al., 2009; Pekrun et al., 2009; Pekrun et al., 2010) have also documented negative associations of anxiety and boredom on performance as well as the role control plays in the process. However, data on the perceptions of students, value toward achievement, and their achievement-emotions have rarely been collected through a social interactive setting.

McCormick’s (2019) research collected data on learning environments and emotional engagement through surveys and the social interactive setting of focus groups. His goal was to understand how seventh grade students described their emotional experiences in academic contexts. One component of McCormick’s theoretical framework was Pekrun’s (2006) control
value theory. McCormick proposed that positive emotions, like pride and enjoyment, increased student autonomy, whereas negative emotions like anxiety and boredom created a sense of apathy toward school and learning. His participant pool consisted of 34 seventh-grade students from a middle school in northern Illinois. McCormick concurs with other researchers (e.g., Fredrickson, 2001; Lewis et al., 2011; Newmann, 1992; Shernoff, 2013; Shernoff et al., 2014) that a balanced cycle of positive emotions, psychological well-being, and optimal learning environments leads to emotional engagement. McCormick identified seven findings that detail this cycle and illustrate how value affects student achievement emotions.

Several of McCormick’s (2019) findings are applicable to the proposed study, although McCormick’s research primarily focused on student engagement. His research argued that optimal emotional engagement for mid-adolescents, such as sixth-grade mathematics students, is too important to ignore. As he worked to explain the definition of emotional engagement, he supported his stance by also addressing the opposing behavior: disengagement in that “the consequences of emotional disengagement are too damaging to be acceptable” (p. 180). McCormick, along with Csikszentmihalyi and Larson (1984) as well as Newman (1992), contended that disengagement occurs when schoolwork is unauthentic and deemed by the student as unworthy of effort, which in turn leads to the achievement-emotion of boredom. McCormick’s findings that inform the proposed study include 1) a student’s need for a balanced cyclical relationship of positive emotions, optimal learning environments, and physical well-being (Fredrickson, 2001; Lewis et al., 2011; McCormick, 2019; Newman, 1992; Shernoff, 2013; Shernoff et al., 2014); 2) boredom as the opposite of flow (Csikszentmihalyi, 1990; Shernoff, 2013; Shernoff et al., 2014); and 3) value in the form of student interaction or student’s perception of the teacher’s value, choice, and authentic instruction (Connor & Pope, 2013; Lewis
et al., 2011; Marks, 2000; McCormick, 2019; Newman, 1992; Ryan & Patrick, 2001; Pekrun, 2006; Shernoff et al., 2014). The following offers examples.

The first of McCormick’s (2019) findings that relate to this study is the concept of a balanced cycle of relationships among emotions, environments, and physical well-being. Although McCormick’s body of research focuses on promoting student engagement, interruptions in the cycle he describes can explain a student’s, such as one in a sixth-grade mathematics class, perception of the achievement-emotion of boredom (see Figure 2).

![Figure 2: McCormick’s cycle. (McCormick, 2019)](image)

McCormick’s (2019) cycle represents an amalgam of flow theory (Csikszentmihalyi, 1990), stage-environment theory (Eccles et al., 1993), and control value theory (Pekrun, 2006) along with others seeking to understand student engagement (e.g., Fredrickson, 2001; Lewis et al., 2011; Newman, 1992; Shernoff, 2013; Shernoff et al., 2014). Referring to Pekrun’s (2006) research, McCormick explained that students make judgements about tasks based on perceived
controllability and value, and these “emotional assessments affect their achievement and well-being” (p. 6). This cycle, which includes positive achievement-emotions such as enjoyment, leads to emotional engagement. Conversely, when a student does not value a given task, the achievement-emotion of boredom is introduced into the cycle (McCormick, 2019; Pekrun, 2006). It is the control-value theory attribute of value present in McCormick’s other findings that supports the research in the proposed study of sixth-grade mathematics students.

Another of McCormick’s (2019) findings relevant to this study is the connection of flow theory (Csikszentmihalyi, 1990) and engagement. Both the theory and attribute place an emphasis on value in terms of autonomy, interest, and intrinsic value. Although flow theory is used to describe an optimal learning environment (McCormick, 2019; Shernoff et al., 2014) through the simultaneous experience of enjoyment, challenge and interest, it also explains how boredom can lead to disengagement. McCormick summarized the experiences of students who reported perceptions of boredom in academic contexts during focus groups by explaining they were less likely to exert sustained effort when the skill, challenge and interest or value were not balanced. In these focus groups, McCormick also found that interest and value could be generated through student interaction.

The last of McCormick’s (2019) research that is useful in the proposed study is the concept of value in the form of student interaction and students’ perceptions of a teacher’s value, choice, and authentic instruction (Connor & Pope, 2013; Lewis et al., 2011; Marks, 2000; McCormick, 2019; Newman, 1992; Ryan & Patrick, 2001; Pekrun, 2006; Shernoff et al., 2014). This is another form of value useful for understanding how the achievement-emotion of boredom relates to the academic achievement of sixth-grade mathematics students. Pekrun’s (2006) research found that students perceived boredom most frequently in the academic setting
of classroom instruction. McCormick’s research found that social interaction was the most frequent context for positive emotions such as pride and enjoyment during classroom instruction. McCormick discovered through his focus groups that one way to promote the achievement-emotions of pride and enjoyment was when students shared core classes with friends. “Conversely, some students also spoke quite extensively about negative emotions...they did not enjoy it when they could not see their friends...or when they were forced to work with other students who were not their friends” (p. 181). Here McCormick, supported by Marks’s (2000) research, emphasizes the value students place on social support. Students’ relationships with their teachers can also generate both positive and negative achievement-emotions (Connor & Pope, 2013; Lewis et al., 2011; Ryan & Patrick, 2001; Shernoff et al., 2014; Skinner & Belmont, 2003). McCormick and Marks both note that dispirited teachers frequently have students who are disengaged and who report perceiving the negative achievement-emotion of boredom. Pekrun (2006) explains, “Emotions exert profound effects on students’ motivation, learning, and achievement” (p. 131), but untangling and delineating which emotions activate and deactivate behaviors is crucial in the academic setting if educators want to address how emotions impact academic outcomes. This is where research into the dynamics of achievement-emotions is useful.

Achievement-Emotions

Pekrun (2006) defines achievement-emotions “as emotions tied directly to achievement activities or achievement outcomes” (p. 317). There are many studies (e.g., Ahmed et al., 2013; Butz et al., 2015; Goetz et al., 2012; Pekrun, 2006; Pekrun & Linnenbrink-Garcia, 2012) that illustrate how emotions are always present in school settings. Pekrun (2006) explains that
“emotions exert profound effects on students’ motivation, learning, and achievement” (p. 131), but untangling and delineating which emotions activate and deactivate behaviors is crucial in the academic setting if educators want to address how emotions impact academic outcomes. Specifically, Pekrun (2016) contends that “learning and achievement are of fundamental importance for students’ educational careers, implying that achievement-related emotions such as enjoyment of learning, hope, pride, anger, anxiety, or boredom are frequent, pervasive, manifold, and often intense in academic situations” (p. 120). The pervasive frequency of perceived achievement occurs because students, including sixth-grade mathematics students, are in a perpetual state of making appraisals about academic contexts (Pekrun, 2006). These appraisals are important as they mediate situational factors, such as outcomes and activities, along with the intrinsic and extrinsic value.

Pekrun’s (2006) control value theory posits that two groups of appraisals have relevance: subjective control and subjective valence. Pekrun refers to subjective control as the influence over a student’s actions or outcomes, while subjective value is the perceived valences of actions and outcomes. Appraisals of control and value are made about an outcome either prospectively or retrospectively. When an appraisal is made prospectively, the student determines if their control is low, medium, or high. Concurrently, the student also makes an appraisal about the value of the object of focus. The valence appraisal is either positive, which is associated with success, or negative, which is associated with failure (Pekrun). For instance, a sixth-grade mathematics student discovers a unit test on one-step equations is coming. This student will simultaneously make an appraisal about his or her control over answering the questions correctly as well as a valence appraisal of success or failure (see Figure 3). For instance, if the student in this example perceives low control over studying as he has left his materials at school, he
perceives a negative valence (failure) as the results of this test will determine his sports eligibility. This combination of prospective appraisals suggests that the achievement-emotion he perceives prior to taking the test is hopelessness.

In contrast, when an appraisal is made retrospectively, the student reflects on their perception of control and determines if control for the object of focus originated from the self or from outside forces (Pekrun, 2006). There are also times when control is irrelevant while the student is reflecting. In this state of appraisal, the student will also make appraisals about valence, either focusing on positive valence – success – or on negative valence – failure (Pekrun) (see Figure 4).
For instance, the sixth-grade mathematics student in the previous example reflects on the results of the unit test on one-step equations, appraising his or her control over the outcome and his or her valence of the results. The score on the test indicates the student passed the test. If the student perceives his or her efforts (control) leading to the results, according to Pekrun’s (2006) research, he or she should perceive the achievement-emotion of pride. If the student perceives the score was the result of using approved notes during the exam, Pekrun would say the achievement-emotion would be gratitude. In this same example, if the student does not consider control at all, making it an irrelevant variable, the perceived achievement-emotion is joy (Pekrun).
Achievement-emotions also occur outside of anticipation (prospective) and reflection (retrospective) on the object of focus. Achievement-emotions occur during the activities that lead to an outcome (Pekrun, 2006), where control and value refer to appraisals of activities and actions. The appraisals are not about the outcome. For instance, Csikszentmihalyi (1975, 1990, 1997, 2000) explains that the perception of enjoyment comes from flow, giving attention to the activity of learning rather than the outcome. Enjoyment is perceived because there is a balance between challenge and interest (McCormick, 2019; Pekrun, 2006; Shernoff, 2013), synonyms for control and value. However, activities can lead to negative achievement-emotions such as stress, anxiety, and boredom (McCormick, 2019; Pekrun, 2006; Shernoff & Csikszentmihalyi, 2009; Shernoff et al., 2014; see Figure 5).

For instance, the same sixth-grade mathematics student mentioned in the prior examples is expected to participate in note-taking activity to prepare for the unit test on one-step equations. The student does not see the value in notetaking. The student does not experience a balance of challenge and interest, or control and value. In fact, the variable of value does not exist. It would not matter if the student’s control was high or low in this activity; the achievement-emotion perceived is boredom (Pekrun, 2006).
In a broad sense, the achievement-emotion of boredom has been an important topic in education for as long as students have been attending lectures. However, it has been only in the last two decades that research has provided a growing examination of how this achievement-emotion relates to academic outcomes. Pekrun et al. (2010) describe boredom as an achievement-emotion with components of unpleasant feelings capable of altering the perception of time and reducing the physiological feelings of arousal. Reviewing other studies, Pekrun et al. (2010) found that boredom negatively relates to the attention and efforts of students, like sixth-grade mathematics students, while they are participating in academic activities. Pekrun et al. (2010) explain, “Students withdrew effort at school as a result of experiencing boredom” (p.
Boredom has traditionally been assumed to be caused by lack of challenge (Csikszentmihalyi, 1975). It has also been found that boredom is related to a low self-perception of ability (Lichtenfeld et al., 2012).

For the current study, discussion on achievement-emotions is narrowed to the singular achievement-emotion of boredom. According to Nett et al. (2010), boredom is often overlooked, so there is a lack of research on boredom in general as well as boredom reported by students in schools. Additionally, Csikszentmihalyi (1997) summarized a trend in boredom for students of middle school age: “adolescents experience higher levels of boredom in school related activities than pre-adolescents, suggesting an increasing trend during this particular developmental stage...if an individual’s perceived capability is greater than the situational challenges, boredom is likely to occur” (p. 157).

Many studies (Ahmed et al., 2013; Artino & Jones, 2012; Lichtenfeld et al., 2012; Nett et al., 2010; Pekrun, 2016) have described how boredom relates negatively to achievement. Nett et al. (2010) also argue that boredom is not simply a neutral state in which students lack interest or enjoyment. Pekrun (2016) adds that boredom occurs when the activity, like sixth-grade mathematics, lacks an incentive or value. Boredom occurs when an activity requires abilities far above or far below one’s competencies, paired with indifference to outcome success or failure. In 2012, Lichtenfeld et al. found boredom could impair motivation and self-regulation as well as lead to poor student achievement. Artino and Jones (2012), along with Ahmed et al. (2013), argued that math achievement was negatively correlated with changes in boredom and anxiety. This idea connects to control-value theory, which states boredom is a negative deactivating emotion (Ahmed et al, 2013; Pekrun, 2006). These findings suggest the current study on the
achievement-emotion of boredom and how it relates to the achievement of sixth-grade mathematics students is relevant and timely.

Lauermann, Eccles, and Pekrun (2017) argue that understanding these antecedents is an important area of research, potentially leading to research on understanding the implications for students’ learning and achievement in school. Lichtenfeld et al. (2012) postulated that “achievement emotions are significantly related to students’ academic performance...anxiety and boredom were negatively related to mathematics achievement” (p. 200). This statement supports the need for more research on the impact of boredom on academic outcomes for middle school mathematics students and for stakeholders, like teachers, who want to identify when the achievement-emotion of boredom occurs, so its negative effects can be addressed.

Engagement

For most teachers, the first indication of academic achievement is student engagement (Finn & Zimmer, 2012; Fredricks & McColskey, 2012; Waggett et al., 2017). Conceptualized by researchers in the 1980s, student engagement was a way to understand and possibly reduce student boredom, alienation, and poor academic achievement (Finn & Zimmer, 2012). Finn and Zimmer point out that “students who are not engaged academically or who exhibit negative social behaviors create academic risk: they have lower achievement levels and are more likely to experience frustration to receive negative responses from teachers” (p. 122). In fact, Hunter and Csikszentmihalyi (2003) maintain that the absence of interest could actually jeopardize the development of an adolescent’s intellect.

However, some researchers claim that engagement goes beyond external indicators such as keeping busy and being well-behaved (Waggett et al., 2017; Wasserstein, 1995). They believe
that engagement comes from within and is self-motivating, wanting to understand something of interest and learning to achieve a goal. Other researchers argue that the invested effort of self-motivation one makes to understand or learn something of personal interest, along with the task’s perceived value and purpose, will generate engagement (Schlechty, 2011; Waggett et al., 2017). These components characterize engagement through behavioral attributes, such as completing a task along with cognitive attributes like assigning value to the task (Fredricks et al., 2004). Control-value theory posits that control and value mediate motivation and engagement as well as a student’s ability to stay on task, ignore distractions, and self-regulate (Pekrun, 2006). The level of control and value then generate emotions associated with the task, which can then impact achievement (Pekrun, 2006). However, the student’s ability to stay on task, ignore distractions, and self-regulate is also dependent on the development of the student (Erickson, 1959; 1964; Piaget, 1957; Vygotsky, 1987), which is important to consider for this study on sixth-grade mathematics students.

Trends in Adolescent Development

Piaget’s (1926, 1957, 1964, 1970) theories are useful for explaining the cognitive development of middle school students (adolescents). Adding to this, Erikson’s (1959) theory helps researchers better understand the stages of the life cycle and an individual’s development of identity. However, Vygotsky’s (1987) theory of the sociocultural view of learning and his Zone of Proximal Development (ZPD) thread through and connect Piaget’s and Erikson’s theories. Therefore, this literature review connects these developmental theories to achievement emotions, adolescent cognitive and identity development, and the culture of learning.
Genovese (2003) explains, “Piaget, more than any other theorist, [has] shaped our understanding of how children’s cognition changes in predictable ways” (p. 128). Each stage of Piaget’s cognitive and emotional development presupposes the attainment of the previous stage (Johnson, 1992). Piaget’s theory focused on the idea that children can solve certain problems at certain ages. These problems can be organized into developmental sequences: prenatal, infancy, early childhood, middle childhood, and adolescence (Genovese, 2003; McCormick & Scherer, 2018). Roughly aligning to the age of students in middle school, the stages of middle childhood and adolescence generally find students progressing through two of Piaget’s (1926, 1957, 1970) cognitive developmental stages: concrete operations and formal operations. Between the ages of 6 and 11, the cognitive development of children is described as concrete operational (McCormick & Scherer, 2018; Piaget, 1957, 1970). For instance, a mathematics teacher working with students of this age may use manipulatives such as colored chips to explain addition or multiplication through grouping and fraction bars to compare parts to whole. Prior to and during the middle school years, students can apply cognitive operations to problems involving concrete objects but not to problems involving abstract manipulation or hypothetical situations (McCormick & Scherer, 2018). For instance, students who are developmentally in the concrete operational stage will find it difficult to work with expressions with letters as variables. Conservative tasks are the hallmark of this stage (McCormick & Scherer). Another example is children in the concrete operational stage are able to understand that the volume of water does not change if poured into a different container or the number of objects does not change if arranged in a different pattern. Children in the concrete operational stage also understand class inclusion, such as all crows are birds but not all birds are crows. Additionally, children in this
stage are also able to order objects by dimension (e.g., shortest to tallest; McCormick & Scherer).

Following concrete operations, students who are 11 or 12 begin to be capable of even more complex tasks. As these students continue to develop cognitively, many move from the concrete operational stage to the formal operational stage (Ausubel & Ausubel, 1966; McCormick & Scherer, 2018; Piaget, 1957, 1970). Piaget (1957, 1970) explains that the clearest indication of moving into the formal operational stage is the ability to think about and solve problems of a hypothetical nature – thinking in possibilities (McCormick & Scherer, 2018). “The intellectually mature individual becomes capable of understanding and manipulating relationships between abstractions directly, that is without any reference whatsoever to concrete empirical reality…. [The student] formulates and tests hypotheses based on all possible combinations of variables” (Ausubel & Ausubel, 1966, p. 404).

A middle school mathematics student who is in the cognitive stage of formal operations understands some math problems can have more than one answer, such as solving for inequalities. For instance, a middle school student who is still in the concrete operational stage may look to the nearest whole number moving to the right on a number line that accurately answers the inequality of what is n, if n > 20. The student who is moving into the operational stage may not need the visual cue of a number line and may recognize that whole numbers with decimals can be included in the solution. A student fully within the operational developmental stage may recognize the real-world application of making a profit after paying for the overhead of a lawn-mowing business. All of these scenarios could describe the developmental stages represented by the student population in a single sixth-grade mathematics classroom.
However, the whole of the adolescent is more than cognitive development. Emotional development is also tied to cognitive development and the self-regulation of emotions such as boredom (Conley, 2008; Johnson, 1992; Mead, 1934; Piaget, 1957). Complementary to Piaget’s cognitive stages of development is a hierarchy of emotional experiences from simple to complex that shape the I and the me (Conley, 2008; Johnson, 1992; Mead, 1934). When children have reached the cognitive formal operational stage using abstract reasoning, they should be able to develop a concept of considering themselves and others around them and should be able to apply norms and behaviors learned while hypothesizing how their actions will apply to new situations and experiences (Conley, 2008). For instance, an adolescent, such as a sixth-grade mathematics student, may have had previous experiences with learning new skills of varying challenge. At some point the type of challenge along with the value perceived by the student (Pekrun, 2006) are identified by the student as boring, and the student then hypothesizes that subsequent experiences will be boring as well. Larson and Richards (1991) proposed that “perceptions may be more closely related to students’ experiences of boredom than the objective situation,” (p. 628). Therefore, high rates of boredom are often cited by the same students across academic settings (Larson & Richards, 1991; Nett et al., 2010). The frequency of certain emotions, those we call achievement-emotions, can become part of a student’s identity (Erikson, 1959).

Erikson and the Life Cycle of Identity

Maintaining a balance between the transitions through the cognitive and emotional stages allows adolescents to self-regulate their emotions, which become part of the adolescent’s identity in each stage (Erikson, 1959; Piaget 1964). Whereas Piaget (1964) emphasized the role of cognitive and emotional development, Erikson (1959, 1964) and McLeod (2008) emphasized the
role of culture and society in the development of the person. McLeod (2008) interpreted Erikson’s (1959) theory by saying that “the ego develops as it successfully resolves crises that are distinctly social in nature. These involve establishing a sense of trust in others, developing a sense of identity in society, and helping the next generation prepare for the future” (p. 1). Erikson’s psychosocial model illustrates how development occurs during eight stages from infancy to adulthood. Erikson proposed that during each stage, a person has to navigate between the needs of the self and the needs of society, which creates a crisis. The positive or negative outcome of each crisis creates a set of characteristics or virtues a person can use to resolve subsequent crises.

The journey through these stages begins with trust versus mistrust. In this stage, infants learn to trust, or not trust, their environment depending on whether their needs, such as being fed or comforted, are being met (Erikson, 1959). Along with trusting or distrusting their environments, an infant may develop a sense of trust or distrust in their ability to correctly identify their needs and to manipulate their environment to meet their needs. Toddlers, or children roughly ages two to four years, begin to exert control over their environment. When control is established, as in the situation of potty-training, autonomy is achieved. However, shame and doubt can occur when mastery is not achieved (Erikson). Usually, by the age of five, children have entered the stage of initiative versus guilt. This stage helps to build children’s confidence as they try new things all while developing a conscience that allows them to recognize the things they should not do.

Two stages associated with adolescence are industry versus inferiority, followed by identity versus confusion (Erikson, 1959). While discussing industry and inferiority, Erikson states, “[Children] want to watch how things are done and try doing them” (p. 87). For the stage
of identity and confusion, Erikson clarifies that it is “more than the sum of the childhood identifications. It is the inner capital accrued from all those experiences of each successive stage, when meaningful identification led to a successful alignment of the individual’s basic drives with his endowment and his opportunities” (p. 94). However, crises in each aforementioned stage are not always resolved. The individual can revisit these stages later in life as he or she continues to navigate the social demands in their environment. For instance, during the middle school years, adolescents navigate new social environments all while being confronted with mastering new sets of skills such as in mathematics. These environmental obstacles create additional crises to be overcome, while the inner capital of past experiences interprets how the outcome should be experienced. For instance, a student whose prior experience led to mistrust of those who should have his or her best interests at heart may interpret a teacher not immediately responding to a raised hand as an indication of imminent failure. This in turn may influence the student’s belief about control and value, which could lead the student to declare he or she is feeling bored. In other words, a student who does not believe he/she has control over learning a new skill and who does not trust the teacher to meet the student’s academic needs may interpret the emotion he/she has assigned to the feeling of high challenge and low value as boredom (Erikson, 1959; Pekrun, 2006).

Autonomy, initiative, industry, and identity all have a role in the academic success of a middle school mathematics student. “Many researchers realize that revealing how students think of themselves in relation to mathematics determines their persistence, interest, and motivation to learn mathematics and is a central component of mathematics identity” (Keck-Stanley, 2010, p. 12). Keck-Stanley, in his interpretation of Erikson’s (1959) life cycle stages of identity, suggests the ability to participate in and perform effectively creates an adolescent’s mathematical
disposition and identity as the middle school student revisits hallmarks of early stages of autonomy, initiative, industry, and identity. A student who finds himself or herself frequently feeling too challenged or not challenged enough in a mathematics class does not find value in the acquisition of mathematical skills and does not trust the teacher to meet the student’s academic needs could form an identity as the student who finds math boring and is unmotivated to persist (Erikson; Keck-Stanley; Pekrun, 2006; Pekrun et al., 2005).

However, just as a student’s mathematical identity can be attributed to successfully, or not so successfully, navigating Erikson’s (1959) psychosocial stages, Keck-Stanley (2010) also reminds us there is a sociocultural component. “Engagement in mathematical activities does not simply refer to social interactions among groups of people but to a more inclusive process of being active participants in a mathematics community of practice and constructing identities in relation to these communities” (p. 14). For instance, much of today’s pedagogical instruction focuses on student-centered instruction and students collaborating to solve problems (Outhwaite et al., 2019). Understanding the stages of development (Erikson, 1959; Piaget, 1926, 1929, 1957, 1964, 1970) and the framework of control-value theory (Pekrun, 2006) and creating a classroom that addresses the sociocultural component may offer strategies to alleviate the achievement-emotion of boredom in the classroom.

Vygotsky (1987) speaks to the necessity of addressing a social community. Outhwaite et al. (2019) described the challenges of learning new math skills while suggesting that Vygotsky’s (1987) sociocultural stance may provide an understanding of how the bridge between cognitive and emotional development can influence achievement-emotions experienced in the classroom. Longitudinal research demonstrates that early conceptual and factual knowledge achievement facilitates higher-level mathematical development. Struggling to pick up these
skills can make students vulnerable to perpetual underachievement. However, child-centered interventions that include targeted practice, direct instruction, and peer groups of participants at different levels of skill acquisition will enhance the development of general mathematics skills for the entire group (Outhwaite et al.). In fact, “The National Council of Teachers of Mathematics (NCTM; 2000) emphasizes the role of classroom mathematical experiences in helping students gain a conceptual understanding of mathematics” (Keck-Stanley, 2010, p. 7). This same research suggests project-based learning as well as interactive strategies to investigate multiple solutions have the potential to engage the interests of the student making in-school and out-of-school connections. This means, the academic surroundings – whether the classroom, cafeteria, or the playground – are fundamental for cultivating an equitable learning environment (Keck-Stanley, 2010). It is equally as important for students to predict who the fastest runner on the playground is as it is for students to manipulate unit tiles in the confines of the mathematics classroom’s four walls. During these interactions, students have an opportunity to address developmental crises on a smaller scale as well as to develop appropriate coping strategies that, in turn, have the potential to redefine their perspectives about control and value and the achievement-emotions, like boredom, connected to the outcomes (Erikson, 1959; Keck-Stanley, 2010; Pekrun, 2006; Piaget, 1957). Furthermore, “Teachers who encourage students to choose their own methods of solving mathematical tasks cause students to gain a deeper understanding of mathematical content” (Keck-Stanley, p. 9). Mathematical tools and manipulatives that help students make generalizations, justify reasoning, and investigate patterns are desirable for promoting a rich and relevant mathematics classroom community.

The in-school and out-of-school social interactions are the center of Vygotsky’s (1987) theory of learning. Vygotsky suggested that children are learning when they play and contended
that language and development build on each other. “When children play, they constantly use language...Vygotsky believed that this interaction contributes to children’s construction of knowledge—to their learning” (Mooney, 2013, p. 101). During play, children communicate using language to articulate their thoughts, give meaning to words and ideas, and create relationships with their peers. These relationships are the building blocks for new learning (Derry, 2008; Mooney, 2013; Vygotsky). Vygotsky claims that “thinking and speech go together. It is not simply a matter of articulating what is already conceived, but articulation is part and parcel of the process of conceptualization” (p. 170). Thinking and speaking lend themselves to verbalizing a perspective and identifying the achievement-emotions attached to the activity and the outcome (Pekrun, 2006). However, Vygotsky warns that concepts are not transferable. He adds, “The teacher who attempts to do this is only achieving mindless learning of words” (p. 170), and Schmittau (2004) suggests, “The child, of course, cannot independently ‘acquire’ what people have already attained, but he should repeat the discoveries of people in previous generations, in a particular form” (p. 21). A teacher cannot simply tell the student how to solve a mathematical problem. The teacher has to provide opportunities for the student to discover how to solve the mathematical problem. Even more importantly, the teacher cannot tell the student what achievement-emotion to feel while they experience navigating the challenge of learning a mathematical skill. The teacher cannot, and does not, tell the student math is not boring. The student has to identify their achievement-emotion from their ongoing experiences of mathematics. Development can occur once the learner has given the concept meaning (Derry, 2008; Gredler, 2011; Vygotsky, 1987).

Vygotsky (1987), Schmittau (2004), and Gredler (2011) viewed language development and the meaning given to a concept much like Piaget’s (1957) stages in that language can move
from concrete to abstract. A word can represent a family of things for a young child, but for the adolescent, it can mean the essence of things (Gredler). Thinking and speaking of concepts is a “shift in the relationship between memory and thinking depends on the adolescent developing a higher form of intellectual activity” (p. 124). This optimization of thinking goes against the memorization of single algorithms, which is still quite common in contemporary schools. Schmittau explains that “algorithms describe how computers solve problems” (p. 23). Advanced mathematical thinking is varied and flexible, and if learned conditionally, it will be more adaptable than if those same skills are learned in an absolutist fashion (Schmittau). For instance, Schmittau suggests children should connect new actions to old. Prior knowledge of operations such as addition, subtraction, multiplication, and division can be connected to new ideas of measurement and place value. The continuous process of making sense of new mathematical concepts forges new connections between previous knowledge and new knowledge (Schmittau). Particularly useful in producing these connections is setting up a framework of academic support or scaffolding.

Vygotsky’s (1987) model of scaffolding, as explained by Nezhnov et al. (2015), transmits cultural knowledge through generalized schema. These researchers explain that “exposure to cultural models stimulates a gradual internal process of knowledge development” (p. 236). The external characteristics of the problem are essential for scaffolding, as the student relies on the similarities to solve the problem. For instance, a student who is learning how to multiply may begin with grouping tangible items like colored blocks. The student may create a variety of arrays using graph paper to demonstrate different factor pairs. Each activity should scaffold deeper understanding for the next level of the skill, which finally leads to the highest level of understanding and consideration of a multitude of other possible relations (Nezhnov et al.), such
as a sixth-grade mathematics student acquiring the skill and understanding that multiplication has an inverse relationship to division. The process of scaffolding lends itself to the student’s ability to control the outcome and success of meeting the challenge. This continued effort of building control over an outcome influences the experience of different achievement-emotions, which is one part of possibly altering the perception of boredom. While the instructor can provide this scaffolding, Vygotsky (1987) suggests using the sociocultural nature of the classroom and the natural relationships among classmates to support development through the ZPD, which in turn can develop the value of the outcome (Pekrun, 2006; Vygotsky).

Keck-Stanley (2010) adds to this understanding: “Vygotsky defines the ZPD as the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (p. 15). In other words, tomorrow’s ability to complete a mathematical task independently depends on the zone of proximal development, meaning exposure to peers who are slightly ahead in skill acquisition and the assistance a student received today. “If a student works with learning material that is too simple or too difficult, then cognitive development does not occur and frustration often occurs” (p. 15). This form of frustration coupled with lack of value for the outcome or lack of value for the activity can lead to the achievement-emotion of boredom (Pekrun, 2006). However, balancing challenge and value that may come from peer assistance has the potential for altering the achievement-emotion of boredom. Prawat (2002) explains, “Vygotsky...favored a certain kind of action—that which promoted self-regulation in individuals” (p. 18). Instead of frustration and boredom, students, for example sixth-grade mathematics students, can experience positive
achievement by receiving mathematical instruction in an enriched environment through scaffolded learning and from interactions with peers who are slightly ahead in skill acquisition.

Chapter Summary

This chapter reviewed existing literature on control value theory and the antecedents to achievement-emotions, all while highlighting the specific achievement-emotion of boredom. The review also described how achievement-emotions connect to engagement, as this study aims to support stakeholders, such as educators, in their effort to identify and monitor student challenges and to help promote academic agency in the sixth-grade mathematics classroom. Finally, this literature review highlighted the developmental stages of the adolescent, while laying out the foundation for research on how the achievement-emotion of boredom relates to the academic agency of sixth-grade mathematics students.
CHAPTER 3
METHODOLOGY

The purpose of this study is to examine the achievement-emotion of boredom as a construct of control-value theory (Pekrun, 2006) as it relates to middle school mathematics students’ academic agency. This chapter explains the methods chosen to conduct the study, including a rationale for the explanatory, sequential, mixed method research design. This chapter will also provide an overview of the participants, a description of their school building, and an explanation of the sample selection procedures. Furthermore, this chapter provides details of the quantitative and qualitative methods utilized to collect and analyze the data.

The following research question guided this study: How does the achievement-emotion of boredom relate to the academic agency of middle school mathematics students? The sub-questions include

1. Is there a significant difference in sixth-grade mathematics students’ perception of boredom between the academic settings of classroom instruction, studying and/or independent learning, and test-taking?

2. How do sixth-grade mathematics students describe their perceptions of achievement-emotions, specifically boredom, in the academic settings of classroom instruction, studying and/or independent learning, and test-taking?

3. To what extent do the qualitative results of focus groups and individual interviews explain, confirm or contradict the quantitative results of the AEQ-M survey?
This study examined sixth-grade mathematics students’ perceptions of the achievement-emotion of boredom and its impact on their academic agency during classroom instruction, studying and/or independent learning, and test taking in the classroom. This study used a combination of purposeful sampling, convenience sampling, and networking sampling (Merriam & Tisdell, 2016). The sampling was purposeful in that the selected participants represented the typical middle school mathematics students in the targeted middle school. The sampling was convenient because the participants came from a district in northern Illinois that was familiar to the researcher. After two rounds of recruiting, 69 participants turned in signed parent permission forms to take the AEQ-M survey.

Rationale for Research and Design

It is common for researchers to use laboratory and field experiments to collect data on the basic components of emotions (Pekrun, 2006), meaning behavior and mood. However, experimental settings are artificial and “do not represent real-life settings” (p. 331). Pekrun contends that to capture the subjective context of an emotional experience, self-report is more reflective of perceptions than experimental research. However, self-reporting alone has disadvantages. Pekrun argues, “Self-report measures [alone] are difficult to construct so that they render interval or ratio scales that accurately capture more complex, non-linear relationships” (p. 332). Bishop and Pflaum (2005), Brown (2012), Daniels and Steres (2011), and McCormick (2019) contend that qualitative research is necessary to expose subtleties of experience that cannot be quantified. Pekrun argued for a mixed methods approach. Supporting Pekrun’s argument, Brown (2012) and McCormick (2019) found success incorporating focus groups and interviews as a means of qualitative data collection to support a quantitative-designed
survey. Focus groups offer a way to collect students’ experiences in a social setting and can be treated as a unique unit of analysis in that the social settings allow the researcher to observe authentic interactions a laboratory setting cannot (Krueger & Casey, 2015; McCormick, 2019). In contrast, individual interviews allow participants to share often overlooked or less explicitly shared individual experiences because many voices are trying to be heard (Brown, 2012; Merriam, 2009; Pekrun, 2006; Trowler, 2010).

Including both quantitative and qualitative tools in this study allows each method to support the other. Greene et al. (1989) used a meta-analysis to make a case for mixed methods studies, identifying five categories that showcase the strengths of each research type to minimize the weaknesses in the research design. Those constructs are defined in Table 2.

<table>
<thead>
<tr>
<th>Triangulation</th>
<th>Complimentary</th>
<th>Developmental</th>
<th>Initiation</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>“seeks convergence, corroboration, correspondence of results from the different methods.” (p.259)</td>
<td>“seeks elaboration, enhancement, illustration, clarification of the results from one method with the results of the other method.”</td>
<td>“seeks to use the results from one method to help develop or inform the other method, where development is broadly construed to include sampling and implementation, as well as measurement decisions.”</td>
<td>“seeks the discovery of paradox and contradiction, new perspectives of frameworks, the recasting of questions or results from one method with questions or results from the other method.”</td>
<td>“seeks to extend the breadth and range of inquiry by using different methods for different inquiry components.”</td>
</tr>
</tbody>
</table>

(Greene et al., 1989; Matuszewski, 2017)
Corroboration, elaboration, informed development, the discovery of paradoxes and contradictions extend the breadth and range of inquiry. Therefore, the researcher borrowed from these methods because they provided the foundation for understanding the unique characteristics of sixth-grade middle school mathematics students, especially the achievement-emotions they overtly and covertly present.

Experiential Knowledge

Direct experience with the unique characteristics of middle grade students is a desirable trait to possess as a researcher. A familiar and convenient sampling came from the researcher’s school district, County Roads Middle School, CRMS (pseudonym). The researcher has worked in the school system for the past 31 years, with 20 of those years as a middle school teacher, and 13 of those teaching sixth-grade mathematics. The researcher is quite familiar with the unique characteristics of sixth graders and the real life demands of meeting their academic, social, and emotional needs.

The researcher understood that her familiarity with the participants and the school district could raise questions of validity due to researcher bias and participant response bias. She concedes that she has a vested interest in her students as they are the reason for her chosen profession, and this research topic is the result of years of experience, which includes frequent reflection on the achievement-emotions that her students present overtly and covertly. She used her close connections to recruit participants, construct questions that are developmentally and topically appropriate, and applied her understanding of adolescent development while connecting with and relating to students during focus group interviews and individual interviews. Other researchers (McCormick, 2019; Mertens, 2015) have noted that working with young adolescents,
like sixth-graders, as research participants can be challenging. However, this charge should be easier for someone who works with sixth-grade mathematics students on a daily basis. CRMS has a sister middle school that also provided an appropriate source to recruit participants for this study.

Participants

Before beginning any study, a population and sample must be identified (Brown, 2012; Creswell, 2009; Gravetter & Wallnau, 2014; Wallen, 1991). The type of sampling was a combination of purposeful sampling and convenience sampling as well as networking sampling (Merriam & Tisdell, 2016). The sampling is purposeful in that selected participants represented typical middle school math students. The National Center for Education Statistics (2000) deliberately does not define the grade levels associated with middle schools; however, the general consensus on age for middle school students is 10 through 14 years of age. The pool of middle school participants from the target middle school also represents a broad demographic in terms of gender, ability, ethnicity, and socio-economic background.

Additionally, the sampling was convenient because the participants came from one school district in northern Illinois that was readily accessible to the researcher. Creswell and Poth (2018) contend there is no specific formula for the appropriate sample size, but a general guideline is to study several sites to identify the specifics about a population. For this reason, the demographics of several school districts have been reviewed within a 60 miles radius west of Chicago, Illinois. Participants were drawn from a district that has 600 or more middle school students and has reported a low socio-economic distribution of 50% or more. The researcher was able to secure a pool of 69 students.
The researcher recognized that middle school students, specifically sixth-grade mathematics students, are underrepresented in achievement-emotion research (Brown, 2012; McCormick, 2019; Trowler, 2010), and she understands that early adolescence, or preteens and teens can be a challenging group when attempting to elicit enthusiasm and responsiveness (McCormick, 2019; Mertens, 2015). However, as McCormick explains, “This is certainly an easier task for those who have experience working with them, along with drawing conclusions that separate rational generalizations for the age group with those that may just exist within the particular sample” (p. 59). The participants for this study were drawn from a sample familiar to the researcher, as she has been teaching middle school students for 20 years and sixth-grade mathematics students for 13 years.

The Illinois Report Card (2020-2021) provided data to compare the school districts in the northern portion of Illinois. The target district (see Table 3) represents the diverse demographics desired for this study, including the following: two middle schools with well over 1,000 middle school students total, ethnic diversity, and a population of more than 50% falling in the low socioeconomic status.

No demographic group was left off the recruiting process. Participants were recruited through teacher invitation and the use of email to the students’ parents/guardians through the target district’s school management software, Skyward. The recruitment letter included three IRB approved permission forms (see Appendix A). There was a permission form for each of the three stages of data collection: AEQ-M survey, Focus Groups, and Individual Interviews. Due to the Covid 19 global pandemic, most of the recruiting was done electronically, as all students attended school remotely through three-fourths of the school 2020-2021 year, followed by one-third of the student population attending in-person for the last nine weeks of the same school
year. All students who participated did so voluntarily. The pool of middle school participants was the result of those who returned signed permission forms from a parent/guardian. The sample of students were used to discover answers directly related to how the achievement-emotion of boredom is perceived by sixth-grade mathematics students. Their contribution to this study was through answering survey items on the AEQ-M, participating in focus groups, followed by individual interviews.

### Table 3

**Target School Demographics**

<table>
<thead>
<tr>
<th>Target District</th>
<th>Enrollment</th>
<th>Racial Diversity</th>
<th>Low Income</th>
<th>Homeless</th>
<th>E.L.L</th>
<th>Student Mobility</th>
<th>Chronic Truancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Middle School 1</strong></td>
<td>625</td>
<td>White 34%</td>
<td>74%</td>
<td>2%</td>
<td>13%</td>
<td>9%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black 26%</td>
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<tr>
<td></td>
<td></td>
<td>Hispanic 32%</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Asian 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other 6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Middle School 2</strong></td>
<td>904</td>
<td>White 41%</td>
<td>61%</td>
<td>2%</td>
<td>14%</td>
<td>9%</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black 23%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hispanic 30%</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Asian 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other 5%</td>
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</tbody>
</table>

**District and School Context**

While much of the previous research on achievement-emotions has focused on collection of data through surveys and subsequent quantitative analysis (e.g., Buric, 2015; Frenzel et al., 2007; Goetz et al., 2008; Kyttilä, & Björn, 2010; Lauermann et al., 2017; Muwonge et al., 2018; Radisic et al., 2015; van der Beek et al., 2017), this study used a mixed methods approach through quantitative analysis of surveys and qualitative analysis of focus groups and interviews.
The first step was locating a middle school and then identifying participants from sixth-grade mathematics classes (Creswell & Creswell, 2018).

The target school district was located in northern Illinois, about 60 miles west of a major metropolitan area. The district has two middle schools, and its total middle school population is approximately 1,500 students (Illinois Report Card, 2020-2021). Both schools house sixth, seventh, and eighth grade students. Of the approximately 500 sixth-grade students, an average of 68% are reported as coming from families with low socio-economic status, 2% are homeless, 13.5% speak English as a second language, 32% are chronically truant (Illinois Report Card). Racial and ethnic diversity are averaged between the two schools and include the following: 31% Hispanic, 24.5% Black, 37.5% White, and 5.5% Other (Illinois Report Card). School class sizes have been consistently higher than the state average for the past five years, with teachers reporting core classes with over 30 students.

Instructional practices follow a middle school philosophy of a gradual transition from self-contained classrooms seen in most elementary schools, while making provisions to become well known by at least one teacher and maintaining a flexible organization to meet the specific needs of individual students. “In practice, middle schools most often use a departmentalized model in which teachers specialize by subject area and students move from one class to another, working briefly with several teachers each day” (National Center for Education Statistics, 2000, p. 10). The middle schools also balance the social-emotional needs of the middle school students with academic progress, following the Positive Behavioral Interventions and Supports (PBIS, 2019) program. Each grade level has its own separate wing. During a typical school year, when students meet face-to-face, students are placed on a team in smaller groupings and move among the core teachers’ classrooms. During the 2020-2021 school year, students were grouped
similarly but attended remote instruction using an online platform to receive instruction and to interact with other students and the teacher. The day’s schedule was divided in such a fashion that students remotely attended their morning classes on Mondays and Thursday, afternoon classes on Tuesdays and Fridays, and worked asynchronously or independently on Wednesdays with the teachers offering remote office hours in the afternoons Monday through Friday. Subjects include math, science, social studies, and language arts as well as electives such as music, art, computers, or intervention and support classes.

The target district’s concerns about equitable access to 21st century resources began a decade before the Covid pandemic. In 2012, the target district began discussions about an initiative for students to receive 1:1 technology. Beginning with eighth grade and moving up through high school, students would receive Chromebooks. The next group was the sixth and seventh grade students, followed by a final push to get Chromebooks into the hands of third through fifth grade students. Kindergarten through second grade had classroom sets that were distributed for home use. By 2016, the target district had reached its goal of distributing 1:1 technology to the designated grade levels (District Slideshow). However, the initiative and commitment to making sure all students were connected to the internet was a daunting task and shortfalls became more obvious in late winter 2020 as districts across the entire nation moved to remote learning in March of 2020 (Dabbagh et al., 2019; Means & Neisler, 2021).

The target district’s tech coordinator explained the district’s first priority was getting Chromebooks to the students in kindergarten through second grade, so they created a drive-through pick-up at the district’s high school for anyone without 1:1 technology. Next, the target district acquired hotspots through a local commercial communication provider. Emails, newsletters, and phone blasts gave families information and pointed them to a district website
built specifically for centralized communication. More specifically, during this time concern
arose about how to reach the families who had been identified through fall registration as not
having internet access. Although the district made heroic efforts, utilizing government grants
and creating partnerships with community businesses to make sure all families had internet
access, connectivity issues frequently impacted instruction.

Procedures and Data Collection

This section details the data collection for this mixed method study. The quantitative data
were collected through the AEQ-M survey (Pekrun, 2006; Pekrun et al., 2005; Pekrun et al.,
2011) and analyzed with repeated measures (within subject) ANOVA. The qualitative data were
collected through focus groups and individual interviews. Then the qualitative results of focus
groups and individual interviews were used to explain, confirm, and/or contradict the
quantitative results provided by the AEQ-M survey.

Procedures

The researcher contacted the target district’s superintendents early in the fall of the 2020-
2021 school year to ask permission to perform a study and recruit sixth-grade mathematics
students from the district as participants. In late winter, the researcher received confirmation
from her university that all protocol steps in the IRB approval process had been completed.
Following this approval, the researcher notified the target district’s superintendents once again in
early February 2021 to share that the IRB approval had been received and the data collection
would begin. Shortly after the communication to the superintendents, the researcher notified the
two district middle school principals and the three assistant principals that IRB approval had
been received and the researcher would soon be recruiting sixth-grade mathematics students to participate in the study. To keep all lines of communication open and to involve all appropriate district stakeholders, the researcher also notified the district’s middle schools’ five counselors, support staff, and mathematics interventionists in the same week of February 2021. The counselors and support staff were valuable in that they could help in recruitment, and they could debrief with students should the activity trigger negative emotions and memories. However, debriefing with the counselors was necessary as the research activities did not trigger negative emotions or memories. Following the initial communication with the target district’s middle school counselors, the researcher then notified the district’s five sixth-grade mathematics teachers.

By the end of February 2021, the researcher used the district’s management and notification system, Skyward, to contact and send an introductory letter to the parents and/or guardians of all sixth-grade students in the building in Middle School 1 to recruit and gain permission for students to participate in the study. Recruitment in the target district’s second middle school began a couple of weeks later. The introductory letter included the three separate permission forms for each phase of data collection: AEQ-M survey, focus group, and individual interview. Within days, the researcher began receiving emails with permission forms signed only for students to participate in the survey phase. On March 9, 2021, the researcher received communication that the permission slips were confusing and overwhelming. All email participant inquiries were responded to with a more concise explanation, instructions on how to respond, and an explanation for needing all three permission forms to be signed. On March 16, 2021, the researcher received communication that the amount of overall district email correspondence, due to the pandemic, was perceived as overwhelming to parents and
guardians. The researcher made the decision to stop email recruitment at that time. The researcher finished up recruiting with follow-up phone calls to families who had expressed interest from both middle schools. Some of the contact information was forwarded to the researcher from colleagues of the second middle school in the target district.

**Data Collection**

Invitations were sent to the first 20 participants, beginning on March 17, 2021, to take the AEQ-M survey. When it became clear that coordinating a single date for administering the AEQ-M could not be achieved, smaller groups and individual invitations were sent out to accommodate the participant’s schedules, until the list of those who had permission forms signed was exhausted. Google Meet invitations were given to the sixth-grade mathematics students to participate in the study, in the afternoon, during what the target district called office hours. This was a one-and-a-half-hour window, after lunch, when teachers kept their Google Meets open so students could join to ask questions about assignments and/or receive assistance. The researcher chose this time as it would not interrupt students’ core content time and was a time students were used to attending non-formal Google Meets. This online platform was used for students to receive and submit a student assent form via Google Forms (see Appendix B), and instructions for taking the survey, which were read to the participants verbatim (see Appendix C). The participants were told that the survey would take no longer than 20 minutes. Then participants were assigned to a Google Meet breakout room. This allowed each participant to have a quiet opportunity to take the survey, while still having access to the researcher if a question should arise. Most participants took less than 15 minutes to complete the survey. Participants were instructed to check in with the researcher after taking the survey to get contact information in
case the participant had any questions. This completed survey was the first of three phases from which data were collected. Phase 2 consisted of data collection in two stages: focus groups and individual interviews. Phase 3 was the triangulation of data collected to create a more in-depth picture of boredom perceived by mathematics students.

**Phase 1: Quantitative Component**

The quantitative means of data collection for the current study was through an existing questionnaire: Achievement Emotion Questionnaire for Mathematics (i.e., the AEQ-M; Pekrun et al., 2002; Pekrun et al., 2005; Pekrun et al., 2004). The questionnaire was chosen because it was specifically created by Pekrun (2005) to test hypotheses on the antecedents of and effects on emotions as they related to the control-value theory. Control-value theory maintains that appraisals based on control and values are the primary sources of students’ achievement emotions (Pekrun et al., 2002). The purpose of using a questionnaire was to gather enough information to determine cause and effect and to predict similar events in the future (Merriam & Tisdell, 2016).

The original AEQ (Pekrun, et al., 2005) survey assessed nine different emotions: enjoyment, hope, pride, relief, anger, anxiety, hopelessness, shame, and boredom (Pekrun et al., 2005; Pekrun et al., 2011). Based on prior quantitative studies (Pekrun, 1992; Pekrun et al., 2002; Pekrun et al., 2004; Titz, 2001), the AEQ scales were developed from the studied emotion taxonomies. These nine achievement-emotions were the most frequently cited by students in the studies (Pekrun et al., 2002; Pekrun et al., 2004; Titz, 2001). The AEQ also addresses activity, achievement-emotions connected to prospective and retrospective outcomes, and positive and negative valence measurements (Pekrun et al., 2011). The initial item pool consisted of 1,500
questions that were narrowed to a final instrument of 232 items organized into instruction-related emotions (80 items), learning or studying-related emotions (75 items), and testing emotions (77 items) (Pekrun et al., 2005; Pekrun et al., 2011). Questions included “I enjoy being in class,” “I get tense while studying,” and “The material bores me.” This original survey, developed by Pekrun et al. (2005), took students approximately 40-50 minutes.

The AEQ-M, designed by Pekrun et al. (2005), specifically surveys students’ achievement emotions in the area of mathematics. The AEQ-M utilizes a five-point Likert scale: 1 = strongly disagree, disagree, neutral, agree, to 5 = strongly agree. Scores on the AEQ-M (Pekrun, 2006) range from 60 to 300. This means that if a student chose a 1, strongly disagree, on the Likert scale for all 60 questions, the student would receive the lowest possible score of 60. This low score of 60 indicates minimal achievement-emotions were experienced in a middle school mathematics class. If the data from an isolated achievement-emotion, such as boredom, were calculated as low, this would indicate the student was minimally perceiving boredom (Bartlett, 2017). If a student chose a 5, strongly agree, on the Likert scale for all 60 questions, the student would receive the highest possible score, which would indicate maximum perception of achievement-emotions. If the data from an isolated achievement-emotion, such as boredom, were calculated as high, this would indicate the student had perceived boredom at the maximum level (Bartlett, 2017). Sixth-grade mathematics students would expect to take 10 to 15 minutes answering questions on this 60-item questionnaire (see Appendix C).

Initially, reliability and validity were obtained from student reports in exploratory studies (Hodapp & Benson, 1997; Pekrun, 1992c; Sarason, 1984; Titz, 2001). The construction of the AEQ was based on a series of preliminary studies (Pekrun, 1992; Pekrun et al., 2004; Pekrun et al., 2002; Spangler et al., 2002; Titz, 2001) with theory-evidence loops integrating both rational
and empirical perspectives (Pekrun et al., 2005). Pekrun et al. also made “an effort…[to]
construct items that ensure discriminant validity of scales measuring different emotions,
including neighboring emotions” (p. 39).

For Pekrun et al. (2005) AEQ study, the researchers used a sample of 389 students who
were enrolled in several undergraduate psychology programs in a Midwestern Canadian
university (Perry et al., 2010). Pekrun et al. (2005) only conducted one session with the student-
participants to complete the measures. The results showed wide variations of item scores on all
scales and robust correlations with $\alpha = .75$ to $.93$. Instrument validity was based on the concept
that there is a distinction between different emotions. The test used for between-emotion
experiences was a Pearson-product moment correlation. Reported again in a later study,
“Overall, these findings show that the emotion constructs measured by the AEQ are clearly
separable” (Pekrun et al., 2011, p. 43). Finally, the correlations also showed the emotions were
separable across the three settings of class instruction, independent study, and test taking.

The scales and results of the AEQ-Mathematics (AEQ-M) (Pekrun et al., 2005) are
similar to those of the AEQ. The German AEQ-M study was based on a sample ($n = 772$) of
secondary school students from grades fifth through tenth. There was a significant item score
variation and good reliability with $\alpha = .84$ to $.92$. Scale correlations found neighboring emotions,
such mathematics anxiety and mathematics hopelessness, to be higher.

For this study, the most appropriate form of data analysis is a repeated measure within
subject ANOVA (Gravetter & Wallnau, 2014). The sixth-grade mathematics students took the
survey once and this form of analysis allows for within subject examination of the survey items
assessing multiple achievement-emotion variables within those settings to identify the significant
correlations between academic settings and achievement emotions. The observed frequency for
the six survey items were also analyzed using a repeated measure within subject ANOVA. Later in phase three, the six survey items on boredom were triangulated with responses given during focus groups and individual interviews. Similarly, the scale reflects each differing achievement-emotion and the academic setting – classroom instruction, independent learning, or test-taking – in which it occurs. Pekrun (2006) championed research using a mixed methodology: “qualitative research may be best suited to explore and describe emotion phenomena and to generate hypotheses whereas rigorous quantitative methodology is needed to test hypotheses on the antecedents and effects of emotions” (p. 331). Based on this recommendation, the current study included data collection through qualitative means as well. The second phase included two stages, data collection from focus groups and from individual interviews.

Phase 2: Qualitative Component - Focus Groups - Stage 1

Qualitative collection of data in this study was consistent with the “basic” approach to uncover the meaning of an “activity, experience, or phenomenon” (Merriam & Tisdell, 2016, p. 23). A basic design, which is appropriate as part of this study, asked sixth-grade mathematics students their beliefs about their control and their value of the content in middle school mathematics classes (Brown, 2012; Creswell, 2009). Control and value are the constructs of control-value theory (Pekrun, 2004, 2006). “Control appraisals consist of perceptions of one’s ability to successfully perform actions and to attain outcomes, [while] value appraisals pertain to the perceived importance of these activities and outcomes” (Pekrun et al., 2014, p. 698). Data collection can also come through interviews: focus groups and individual.

Morgan’s (2019) Basic and Advanced Focus Groups provides a foundation for focus groups as a means of data collection through group discussion. Focus groups rely on the
interactions of participants to “to produce data that would be less accessible without that interaction” (p. 5). Active exchange is the key advantage of the focus group, so even though the researcher guides the conversation by providing questions, the members of the focus group generate the data.

The most obvious step in using a focus group to generate qualitative data is the requirement of creating discussion questions (Morgan, 2019). The first requirement is that the participants need to understand them. Morgan suggests that the researcher should translate questions into the language of the local community. The participants in this study were sixth-grade students whose ages ranged from 11 years to 12 years. Although the language development for early adolescents can range from concrete operational to abstract (Gredler, 2011; Piaget, 1957; Schmittau, 2004; Vygotsky, 1987), participants in this study did not have any difficulty understanding questions about their perceptions of achievement-emotions experienced in mathematic academic settings (Gredler). However, it was a good idea, prior to facilitating a focus group, to have questions back translated, meaning inviting an impartial colleague to discuss the intent of a sentence (Morgan). After reviewing the AEQ-M survey items with her grade- and content-like colleagues, the researcher was able to determine that the items would be understood by sixth-grade mathematics students.

Another consideration to creating questions for a focus group is how to begin. Directness can be off-putting, specifically when working with sixth-grade students. Discussion starter questions and warm-up questions were used to create a sense of trust between participants and the researcher and provided the researcher with a frame of reference (Morgan). Morgan suggests, “An example would be to have them start by listing as many relevant aspects of the topic that they can” (p. 108). This approach can create a successful collection of data from a
focus group, emphasizing one of the strengths of this form of qualitative data collection (see Appendix C). For example, a starter question was, “List as many words that come to mind when I say the word math.”

Morgan (2019) shares that focus groups, like other forms of qualitative data collection, have strengths and weaknesses. The strength of using a focus group is in the interaction of the participants. “These discussions can clarify not just what participants think but why they think the way they do,” says Morgan (p. 6). This interaction provides a natural opportunity for participants and the researcher to learn how the participants’ experiences and perceptions are similar and different from each other.

In this study, the researcher was limited by the number of participants who turned in a signed permission form to participate in a focus group. Also, the researcher decided to use the online platform of Google Meet for the focus groups to protect the health and safety of the participants during the pandemic. The 18 participants who turned in signed permission forms for the focus groups were assigned to one of three focus groups using an online tool that randomly assigned participants to groups. Not all of the sixth-grade mathematics students who were invited to join a focus group did so. A fourth focus group was created for those who were not able to attend their originally assigned focus group.

Of the 18 students who were invited to join a focus group, 13 actually participated (see Table 4). The table reveals some patterns about the participants. There were six females, six males, and one student who identified as non-binary, or 46% females, 46% males, and 8% non-binary. The sample was predominately white, which is not an accurate reflection of this Northern Illinois School district’s demographics. The following explains how the focus groups were formed.
Four of the six mathematics students assigned to focus group 1 reported to their assigned Google Meet. Two of the six mathematics students assigned participants for the second focus group joined their assigned Google Meet. During the third focus group, four of the six mathematics students joined their assigned Google Meet. The researcher decided to create a fourth focus group and invited the mathematics students who were not able to attend their original assigned date and/or time. Of those who received a second invitation to join a focus group, three mathematics students joined the fourth group.

Table 4
Focus Group Participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Race</th>
<th>Focus Group</th>
<th>Individual Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eva</td>
<td>Female</td>
<td>White</td>
<td>Group 1</td>
<td>Yes</td>
</tr>
<tr>
<td>Ben</td>
<td>Male</td>
<td>White</td>
<td>Group 1</td>
<td>Yes</td>
</tr>
<tr>
<td>Declan</td>
<td>Male</td>
<td>White</td>
<td>Group 1</td>
<td>Yes</td>
</tr>
<tr>
<td>Kobe</td>
<td>Male</td>
<td>Hispanic</td>
<td>Group 1</td>
<td>Yes</td>
</tr>
<tr>
<td>Chris</td>
<td>Non-binary</td>
<td>White</td>
<td>Group 2</td>
<td>Yes</td>
</tr>
<tr>
<td>Uri</td>
<td>Male</td>
<td>White</td>
<td>Group 2</td>
<td>No</td>
</tr>
<tr>
<td>Fiona</td>
<td>Female</td>
<td>White</td>
<td>Group 3</td>
<td>Yes</td>
</tr>
<tr>
<td>Elena</td>
<td>Female</td>
<td>White</td>
<td>Group 3</td>
<td>Yes</td>
</tr>
<tr>
<td>Hazel</td>
<td>Female</td>
<td>White</td>
<td>Group 3</td>
<td>Yes</td>
</tr>
<tr>
<td>Graham</td>
<td>Male</td>
<td>White</td>
<td>Group 3</td>
<td>Yes</td>
</tr>
<tr>
<td>Ivy</td>
<td>Female</td>
<td>Hispanic</td>
<td>Group 4</td>
<td>Yes</td>
</tr>
<tr>
<td>Jonah</td>
<td>Male</td>
<td>White</td>
<td>Group 4</td>
<td>Yes</td>
</tr>
<tr>
<td>Tiana</td>
<td>Female</td>
<td>Hispanic</td>
<td>Group 4</td>
<td>No</td>
</tr>
</tbody>
</table>
The researcher opened the Google Meet five minutes prior to the assigned time. As the participants signed on to the Google Meet, they engaged with the researcher answering questions about their day in school. Following the basic approach (Morgan, 2019), the researcher began with an introduction followed by the icebreaker, “Let’s start by listing as many words that come to mind when I say the word math” (see Appendix D). The participants also answered the initial question “What things in your math class help or hurt your ability to learn math?” that frequently led to discussions about learning remotely in a pandemic and the use of technology to receive instruction. Finally, participants in each focus group were asked to reflect on the six AEQ-M survey items, share their responses to the survey items, and elaborate on why they responded the way they did and how their responses might change. The participants in all focus groups did as they were asked while also interacting with their peers’ responses.

Although the goal of this study was to examine the influence of control-value theory as it relates to boredom, the researcher felt it was important to understand the lived experiences of the participants as sixth-grade mathematics students. “Each interview relationship is individually crafted,” explains Seidman (2019, p. 101). The researcher developed rapport by allowing the sixth-grade mathematics participants to discuss interests outside of school, as well as the use of technology to receive instruction, and standardized testing. The discussions were rich. This overview or examination of the process, described as a grand tour by Saldaña (2016), revealed the active discussions about their perceptions of boredom and six subcategories of interest to the participants: areas of success, appraisal values, executive functioning, intentional distractions, time, and influencers. These subcategories were achieved through the coding process.
The process of coding for this study began with the researcher reformatting the printed transcripts of the focus group conversations. The documents included double-spaced lines of interview text, along with indented lines to indicate a change of who is speaking. Separate font colors were given to each speaker for quicker referencing. From there, the a priori goal (Saldaña, 2016) of the first round of coding was to highlight any mention of boredom and any of its word-family forms. The word boredom and its word-family forms appeared in the focus group conversations 43 times. However, the researcher noted that students would also discuss the components of unpleasant feelings associated with boredom without actually saying the word. These unpleasant feelings included the perception of time being altered and reduced physiological feelings of arousal (Pekrun et al., 2010). Frequently, the conversations of these students in their focus group also described activities and behaviors that preceded or coincided with the unpleasant feelings and/or the perception of boredom. The bulk of the focus group interviews pertained to experiences with learning math. It is for these reasons; the researcher chose a hybrid of first cycle coding to include a grand tour along with in vivo coding based on the work of Saldaña.

Grand tour coding is an overview of all things discussed in the focus groups, while in vivo is an approach that requires the researcher to consider the participants’ perspectives and actions (Saldaña, 2016). The researcher went through and underline all activities and behaviors that had to do with math or the perception of the achievement-emotion of boredom. The underlined words were transferred to notebook paper. Tally marks were made next to concepts if they were repeated. After completing the recording of the words and concepts and the tallying,
the researcher engaged in a second round of eclectic coding. She recorded the most frequently mentioned ideas onto sticky notes. An office wall provided a large blank surface to group sticky notes with like ideas. This cycle of coding moved into pattern coding, during which more focused categorizations began to appear as subcategories. Table 5 represents the subcategories and the number of times they occurred, displaying the wide range of structural content, with the color gray representing codes for control and black representing codes for value.

Table 5
Coding Cycle—Grand Tour Overview—Total Occurrences per Code

<table>
<thead>
<tr>
<th>Executive Functioning (Control)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies</td>
<td>41</td>
</tr>
<tr>
<td>Completing Assignments</td>
<td>34</td>
</tr>
<tr>
<td>Paying Attention</td>
<td>32</td>
</tr>
<tr>
<td>Accuracy</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intentional Distractions (Control)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>13</td>
</tr>
<tr>
<td>Fidgets</td>
<td>10</td>
</tr>
<tr>
<td>Eating</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (Control)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passage of</td>
<td>83</td>
</tr>
<tr>
<td>Frequency</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appraisals (Value)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests/Quizzes</td>
<td>35</td>
</tr>
<tr>
<td>Interactive Games</td>
<td>26</td>
</tr>
<tr>
<td>Variety</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Influencers (Value)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Family</td>
<td>66</td>
</tr>
<tr>
<td>Teacher</td>
<td>64</td>
</tr>
<tr>
<td>Peer</td>
<td>21</td>
</tr>
</tbody>
</table>
The descriptor of executive functioning refers to the use of self-regulatory or goal-directed behaviors in which the students identified their engagement (McCormick & Scherer, 2018; Mooney, 2013). The intentional distractions descriptor refers to the coping strategies students communicated they used when perceiving boredom. The time descriptor represents both the passage of time and the frequency in which the phenomenon occurred. The descriptor, appraisal values, illustrates the positive and negative subjective importance of the activities and outcomes (Pekrun & Stephens, 2010; Story, 2013). Finally, the influencers descriptor characterizes the many people the participants described as influencing their academic success.

The frequency data and varied topics of interest were useful for building descriptive evidence (Saldaña, 2016) and support of the control-value framework and establishing discussion topics for the individual interviews. For instance, in all four focus groups, discussion arose about the boredom perceived during standardized test-taking even though there were no questions on the AEQ-M that addressed this topic. The mathematic students who participated in the focus groups were invited to participate in individual interviews. Continuing to collect data in this fashion aligns with the “basic” approach described by Merriam and Tisdell (2016), which can uncover the meaning of “activity, experience, or phenomenon” (p. 23). Adding to this line of thought, Morgan (2019) argues, “These discussions can clarify not just what participants think but why they think the way they do,” says Morgan (p. 6). This argument lends to the second stage of qualitative data collection, individual interviews. All of the sixth-grade mathematics students who participated in the focus groups were invited to participate in individual interviews. As noted previously in Table 4, 11 of the 13 students who participated in the focus groups agreed to participate in an individual interview.
Although the interaction of participants in focus groups is valuable, focus groups alone can lack concentrated discussions (Morgan, 2019). Conversations are researcher-centered, simply because the focus group is initiated by the researcher. Focus groups can also create a time constraint, limiting the amount that each participant can share. Morgan also argued that focus groups do not allow for the naturalness of going into the field and observing people in their own settings, which during a pandemic is nearly impossible. Finally, focus groups lack the depth of one other fairly popular form of qualitative data collection, individual interviews (Morgan). Individual interviews, given an allotted time to be completed, make it “possible to hear one person speak about the research topic for an hour or more” (Morgan, p. 7). It is for this reason, this study used individual interviews as a form of data collection in the second stage of Phase 2.

Phase 2: Qualitative Component - Individual Interviews - Stage 2

Seidman’s (2019) book, Interviewing as Qualitative Research, provides a foundation for the interview as a means of data collection. The interview is a vehicle for student voice, a method that reflects the research question and allows the researcher a way to understand the lived experience. Brown (2012) and Trowler (2010) note limited research has drawn data from student voice. Besides giving voice to the student as a participant, the interview as a means of data collection should reflect the research questions. The research questions for this study asked middle school students to reflect on their perceived feelings of boredom in their sixth-grade mathematics class. Seidman (2019) refers to this as a lived experience. The interview transforms the lived experience into textual expression (Schutz, 1967; Seidman, 2019).
The researcher understood that individual interviews were important for understanding the lived experience of a sixth-grade mathematics student in the classroom as key to collecting data for this study. Developmentally, sixth-grade students have the skills to share their lived experiences. Most middle school students are in the concrete operational stage of development, allowing them to take into account the context and perspective of interview questions (McCormick & Scherer, 2018). With an expanded memory and working schemas, or generalized knowledge of situations and events, they are able, with some accuracy, to reflect on and articulate their lived experiences in the sixth-grade mathematics classroom (Dimmitt & McCormick, 2012; McCormick et al., 2013; McCormick & Scherer, 2018; Winne & Azevedo, 2014). Seidman (2019) provides guidance for researchers wanting to use interviewing as a research method. Seidman explains that an interview is a way to gain insight into other people’s stories (see Appendix D). For those telling the stories, it is a meaning-making process. Vygotsky (1987) would say that each word a person uses in their story-telling gives acumen into their consciousness. According to Seidman, “At the very heart of what it means to be human is the ability of people to symbolize their experience through language” (p. 8). Story-telling through a structured interview is then a basic mode of inquiry and, therefore, appropriate for the current study. Eleven of the 13 focus group participants accepted the invitation to be individually interviewed. Each individual interview was allotted an hour, and all individual interviews were completed within the time allotted.

Similar to the focus groups, the researcher opened the Google Meet five minutes prior to the assigned time. As the participants signed on to the Google Meet, the researcher asked about each participant’s day in school. The researcher followed this with an introduction as a reminder to what the study was about and then an icebreaker (see Appendix E). The researcher asked each
participant about their high and low points of the week followed by questions concerning each participant’s progression of acquiring their mathematical foundational skills of counting, adding, subtracting, multiplying, and dividing.

The bulk of the individual interview centered on having the participant elaborate on any unique responses they made during their focus group interview, followed by restating the AEQ-M survey items on boredom. For instance, the researcher frequently added, “I noticed in the focus group, you responded to the discussion about standardized tests. Can you tell me more about that?” The researcher also asked each participant to elaborate on their perceptions of boredom in general.

Coding: Individual Interviews

Coding for the individual interviews began in a similar manner compared to the coding of the focus groups. The individual interviews were transcribed, formatted, and printed off so the researcher could code the ideas shared by the students. However, the transition from grand tour to focus coding was more systematic, and subcategories became descriptors of control and value. The descriptors for control became skills, executive functioning, intentional distractions, and time. The descriptors for value became appraisal values and influencers.

Phase 3: Triangulation of Quantitative with Qualitative Results

The purpose of triangulating qualitative with quantitative results is to draw on the inherent strengths of quantitative research and qualitative research (Castro et al., 2010; Divan et al., 2017; Hart et al., 2009; Hubball & Clarke, 2010). The strength of qualitative research is it allows for in-depth analysis of complex connections of lived experiences that cannot be fully
attained with measurement scales and multivariate models (Divan et al., 2017; Plano Clark et al., 2008). Alternatively, qualitative research has been criticized for being difficult to replicate, subjective, and its methods and conclusions lack clarity (Bryman, 2012; Divan et al., 2017; Dreher, 1994). A strength of quantitative research is it includes accurate measurement of closed-ended questions, like those in the AEQ-M (Pekrun et al., 2005), as well as the ability to test hypotheses, make associations, and generate correlations (Divan et al., 2017; Castro et al., 2010; Creswell, 2012). On the other hand, quantitative research separates information from the context, fails to separate people from institutions, and gives into a false sense of accuracy, while creating a static view of the lived experience (Bryman, 2012; Castro et al., 2010; Creswell, 2012; Divan et al., 2017). As such, the participants in this study shared that they understood the generalizations made by the survey items in the AEQ-M; however, during the focus groups and individual interviews, they often explained the circumstances that would have altered their final choice on the survey items. For instance, item #11 states, “I think mathematics class is boring” (Pekrun et al. 2005). The participants gave varying reasons why they chose strongly disagree to strongly agree, but they also shared their experiences that would contradict their survey response. Divan et al., supported by other researchers (Chick et al., 2009; Creswell, 2012; McKinney, 2007), explained why a mixed methods study provides a better understanding of the research problem. In this study, the researcher used the qualitative responses to better understand the quantitative analysis and shared this information in the results section.

Summary

Chapter 3 detailed the explanatory, sequential, mixed methods design used to study how the achievement-emotion of boredom relates to the academic agency of middle school
mathematics students. Quantitative data were analyzed with descriptive and relational statistics. This process was followed by collection of the qualitative data that were analyzed through thematic coding. The third phase triangulated the data from phases one and two, providing a richer overall picture and understanding of sixth-grade students' perceptions of the achievement-emotion of boredom in relation to their math class.
CHAPTER 4

QUANTITATIVE ANALYSES AND RESULTS

The purpose of this study was to examine sixth-grade mathematics students’ perceptions of boredom and the impact of boredom on their academic outcomes. The study used the Achievement-Emotion Questionnaire for Mathematics (AEQ-M) to examine boredom during instruction, studying/independent learning, and test taking in the classroom. The preliminary results followed by analysis boredom within the three mathematics settings showed significant differences in the level of perceived achievement-emotions, with the highest difference between the setting of studying/independent learning and testing. There were also significant differences in how boredom is perceived across those settings. Participants showed the greatest differences in perceiving boredom while responding to the questions, “During class, I am so bored that I can’t stay awake,” and “Before studying, just thinking of my math homework assignments makes me feel bored”.

The survey was sent to approximately 470 sixth grade mathematics students from the targeted school district using the district’s management and communications system, Skyward. Sixty-nine students (~15%) returned parent permission forms to take the AEQ-M survey. All 69 participants completed the survey. Table 6 presents the demographic information for the survey participants. Table 6 shows that the participants who took the survey represent a typical demographic for the targeted school district. Thus, the results of the study may be
generalizable to the rest of the sixth-grade student population of the targeted school district but generalizing to other school districts with a different demographic should be done with caution.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Number of Participants</th>
<th>Percents</th>
<th>Middle Schools 1</th>
<th>Middle Schools 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>40</td>
<td>≈57%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>≈41%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Non-binary</td>
<td>1</td>
<td>≈2%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>≈2%</td>
<td>≈1%</td>
<td>≈1%</td>
</tr>
<tr>
<td>Black</td>
<td>16</td>
<td>≈23%</td>
<td>≈26%</td>
<td>≈23%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>21</td>
<td>≈30%</td>
<td>≈32%</td>
<td>≈30%</td>
</tr>
<tr>
<td>White</td>
<td>27</td>
<td>≈39%</td>
<td>≈34%</td>
<td>≈41%</td>
</tr>
<tr>
<td>Not Listed</td>
<td>4</td>
<td>≈6%</td>
<td>≈7%</td>
<td>≈5%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Years</td>
<td>26</td>
<td>≈38%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>11 Years</td>
<td>43</td>
<td>≈62%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Preliminary Analysis Based on Pekrun’s Research

The overarching research question guiding this study was “How is boredom perceived by sixth-grade mathematics students.” Part of this analysis included looking for significant differences in sixth-grade mathematics students’ perception of boredom between the academic settings of classroom instruction, studying and/or independent learning, and test-taking. The findings of Pekrun (2006) and his colleagues (Pekrun et al., 2011) showed differences in
perceived achievement-emotions based on each of these settings. For the sake of consistency, with analyses in Pekrun (2006) and Pekrun et al. (2011), the researcher conducted a preliminary analysis using a dependent within-subject analysis of variance (ANOVA) of the entirety of AEQ-M (Pekrun, 2005) survey items.

The quantitative data were first analyzed for differences in settings. Survey items 1 through 19 discussed achievement-emotions students might perceive in the classroom setting. Answer choices were 1 to 5 (strongly disagree, disagree, neutral, agree, strongly agree). In the Classroom Instruction section, students could have a total score as low as 19 or as high as 95. The mean score in this study for classroom instruction was 50.83 ($SD = 6.58$; see Figure 6). Figure 6 displays the AEQ-M results for survey items 1-19. The Y-Axis refers to the number of participants in each bin. The scores are normally distributed. There is a slight positive skew, meaning there is a slight trend toward perceiving more achievement-emotions during classroom instruction.

Figure 6: Descriptive statistics of achievement emotions in mathematics in the classroom setting.
Survey items 20 through 37 explored achievement-emotions during studying and independent learning. Using the same Likert scale as previously mentioned, students could have a total score for Studying/Independent Learning as low as 18 or as high as 90. The mean score for Studying/Independent Learning was 45.78 (SD = 6.29; see Figure 7). Figure 7 displays the AEQ-M results for survey items 20-37. The Y-axis refers to the number of participants in each bin.

![Histogram of total scores for Studying and Independent Learning](image)

**Figure 7**: Descriptive statistics of mathematics settings: Studying-independent learning.

The scores for perceiving achievement-emotions during studying and/or independent learning were normally distributed with a slight positive skew. There was a trend for students to perceive more achievement-emotions during studying and/or independent learning.

Survey items 38 through 60 focused on students’ perceptions of achievement-emotions during testing. Students could have a total score in testing as low as 23 or as high as 115. The
mean score for testing was 61.58 (SD = 12.53; see Figure 8). Figure 8 displays the AEQ-M results for survey items 38-60. The Y-Axis refers to the number of participants in each bin.

Although there is the slightest positive skew, the scores for perceiving achievement-emotions during testing are the most normally distributed. The least mean represented the setting of studying and/or independent learning. After creating the descriptive statistics, the data were analyzed for differences in the three mathematics academic settings: classroom instruction, studying/independent learning, and testing.

Research Question 1 Analysis

Research question 1 asks is there a significant difference in sixth-grade mathematics students’ perception of boredom between the academic settings of classroom instruction,
studying and/or independent learning, and test-taking? This question was analyzed by testing the mean differences between settings using a within-subject analysis of variance (ANOVA). There were significant differences \( p < .05 \) between the three settings, with the greatest difference seen between the setting of studying/independent learning and testing \( p < .001 \). The results illustrated in Table 7 can be interpreted, as Mauchly’s Test of Sphericity indicates the assumption of sphericity has been violated, \( X^2(2) = 24.606, p < .001 \).

Table 7
Mauchly’s Test of Sphericity: Settings

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Huynh-Feldt</th>
<th>Lower-Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings</td>
<td>.693</td>
<td>24.606</td>
<td>2</td>
<td>.000</td>
<td>.765</td>
<td>.779</td>
<td>.500</td>
</tr>
</tbody>
</table>

To reduce the risk of a Type 1 error, I adjusted the degrees of freedom using the corrective tests under “Epsilon.” Since both Greenhouse-Geisser (.765) and Huynh-Feldt (.779) have epsilon values greater than .75, the researcher used the interpretation of the Huynh-Feldt corrections (see Table 8).

Looking at the tests of within-subjects effects, Huynh-Feldt is statistically significant \( p < .001 \). These results indicate differences between mathematics settings and the achievement-emotions perceived by sixth-grade students in them. This ANOVA was followed by a Bonferroni Pairwise post hoc test on the mathematics settings to determine which pairs differ.
Bonferroni Pairwise Comparisons of Mathematics Settings

The researcher used the Bonferroni Pairwise test to compare achievement-emotions across the three mathematics settings: classroom, studying and/or independent learning, and testing (see Table 9).

Using the Bonferroni Pairwise Comparison procedure, related sample t-tests, showed a statistically significant difference of perceived achievement-emotions between the setting of classroom compared to studying and/or independent learning ($p < .05$). There was a statistically significant difference of perceived achievement-emotions between the setting of classroom compared to testing ($p < .05$). There was also a statistically significant difference of perceived achievement-emotions between the setting of studying and/or independent learning compared to
testing \((p < .05)\). The greatest of these differences was between studying/independent learning and testing \((p < .001)\).

Table 9

Bonferroni Pairwise Comparison: Mathematics Settings

<table>
<thead>
<tr>
<th>Mathematics Settings</th>
<th>Mathematics Settings</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower-Bound</th>
<th>Upper-Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>Studying/Independent Learning</td>
<td>5.043</td>
<td>.662</td>
<td>.000</td>
<td>3.417</td>
<td>6.669</td>
</tr>
<tr>
<td>Classroom</td>
<td>Testing</td>
<td>-10.754</td>
<td>1.147</td>
<td>.000</td>
<td>-13.568</td>
<td>-7.939</td>
</tr>
<tr>
<td>Studying/Independent Learning</td>
<td>Classroom</td>
<td>-5.043</td>
<td>.662</td>
<td>.000</td>
<td>-6.669</td>
<td>-3.417</td>
</tr>
<tr>
<td>Testing</td>
<td>Classroom</td>
<td>10.754</td>
<td>1.147</td>
<td>.000</td>
<td>7.939</td>
<td>13.568</td>
</tr>
<tr>
<td>Testing</td>
<td>Studying/Independent Learning</td>
<td>15.797</td>
<td>1.057</td>
<td>.000</td>
<td>13.203</td>
<td>18.391</td>
</tr>
</tbody>
</table>

In preparation for the focus group interviews, which revisited the survey items that discussed the perceptions of boredom in the three mathematics settings, the researcher also ran a repeated measure, within-subject dependent ANOVA to analyze the achievement-emotion variables of the six specific survey items (\#6, \#11, \#14, \#20, \#25, and \#31) on boredom. The
section on testing in the AEQ-M did not have any survey items on boredom. Later, these six survey items were used in the focus groups as discussion topics.

Research Question and Sub-question 1: Boredom Within Settings

For the analysis of the six survey items on boredom, the following overarching research question guided this study: How is boredom perceived by sixth-grade mathematics students? The findings from the survey addressed the following sub-question:

1. Is there a significant difference in sixth-grade mathematics students’ perception of boredom between the academic settings of classroom instruction, studying and/or independent learning, and test-taking?

Subsequently, the quantitative data were next analyzed for differences in boredom within the settings. Survey items #6, #11, and #14 addressed boredom in the classroom during instruction. Survey items #20, #25, and #31 addressed boredom during studying and/or independent learning. There were no survey items that addressed boredom in testing. Likert choices were 1 = strongly disagree, disagree, neutral, agree, to 5 = strongly agree. For each survey item, total scores for participants (N = 69) could range from 69 through 345.

Survey item #6 states, “During class...I can’t concentrate because I am so bored.” The mean score in this study for item #6 is 2.64 (SD = 1.1; see Figure 9).
Figure 9: Descriptive statistics: Survey item #6 - I can’t concentrate because I am so bored.

Survey item #11 stated: During class...I think the mathematics class is boring. The mean score in this study for survey item #11 is 2.46 (SD = 1.04, see Figure 10).

Figure 10: Descriptive statistics: Survey item #11 - I think the mathematics class is boring.
Survey item # 14 stated: During class...I am so bored that I can’t stay awake. The mean score in this study for survey item #14 is 2.04 (SD = 0.95, see Figure 11).

![Graph showing descriptive statistics for survey item #14](image)

Figure 11: Descriptive statistics: Survey item #14 - I am so bored that I can’t stay awake.

Survey item # 20 stated: Before studying...Just thinking of my math homework assignments makes me feel bored. The mean score in this study for survey item #20 is 2.75 (SD = 1.14, see Figure 12). Survey item # 25 stated: During studying...I’m so bored that I don’t feel like studying anymore. The mean score in this study for survey item #25 is 2.67 (SD = 1.22, see Figure 13).
Figure 12: Descriptive statistics: Survey item #20 - Just thinking of my math homework assignments makes me feel bored.

Figure 13: Descriptive statistics: Survey item #25 - I’m so bored that I don’t feel like studying anymore.
Survey item #31 stated: During studying...My math homework bores me to death. The mean score in this study for survey item #31 is 2.42 (SD = 1.1, see Figure 14).

Figure 14: Descriptive statistics: Survey item #31 - My math homework bores me to death.

All of the histograms for the survey items on boredom have slight positive skews. The lowest mean is for survey item #14, from the setting of classroom instruction, which states, “I am so bored that I can’t stay awake.” The highest mean is for survey item #20, from the setting of studying and/or independent learning, which states, “Just thinking of my homework assignments makes me feel bored.” After creating the descriptive statistics, the data were analyzed, testing the relationships between the six survey items using a within-subject analysis of variance (ANOVA).
Research Question and Sub-question 1: Boredom Within Settings

The sub-question of Hypothesis 1 considers whether there are differences in sixth-grade mathematics students’ perceptions of boredom between the academic settings and was analyzed by testing the relationships using a within-subject analysis of variance (ANOVA).

Mauchly’s Test of Sphericity indicates the assumption of sphericity has been met, $X^2(14) = 17.732$, $p = .22$ (see Table 10).

<table>
<thead>
<tr>
<th>Mauchly’s Test of Sphericity: Perceptions of Boredom Within Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Subjects Effect</strong></td>
</tr>
<tr>
<td>Boredom Items</td>
</tr>
</tbody>
</table>

Since sphericity has been assumed, the researcher can use “Sphericity Assumed” results in the Tests of Within-Subjects Effects, which illustrates that effects are statistically significant ($p < .001$, see Table 11). This analysis was followed by a Bonferroni Pairwise post hoc test on the perception of boredom within the mathematics settings to determine which pairs differ (see Table 12).
Using the Bonferroni Pairwise Comparison procedure, related sample t tests, showed four comparisons that were statistically significant: “During class, I can’t concentrate because I am so bored” (1 – question #6) compared to “During class, I am so bored that I can’t stay awake” (3 – question #14); “During class, I think the mathematics class is boring” (2 – question #11) compared to “During class, I am so bored that I can’t stay awake” (3 – question #14); “During class, I am so bored that I can’t stay awake” (3 – question #14) compared to “Before studying, just thinking of my math homework assignments makes me feel bored” (4 – question #20); and “During class, I am so bored that I can’t stay awake” (3 – question #14) compared to “During studying, I’m so bored that I don’t feel like studying anymore” (5 – question #25) (p < .05). The two questions with the greatest significant difference were question #14 (3) and question #20 (4) (p = .000075). More students (n = 49) chose strongly disagree or disagree when considering survey item #14 (3), “During class, I am so bored that I can’t stay awake,” than the other Likert choices of neutral, agree, or strongly agree. Survey item #20 (4), which states, “Before studying,
just thinking of my homework assignments makes me feel bored,” had more students (n = 24) chose “neutral” out of the Likert options. These six survey items were used in the focus groups as discussion topics, and the researcher used the participants’ responses to corroborate and/or refute these statistical findings.

Table 12

Bonferroni Pairwise Comparison: Boredom Within Mathematics Settings

<table>
<thead>
<tr>
<th>Mathematics Settings 1</th>
<th>Mathematics Settings 2</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval for Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>.174</td>
<td>.126</td>
<td>1.000</td>
<td>[-.208, .556]</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>.174</td>
<td>.136</td>
<td>.001</td>
<td>[.181, 1.008]</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>-.116</td>
<td>.123</td>
<td>1.000</td>
<td>[-.490, .259]</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>-.029</td>
<td>.126</td>
<td>1.000</td>
<td>[-.411, .353]</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>.217</td>
<td>.118</td>
<td>1.000</td>
<td>[-.143, .578]</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>.420*</td>
<td>.125</td>
<td>.018</td>
<td>[.041, .799]</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>-.420*</td>
<td>.119</td>
<td>.259</td>
<td>[-.651, .072]</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>-.203</td>
<td>.112</td>
<td>1.000</td>
<td>[-.545, .139]</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>-.710*</td>
<td>.143</td>
<td>.000</td>
<td>[-1.146, -.274]</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>-.423*</td>
<td>.152</td>
<td>.002</td>
<td>[-1.085, -.161]</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>-.377</td>
<td>.136</td>
<td>.105</td>
<td>[-.789, .036]</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>-.246</td>
<td>.110</td>
<td>.426</td>
<td>[-.088, .581]</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the .05 level.
Chapter 4 described the survey participants and the results of the analyses addressing the research question along with the first sub question: “Is there a significant difference in sixth grade mathematics students’ perception of boredom between the academic settings of classroom instruction, studying and/or independent learning, and test-taking?” Post hoc pairwise analysis was also reported for the relationship among mathematics settings and the perception of boredom in those settings. The results of the preliminary analysis showed significant differences in the level of perceived achievement-emotions across the three mathematics settings, with the greatest significant difference between studying and/or independent learning and testing with students, with the mean Likert score for perceiving emotions during studying/independent learning less than the mean Likert score for perceiving emotions during testing. Following the preliminary analysis of achievement-emotions, an analysis of the six survey items on boredom, representing the settings of classroom instruction and studying and/or independent learning, was completed. The results of this analysis demonstrated there was a significant difference between the two settings. The greatest difference found was between the two survey items, which state, “During class, I am so bored that I can’t stay awake (classroom instruction),” and “Before studying, just thinking of my math homework assignments makes me feel bored (studying/independent learning).” Analyses of the participants’ responses to the six survey items, on boredom, as they are discussed in focus groups are addressed in Chapter 5.
CHAPTER 5

STUDY PARTICIPANTS AND FOCUS GROUPS

This chapter provides the results from the focus groups and individual interviews. The following overarching research question guided this study: How is the achievement-emotion of boredom perceived by sixth-grade mathematics students? The findings from the focus groups and individual interviews addressed the following sub-questions:

a. How do sixth-grade mathematics students describe their perceptions of achievement-emotions, specifically boredom, in the academic settings of classroom instruction, independent learning, and test-taking?

b. To what extent do the qualitative results of focus groups and individual interviews explain, confirm, or contradict the quantitative results of the AEQ-M survey?

Participants

Of the 69 students, 13 participants participated in one of four focus groups, and 11 of those 13 completed individual interviews. The following are descriptions of the members in each focus group.

Focus Group 1 met in early May of 2021 and consisted of four participants: Ava, Ben, Declan, and Kobe. During the icebreaker, Ava shared that she lived with both mom and dad and a sibling and she had two cats. She enjoyed most of the responsibilities of taking care of her pets and was looking forward to a summer trip with their family. Ben also lived with a sibling
and two parents. During the icebreaker, Ben described a way he worked with his sibling and parent to build a business recycling sports equipment. He also shared that he had two cats and an anole. Ben shared with the group that the anole had asexually reproduced earlier in the school year. Ben also told his group that during that particular day his braces were bothering him causing him some discomfort while playing a musical instrument in band class.

Declan, a third participant in Focus Group 1, informed the group that his family is really important to him. He lived with both of his parents and two siblings, one older and one younger. He also had a dog he was very proud of. He enjoyed being outside and playing soccer for the target school district and was also on a traveling team. His favorite subject was choir and his least favorite subject was language arts. Declan’s high point for the week was bringing up his mathematics grade and his low point was an altercation on the bus. Conversely, Kobe, the fourth group member, was an only child. Kobe shared that he likes to bake. He also enjoyed reading, especially Harry Potter, but his time was currently preoccupied with practicing his cello for a third and final orchestra concert that would occur at the end of the week – the finale for the end of the school year. Kobe’s best part of the school day was when he feels awake: “In the second to last class...that's when I actually wake...I guess I'm more awake and I am more attentive.”

All the participants self-reported current marks in math as well as the grade mark received the previous year. Ava, Ben, and Declan all divulged that they were currently receiving A’s in mathematics as well as receiving A’s the previous year. Kobe was the exception. He received an A in mathematics the previous year, but he was currently receiving a C.

Focus Group 2 met a couple of days after the first focus group and included Chris and Uri. Chris was also individually interviewed. Throughout Chris’ profile, the pronouns they and
them are used to honor Chris’ identity. Chris lives with their parents and two siblings: one older and one younger. During the icebreaker, Chris shared their high point for the week was playing outside in PE. They were an active student who likes basketball, soccer, and just walking around the track. This was their first year participating in track and field. Even though PE was their favorite class, they said they enjoyed all of their other classes: “It's kind of hard, because I enjoy most [of] my classes.” Chris self-reported their mathematics grade for this year was an A; however, their mathematics grade for the previous year was a B.

Fiona, Elena, Hazel, and Graham made up Focus Group 3. They met in mid-May. Fiona was the first to share, mentioning that she enjoyed being active, but she was not a fan of PE. She liked to be outside swimming or playing basketball; however, she was also an avid reader and liked to participate in community theater activities. She loved history, and although math is not her favorite, she said the teachers made it fun. “I have never really liked math...I just like my teachers more.” Fiona lived with her parents, younger brother, and a dog. Excited to share, Elena explained that she also lived with her parents, a younger sibling, but she had a cat instead of a dog. Elena enjoyed reading, music, and being with her friends. In fact, she shared that being back in school face-to-face and seeing her friends was the highlight of her week, “I got to go back in person. That was fun...Everyone’s funny and awesome...and we all have things in common.”

The third member of Focus Group 3 was Hazel. During the ice-breaker, she shared she was slightly frustrated with the last week of the school year: “It kind of seems pointless that I have to go to school, but not do any work.” Hazel liked to keep herself busy by rollerblading, making art, and practicing her cello. She lived at home with both her mom and dad and a younger sibling. The fourth member of the group, Graham, revealed he was looking forward to
the end of the school year but that he was also going to miss his classmates and teachers: “[I’ve] kind of grown close to these people...I have made so many friends.” He also shared that he really likes school: “Ever since I was little, I loved school.” Graham lived at home with both mom and dad and a younger sibling who is still a toddler.

All of Focus Group 3 self-reported current marks in math as well as the grade they received the previous year. All four group members were currently receiving A’s in mathematics as well as earning A’s the previous year.

Focus Group 4 also met in mid-May, approximately two weeks before the end of the school year. This group included three members: Ivy, Jonah, and Tiana. During the icebreaker, Ivy shared her disappointment in the school year: “It wasn’t even a school year because we’re all out of school for like six months.” However, she was excited the school year ended with students attending in person: “I feel like I learn better when I can actually see [students].” The highlight of Ivy’s week was doing well on a final quiz, but she was upset that she did not have her math book: “I forgot my math book because the teacher said that we weren’t going to need it anymore...like the week before. I came into class...and then, we needed it.” Ivy liked swimming and drawing anime in her free time. She lived with her mom and her grandma.

Jonah explained that he walks to and from school. Jonah said he does not enjoy the daily walk. He expressed an interest in video games, his favorites being Okami and Genshine Impact, which are combat role-playing games. Jonah lived with his dad, stepmom, two older siblings, and a dog.

Tiana shared she was excited for the summer. She was looking forward to swimming, going places, and getting out of town. She said, “Sometimes, I go to Texas and visit my dad’s side of the family. And sometimes, I just go to Chicago...to go shopping.” When the researcher
asked Tiana who she traveled with in Chicago, Tiana responded, “My tia...my aunt...because she is fun. It is always fun with her.”

Ivy and Jonah self-reported their current marks in mathematics as well as the marks they received in mathematics the previous year. Ivy was earning an A in math in the current school year as well as in the previous year. Jonah received a D in mathematics in the current school year but an A in mathematics during the previous school year. Tiana opted to not share her grades.

Thirteen sixth-grade mathematics students participated in the first stage of the Phase 2 data collection, focus groups. The following captures the highlights of the discussions which include the participants’ responses to the AEQ-M survey items on boredom, as well as their elaboration on their perceptions of boredom. The participants’ responses also helped generate questions for each individual interview, adding to the collected data to be considered by the researcher, such as strategies to alleviate the perception of boredom, academic tasks that elicit boredom, like testing, and how boredom impacts academic agency.

Focus Group Discussions

Focus group discussion questions, about the achievement-emotion of boredom, were derived from survey items presented in the first phase of the study, the collection of quantitative data through the AEQ-M survey. However, this quantitative methodology has limits. Russo et al. (2021) explain that it operationalizes complex psychological constructs, whereas “qualitative approaches to educational research...allow for more direct and nuanced inquiry into an issue of interest” (p. 11). Focus groups were used to bridge quantitative and qualitative data, allowing
the researcher to better understand the nuances of boredom perceived by the sixth-grade mathematics students.

In this phase, the sixth-grade participants (n = 13) responded to the six questions specifically about boredom on the AEQ-M survey in their own words (Pekrun, 2005). Three questions asked about their perceptions of boredom during mathematics classroom instruction:

- # 6: During class...I can’t concentrate because I am so bored.
- #11: During class...I think the mathematics class is boring.
- #14: During class...I am so bored that I can’t stay awake.

Three other questions asked about their perception of boredom during independent mathematics study:

- #20: Before studying...Just thinking of my math homework assignments makes me feel bored.
- #25: During studying...I’m so bored that I don’t feel like studying anymore.
- #31: During studying...My math homework bores me to death.

Clarification and/or elaboration of survey responses and the resulting discussions and interactions in the focus groups provided a natural opportunity for the participants to expand on their experiences and perceptions in their mathematics settings. Their conversations supported the findings of the AEQ-M survey in that the different mathematics settings elicited different achievement-emotions and different levels of perceptions of those achievement-emotions. Their perceptions of boredom for items #14 and #25 differed greatly from comparing their ability to stay awake in class due to boredom to persevering while studying independently. Other survey items did not create such a difference in perception across the participants. For instance, item #31 used the phrase “bored to death,” and the participants discussed figurative language and how it evoked speculative reflections. The following presents a reflection and analysis of the qualitative data generated by the focus group interviews. The six survey items on boredom were
discussed and the researcher analyzed how the data connect to Pekrun’s (2006) control-value theory by identifying the six corresponding descriptors for control and value. The following presents a reflection and analysis of the qualitative data generated by the focus group interviews. The six AEQ-M (Pekrun et al., 2005) survey items on boredom were discussed in the focus groups and the researcher analyzed how the data connected to Pekrun’s (2006) control-value theory by identifying the six corresponding descriptors for control and value. The descriptors for control are skills, executive functioning, intentional distractions, and time. The descriptors for value are appraisal values and influencers.

**Survey Item #6: I Can’t Concentrate Because I Am So Bored**

The purpose of the focus groups was to gather more insight into the responses to the six AEQ-M questions on boredom. The first survey item from the AEQ-M that addresses boredom (item #6) states: “During class, I can’t concentrate because I am so bored.” The Likert scale runs from 1 (strongly disagrees) to 5 (strongly agrees), and the participants had mixed responses to this. Table 13 shows examples of responses and where they fall in the control-value framework. The table displays the codes and descriptors for control: skill, executive functioning, intentional distractors, and time. The table also displays the codes and descriptors for value: appraisals both positive and negative and influencers.

Focus Group responses ranged from strongly disagree to strongly agree as they reflected on survey item #6. Ben, Kobe, Fiona, Graham, Elena, Declan, Chris, and Jonah all expressed varying degrees of agreement that boredom in their mathematics class could produce the inability to concentrate. Declan, Ava, Chris, Uri, Hazel, Ivy, and Tiana disagreed that boredom in mathematics class caused them to lose the ability to concentrate. However, many of the
participants gave alternating reasons for control or value descriptors -- such as perceived mathematics skills, executive functioning, intentional use of distractors, time, appraisal values, and those who influence the students’ success in acquiring mathematics skills -- as reasons their Likert choice to the survey item could be altered.

Table 13
Response Examples to Item #6

<table>
<thead>
<tr>
<th>Control-Value Theory Components</th>
<th>Descriptors Types</th>
<th>Focus Group Examples and Participant Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills</td>
<td>&quot;If I know it, I kind of get bored.&quot; (Fiona, Focus Group 3)</td>
<td></td>
</tr>
<tr>
<td>Executive Functioning</td>
<td>&quot;I just, you know, pay attention and write my notes down&quot; (Ivy, Focus Group 4)</td>
<td></td>
</tr>
<tr>
<td>Intentional Distractions</td>
<td>“I have some sort of a fidget.” (Ben, Focus Group 1)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>&quot;I really don’t think they need to take a whole ten minutes of my time to learn a [mathematics skill] again.&quot; (Graham, Focus Group 3)</td>
<td></td>
</tr>
<tr>
<td>Appraisal Values</td>
<td>“I have quite a lot of fun doing math.” (Uri, Focus Group 2)</td>
<td></td>
</tr>
<tr>
<td>Influencers</td>
<td>&quot;My older brother has ADHD, which is focusing, but I’m the opposite.”(Declan, Focus Group 1)</td>
<td></td>
</tr>
</tbody>
</table>

Declan, Chris, Kobe, and Uri disagreed that boredom in mathematics made it difficult to concentrate. Kobe, who liked math but not as much as reading, later changed his mind and shared that if he had to redo the survey, he would change his answer to strongly agree “because sometimes I daze off...yeah, I just kind of daze off.” Kobe’s response to this item on boredom is value-related based on his reverence of reading over math. Ava and Fiona agreed that boredom could make it difficult to concentrate during mathematics class.
Frequently, the discussion pertained to skills as being an important control descriptor influencing their response to survey item #6. For instance, Ava acknowledged the mathematics topic and her skill level, a control characteristic, could influence when she was able to concentrate and whether she felt boredom. She shared that her response was neutral.

It really depends on the topic. I could do the subject...I know [the skill] really well...well this is boring...I’m not going to concentrate on it. If it’s raining outside, or if cars are driving by, or a fire truck, there’s police across the road. I’m definitely going to be looking at it.

Uri also stated that he strongly disagreed with item #6 because “I have quite a lot of fun doing math. Maybe, it is because I’m actually pretty good at it.” However, this was not always the case. The researcher asked if Uri had always been good at math. Uri promptly stated, “No! In first and second grade, I absolutely hated it and wanted to have absolutely nothing to do with it.”

Unfortunately, Uri could not recall what had changed to make him like mathematics. After reflecting on her groupmate’s comments, Fiona thought her response was made based on a combination of descriptors like skill, executive functioning and distractors:

If I know it, I kind of get bored. My mind trails off into some other fantasy world, because I know what I am doing. But then, there are those times when I’m learning something, and I start to understand [it] a bit, then my brain thinks I know all of it. And then, I realize [the teacher] has moved on to the next question...Then, I’m like, I don’t remember what you just did.

Finally, Tiana also thought skill combined with executive functioning influenced her perception of boredom and an ability to concentrate: “When it’s too easy, [I] kind of zone out...it does get a little boring...or maybe, when it’s too hard, [I] kind of just stop trying.”

Participants also discussed the conscious control of thoughts and actions in pursuit of goal-directed achievement or executive functioning (McCormick & Scherer, 2018) as a reason for their responses to survey item #6. For example, Chris felt that their disagreement with item
#6 needed clarification: “Sometimes, I am bored, but I’m never that bored that I can’t concentrate. So, I just said, disagree...Most of the time I am concentrat[ing].” Elena also added:

If we’re learning something that we kind of already learned, like ratios or something, and it’s very simple...I can pay attention...I don’t need to think as hard. But if we’re learning something difficult, it is easier for me to zone out (and not concentrate), because I’m like, ugh. I don’t know [this]. Wait, what did we just write down?

Ivy shared that her ability to self-regulate in the classroom exceeded opportunities for boredom to influence the inability to concentrate: “I’m not usually...like...bored in math class. I just, you know, pay attention and write my notes down.” For Jonah, the lack of executive functioning that contributed to his response to item #6. He shared it was his skill and not knowing how to self-advocate that influenced boredom and the inability to concentrate: “When [I] have a question...[I] don’t know how to ask.”

Ben explained how he used distractors to interrupt boredom and stay focused. Ben reiterated that he could not focus when he was bored; however, he had a strategy for staying focused when he perceived boredom: “I have some sort of a fidget.” This statement shows that Ben has found a way to allow control to excel over value as earlier he had shared that he did not like mathematics.

There were also moments throughout the focus group interviews in which participants referred to time, either the passage or frequency, as a reason for a response. Time is included as a descriptor for control, as students felt they or others could manipulate it. For instance, Graham discussed the amount of time his peers took for repeat instruction, but also how time seemed to not be an issue when Graham was learning something new:

I’m bored and can’t concentrate because I already know the lesson. I know some kids don’t get [the mathematics skill], but I really don’t think they need to take a whole ten minutes of my time to learn a [mathematics skill] again. But, when I’m learning something, I’m super into it, because I’m like this is new, I need to learn it.
The focus group participants also shared value-statements when discussing survey item #6, does boredom cause the inability to concentrate. Ben shared that he does not like math, a value statement. Ben explained that he has difficulties concentrating when he is bored: “I get so bored in class...it stops me from learning, and...I go on to other stuff.” He added that sometimes he emailed people when he was bored. He also shared that one of the remote learning tools frequently used in his mathematics class was to blame for his boredom: “[When] I’m doing those Nearpods\(^1\)...they’re pretty darn boring.”

Kobe, who liked math, but preferred reading over it, shared that if he had to redo the survey, he would change his answer to strongly agree “because sometimes I daze off...yeah, I just kind of daze off.” Kobe’s response to this item on boredom is value-related.

Declan, too, wanted to clarify that he could recall a time in second grade when his concentration was interrupted by something more exciting but not because he was bored. Declan’s response helps explain how skill and control can be trumped by interest and value.

One of my assistant teachers was like, “Bald eagle.” We all saw a bald eagle and ran to the window. We were there for 10 minutes until it flew away. So, if it is something eye-catching, I won’t focus, but if it is something neutral, I will.

Chris and Uri, from Focus Group #2, both shared they like math. Their enjoyment came from their skill at math. On the other hand, Hazel thought that value could be added to mathematics by including “fun activities” to reduce boredom and increase her ability to concentrate. She also agreed with two of her groupmates who felt they were more likely to concentrate and feel less boredom when they were learning or developing control over a new mathematics skill:

I agree with [Graham] and [Fiona], because I think it’s very boring when [the teachers]

\(^1\) Nearpod is an interactive tool used for student engagement.
are teaching stuff that I already know. I can’t concentrate and I zone out. But, if they are teaching something hard and new, I’m like oh, I need to focus.

Finally, the descriptor of value includes those around the participants who influenced their ability in mathematics and, in particular, boredom and their ability to concentrate. Declan provided an example of an influencer combined with his own executive functioning ability. He compared himself to his older brother, while aligning attention and focus with the lack of boredom.

My older brother has ADHD, which is focusing, but I’m the opposite. I can focus through anything, even if there’s like a tornado siren going off. I never get bored either, because I pay attention. I’m like this all the time.

Declan’s example contradicted his initial response of agreeing that boredom could evoke the inability to concentrate. However, like most of his groupmates, he expressed his understanding of how boredom could produce this perception and how circumstances and individual differences could change that experience. Once there was a lull in the conversations about survey #6, the researcher asked the participants if there were anything else they would like to add to the discussion. Once it was confirmed that the participants had shared their thoughts on concentration and boredom in mathematics, the interview went on to survey item #11.

Survey Item #11: I Think the Mathematics Class is Boring

The second survey item from the AEQ-M that addressed boredom is item #11: “During class, I think the mathematics class is boring.” The Likert scale runs from 1 (strongly disagrees) to 5 (strongly agrees), and the participants all had mixed responses to this item. Table 14 shows examples of responses and where they fall in the control-value framework.
Focus Group responses ranged from strongly disagree to strongly agree as they reflected on survey item #11. Kobe, Ben, Hazel, and Fiona all expressed varying degrees of agreement that mathematics class is boring. Declan, Uri, Graham, Ivy, and Tiana all expressed varying degrees of disagreement that mathematics class was boring. Four participants stated they chose neutral for survey item #11. However, similar to survey item #6, many of the participant gave alternating reasons, citing control or value descriptors such as perceived mathematics skills, executive functioning, intentional use of distractors, time, appraisal values, and those who influence the students’ success in acquiring mathematics skills as reasons their Likert choice to the survey item could be altered. For instance, Ava stated that she chose the Likert response of neutral for survey item #11, stating that her skill level could alter whether she perceived
mathematics class as boring: “It really depends.” She said she considered her mathematics skills and whether she had mastered them: “[If] I already know [the mathematics skill], yeah I’m bored. I guess if it is something I’m struggling to do, I’m going to be on it...I’ve got to complete it to be successful.” On the other hand, Kobe disagreed with Ava, “If I don’t know how to do it, I probably find myself being more bored than if I did know how to do it.” Elena, from Focus Group #3, also referenced her skill level for influencing her Likert choice on the survey. She emphasized that learning new material in math class is what makes it boring: “I get really bored if we’re learning something new. It depends on what we’re learning. If we’re learning something new to me...I just kind of zone off. I don’t necessarily understand.”

A couple of participants mentioned attributes of executive functioning for inspiring their Likert choice on survey item #11. An example is Chris working toward completion of a mathematics task. They explained, “I remember thinking it’s only [boring] sometimes, but sometimes I really like going through after the problem feeling that achievement of just finishing it.” Graham also found that taking notes was an important task for success and said he could use it as a way to distract himself from being bored. He shared, “[Math] is not so boring. It depends on what we’re on. If I know it, it’s boring. But, if it’s like super easy and simple, I’m going to write down a few notes. It’s just for a little while.”

Another descriptor for control is time, particularly frequency or number of times a task was presented. Declan noted that this in particular could create the perception of mathematics class as boring, admitting that it was one reason he did not like mathematics: “I answered that [math class] wasn’t really boring...I didn’t say super disagree because sometimes...math can get boring if you’re doing things over and over and over again.” Graham also shared this sentiment, stating, “[previously] learned material could make math class seem boring.”
Focus group participants also shared value-statements when discussing survey item #11, describing their answers for whether they perceive mathematics class as boring. Uri is an example of a participant who strongly disagreed with survey item #11 and explained why. He reiterated that he really liked math and he found it “fun” and “I’m really good at math.” There were others who shared positive values for math, like Ivy. She explained, “I don’t really think it is boring. I actually kind of like math. It’s like one of my favorite classes.” Tiana also experienced a positive value for mathematics: “Like I said earlier, math is my favorite subject.” On the other hand, Elena felt differently. She stated, “I don’t necessarily enjoy math as much as other classes, but I’m not necessarily bored. I don’t necessarily want (emphasized) to do it.” Agreeing with Elena, Hazel stated, “I find math not as enjoyable as other subjects.” Jonah was not sure he agreed with math class being boring, but he did feel the tests were. Jonah reported, “Maybe when I do a test, it’s boring. Tests are boring most of the time.” He shared in his individual interview about his frustration with standardized tests and the technology necessary for education to continue in a pandemic.

Other participants connected a positive value of mathematics to the influences of others around them. Ben strongly agreed with item #11, but for Ben, mathematics skills, or lack thereof, did not make his math class boring. It was his connection to his teacher. He shared that his connection and relationship to his teacher were the strongest deterrent for boredom in math class: “[Math] is the most boring class...compared to other teachers [who]...play a dance video...that helps me learn.” Hazel and Fiona, who had stated earlier they were not fond of mathematics, also made references to their teachers. Hazel explained, “Math isn’t too boring most of the time, because my teacher is really fun.” Fiona agreed with Hazel about making
connections with her teachers and noted that those connections counteracted most instances of
math class being perceived as boring. She professed:

I find math not as enjoyable as other subjects. I always seem to find that my math
teachers...make math better. I don’t want to do math. I’m one of those kids who goes
“Ugh” when it’s math time. Whatever my teacher does, it doesn’t matter if it’s exciting
or we’re doing math in general, I normally like my teachers. I look forward to seeing my
teacher. I wouldn’t find [math class] boring.

These connections to others, like teachers or family members, were frequently cited in focus
groups and in individual interviews as a way to add value to mathematics. Once students
finished up sharing their thoughts on perceiving boredom in mathematics class, they discussed
one of the symptoms of boredom (Csikszentmihalyi, 1997), feeling tired or sleepy. Survey item
#14 address this concept.

Survey Item #14: I Am So Bored That I Can’t Stay Awake

The third survey item from the AEQ-M that addresses boredom is item #14: “During
class, I am so bored that I can’t stay awake.” The Likert scale runs from 1 (strongly disagree) to
5 (strongly agree), and the participants in all of the focus groups had mixed responses to this
item. Table 15 shows examples of the participants’ responses and where they fall in the control-
value framework.

Most of the participants in all four focus groups agreed that falling asleep because of
boredom was not something they would do; however, many expressed they had experiences with
being tired. Although seven participants—Ben, Kobe, Hazel, Elena, Ivy, Jonah, and Tiana—
agreed with this statement, they were quick to point out that their choice was not strongly agreed
and they really thought the statement was hypothetical. For instance, Ben, from Focus Group 1,
began the discourse wondering if the survey item was more of a speculative statement: “I mean
it’s not true. I think it means hypothetically. Like, I’m just so bored that I really can’t pay attention. It’s kind of what I think that question means.” When probed for Ben’s personal response, he stated, “I don’t fall asleep in the middle of class.” He then added, “It’s not like I’m wide awake either.” After a brief moment, Ben reiterated his strategy for staying on task: “I feel like I’m saying this to every question. I can’t pay attention without a fidget.” The rest of the participants—Declan, Ava, Ben, Chris, and Fiona—strongly disagreed with survey item #11, “During class, I’m so bored I can’t stay awake.” Graham was the only participant who said he was neutral.

Table 15

Response Examples to Item #14

<table>
<thead>
<tr>
<th>Control-Value Theory Components</th>
<th>Descriptors Types</th>
<th>Focus Group Examples and Participant Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>&quot;I’m prepared for the test.&quot; (Graham, Focus Group 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;I try not to focus on being sleepy.” (Tiana, Focus Group 4)</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>&quot;I can’t pay attention without a fidget.” (Ben, Focus Group 1)</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>&quot;I end up going to bed around 10:00, because I lose track of time reading.&quot; (Kobe, Focus Group 1)</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>N/A</td>
</tr>
<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>&quot;My mom is like go to bed. It’s nine.’(Declan, Focus Group 1)</td>
</tr>
</tbody>
</table>
The focus group participants shared interesting thoughts about this survey item, ascribing to descriptors of control from the control-value theory. Most, if not all, gave some examples of getting enough sleep was the real culprit of fatigue. Although a few participants stated they could understand that boredom might make an individual feel tired. Declan, who strongly disagreed about the survey item, argued, “I get enough sleep. I’m not one of those people who stays up all night playing video games or anything.” Declan gestured to Ava, with whom he has been friends with for years: “My mom, and probably [Ava’s] mom too, tells us to go to bed early. My mom is like go to bed. It’s nine.” Ava was surprised, “She lets you stay awake until nine? I’ve got to be in bed by eight.” Ava then clarified her response: “I’m not tired. I guess it really depends on how much sleep [I get]. If I get two hours of sleep, well yeah, I would probably fall asleep. Probably not.”

Kobe explained that he did not have the same bedtime rules: “I end up going to bed around 10:00 because I lose track of time reading. I would definitely try to doze off [or] probably end up daydreaming in the middle of class.” Ben added that he, too, stays up late sometimes to read, adding, “I don’t really feel a difference during the day, but I know it’s not good for me to get less sleep.”

Chris immediately disagreed with this item: “I [find] it very hard to sleep in class. I find it super hard with that feeling the teacher’s just going to be staring at me.” Chris did not feel that boredom and sleepiness went together. Hazel continued the conversation by saying, “Well, I’ve never fallen asleep in math class before, but sometimes I get tired.” Then she added, “I’m tired in math class when I don’t get enough sleep…or when the lesson is boring.” Elena agreed that she might get tired in math class because she did not get enough sleep:
I’ve also never fallen asleep in class. I have been tired. Probably, I didn’t get enough sleep or something. I don’t personally stay up late. Other people might be like that because they don’t go to bed.”

Graham, on the other hand, could see both sides of the argument; however, his experience was not being tired from not having enough sleep. He would get tired because math class was not meeting his expectations. He gave an example of a time when the expectations changed, which led to perceiving boredom.

Researcher: Okay, [Graham], what do you think? [In math class], I am so bored that I can’t stay awake.

Graham: It depends if we’re doing a review...when we do a review and I’m all caught up with everything...because not everyone really understood it...I’m all ready. I’m prepared for the test. I’ve got my notes...I’m just like great...we have a review on the one day I am ready for [a test].

Researcher: Let me make sure I’m understanding [you]. The question was, I am so bored that I cannot stay awake in math class. The example you gave is when you are really prepared for a test and the schedule gets switched up...especially when it’s changed to a review...you get bored...and tired?

Graham: Exactly. Yeah.

Fiona, also a member of the third focus group, argued she would never fall asleep in math class because of being bored. However, she did think of one possible exception.

I’m not the person who falls asleep in class...sometimes, I do feel really tired...but then, my body is like no, no, no,...I don’t normally get bored enough in math that I want to fall asleep...I might have felt like I might fall asleep, because it’s math or whatever...the only time I have ever fallen asleep during class is after a MAP test.

Upon hearing Fiona mention boredom and the target district’s standardized benchmark MAP testing, Hazel added: “Yeah, the MAP test, during it, when I’m taking it, I find it super hard to focus. And I get so tired.”

The theme of control and sleep carried over into the last focus group. Ivy agreed with being tired in math class, but she said it was due to the time of day: “I kind of agree, because I
have math...math is my first period. I usually don’t do good with waking up early in the
morning. So, I’m pretty tired during math.” Jonah could understand how his peers might be tired
in math class, but he disagreed with item #14: “I don’t know. Maybe others [get tired]. I’ve
never really gotten tired.” Tiana agreed with feeling tired but not falling asleep. She had a
strategy: “Even though I get tired in the morning, I try not to focus on being sleepy.”

None of the participants in any of the four focus groups gave a specific appraisal value to
this survey item, which was not surprising given that most participants felt the survey item was
hypothetical in nature. The next survey item, addressing boredom and homework, was not
viewed as hypothetical. All of the students had experienced mathematics homework at some
point in their academic careers.

Survey Item #20: Just Thinking of My Math Homework Assignments Makes Me Feel Bored

The fourth survey item from the AEQ-M that addresses boredom is item #20, and it
states: “Just thinking of my math homework assignments makes me feel bored.” The Likert
scale runs from 1 (strongly disagree) to 5 (strongly agree), and the participants in all of the focus
groups had mixed responses to this item. It is also important to know the participants were
responding to a survey item that addressed homework during a school year requiring remote
learning. Most of the sixth-grade math teachers in the target district did not assign traditional
homework. Table 16 shows examples of the participants’ responses and where they fall in the
control-value framework.
Response Examples to Item #20

<table>
<thead>
<tr>
<th>Control-Value Theory Components</th>
<th>Descriptors Types</th>
<th>Focus Group Examples and Participant Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>&quot;[Math homework] was never really hard.&quot; (Ivy, Focus Group 4)</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>&quot;We would just tear out...My Math homework. Fill it out. Bring it in the next day.&quot; (Graham, Focus Group 3)</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>&quot;It doesn’t matter if there’s a few questions or not. I didn’t find it boring.&quot;(Tiana, Focus Group 4)</td>
</tr>
<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>&quot;When I got homework, I just remember it being so fun.&quot; (Chris, Focus Group 2)</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>&quot;I always have my parents check my homework after I’m done.&quot;(Fiona, Focus Group 3)</td>
</tr>
</tbody>
</table>

Focus Group responses ranged from disagree to strongly agree while reflecting on survey item #20. It is important to note that middle school teachers of the target district assign very little to no homework. Participants were told if they did not receive mathematics homework in the current school, they should reflect on a school year when they did. Ben, Kobe, Hazel, and Elena all expressed varying degrees of agreement with survey item #20. Declan, Chris, Uri, Graham, Fiona, Ivy, and Tiana all expressed varying degrees of disagreement that thinking about mathematics homework made them feel bored. Ava and Jonah stated that they chose neutral for survey item #20.
Frequently, a participant’s skill in mathematics was cited as the reason for their Likert choice for survey #11. For instance, Elena thought back to her elementary school years. She explained:

In 5th grade and before...we always did My Math homework from our workbook. Those were never really hard, because it was two pages of work. It’s just normal questions, not word problems. I don’t know what kind of math homework we would have in middle school. But, based on homework from elementary school. I don’t get bored with them.

Elena’s response to survey item #20 was neutral, explaining she neither loves nor hates mathematics homework. Ivy also shared that math homework “was never really hard. So, I could just finish it in a couple of minutes and be done with it.” Ivy also clarified her stronger impression of math, saying, “[Math] doesn’t really make me bored. I just don’t like it. Other participants also made value statements about this survey item and mathematics in general. Kobe expressed:

Honestly, in elementary school, my math homework wasn’t really top priority for me. It still isn’t. My top priority is violin practice...in elementary school, it is more like...you just go home...get [your homework] done right away...just be done with it. It was no really big fuss.

Chris and Uri assigned positive value to mathematics homework. Chris, who strongly disagreed with survey item #20, did not assigned a positive value, in this situation, but alluded to executive functioning, saying, “Last year, when I got homework, I just remember it being so fun to just answer the problems correctly and then turn it in.” Uri felt the same way. “I strongly disagree. I personally love math.” On the contrary, Ivy shared, “It doesn’t really make me bored. I just don’t like [math homework].”

Hazel had a strong opinion about a specific type of mathematics homework. Hazel strongly agreed with the statement: just thinking of my math homework assignments makes me
feel bored. She shared, “Yeah, for homework, we do this thing called ALEKS. It’s really boring. It’s not fun. I get bored just for thinking about it.”

Time, duration and frequency, a descriptor of control, also came up in focus group interviews. Ava explained her perceptions of boredom that pertained to math homework:

It depends...if it’s super hard like five pages long, I’m not going to get bored. I’m going to get stressed, because I’m like I need to get this done...when I’m in class and...the teacher gives me time to do my homework, I’m going to do my homework. Others would go off and play a game I’m like, Nah, I gotta do it. You can do other things later.

Ivy, who disagreed with the survey item, also brought up the practice program, ALEKS. She stated, “It’s not really homework. [the teacher] calls it homework, but she has us play a game on Monday.” In Ivy’s class, this game is used as the deciding factor for the amount of time students spend on homework. Ivy explained that a top is spun and the outcome determines how many minutes of ALEKS practice the class receives for that week. Ivy finished with, “If you spin the top for 30 seconds, then we have no homework. [The teacher] usually assigns 30 minutes...Last week, we only had to do one minute of homework.” Jonah compared homework to tests. Jonah said, “Only sometimes” homework was more boring than tests because redoing homework was “just on your own time.”

Tiana, on the other hand, disagreed with survey item #20. She explained, “When I had homework in fifth grade, it was like a few problems.” When the researcher asked Tiana if the number of homework problems influenced her perception of boredom, she stated, “It doesn’t matter if there’s a few questions or not. I [don’t] find it boring.”

2 ALEKS is a practice program used in the target district that adjusts to each student’s mathematics skill and assigns lessons based on those skills. All middle school students in the target district, which includes sixth graders, use this program as part of the mathematics curriculum.
Finally, a participant’s Likert choice for survey item #20 could be influenced by the personal connections the student makes. Fiona shared:

For fifth grade...I had two pieces of homework to do...My Math stuff...I’m being...an overachiever...I always felt like I would mess up on my math homework and it would stress me out...So, I always have my parents check my homework after I’m done...I’m somebody who always finds it hard to ask the teacher for help...it’s easier now...I wanted to get it right.

Elena also felt supported by her parents. She explained, “[If] I get something wrong, I have my parents check it or something. I get really, really upset if I got something wrong...I get really worked up.” Elena’s response reflected both control and value in that skill (control) was necessary to do the homework task and value was given to homework through the support of her parents. Participants’ responses on the next survey item, #25, would illustrate a different descriptor of control, executive functioning.

Survey Item #25: I Am So Bored That I Don’t Feel Like Studying Anymore

The fifth survey item from the AEQ-M that addresses boredom is item #25: “During studying, I’m so bored that I don’t feel like studying anymore.” The Likert scale runs from 1 (strongly disagree) to 5 (strongly agree), and the participants in all of the focus groups had mixed responses to this item. Table 17 shows examples of the participants’ responses and where they fall in the control-value framework.

While reflecting on survey item #25, focus group responses ranged from disagree to agree, but with the majority disagreeing. Declan, Ben, Ava, Kobe, Elena, Fiona, Ivy, and Uri all disagreed with the statement. Chris and Graham agreed. Hazel, Jonah, and Tiana responded neutral on the Likert scale for survey item #25. Studying is an example of executive functioning, informed regulation of thoughts and actions in reaching goal directed behavior (McCormick &
Scherer, 2018). Many of the participants’ responses echo this definition as they explained their thoughts on studying. Frequently, executive functioning behaviors are paired with mathematics skills along with support by influencers.

### Table 17

**Response Examples to Item #25**

<table>
<thead>
<tr>
<th>Control-Value Theory Components</th>
<th>Descriptors Types</th>
<th>Focus Group Examples and Participant Names</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control Descriptors</strong></td>
<td>Skills</td>
<td>&quot;It comes time for the test, and I remember how to add 5 + 5…something I don't need to know.&quot; (Fiona, Focus Group 3)</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>&quot;It’s just do it, write it down, and get it over with.” (Kobe, Focus Group 1)</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Value Descriptors</strong></td>
<td>Appraisal Values</td>
<td>&quot;I don’t necessarily like it.&quot; (Elena, Focus Group 3)</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>&quot;My dad, he’s an engineer, so he does a lot of math.”(Graham, Focus Group 3)</td>
</tr>
</tbody>
</table>

Declan started the discussion about this survey item:

I said super disagree, because I’m never bored in math...I’m good at it and my teacher...is always planning ahead. So, if we’re done with the assignment...she always has a game or something planned afterwards. So, I would say...I’m never bored that I won’t study.

Ben remembered a tool he used to study in elementary school: “Flocabulary, I think it’s called...stuff like that helps me study [and] it’s not particularly boring.” When the researcher asked Ben to share a bit more about Flocabulary, he explained:

They have those for math...to help you study...you have to find one that matches or create
your own...that would be hard...like that stuff that rhymes, [or] stuff in your head that goes together like PEMDAS. I know it’s not really studying, but...I remember the order of operations because of that.

Ava also said she disagreed, but it was because she does not study: “I just pay attention in class, and then when I do the test, I ace it.” Kobe agreed with Ava and Declan and disagreed with the survey item. He stated, “Honestly, I don’t feel bored if I study. It’s mostly just...my math homework. It’s just do it, write it down, and get it over with.” Hazel had mixed feelings about the survey item because she felt she also did not need to study too hard. However, when she did, she noted that “it feels really boring, and I don’t want to do it anymore.” Elena also stated that she did not study much; however, she did discuss studying during a school year of remote learning because of a pandemic.

We go over it in class. We don’t have a textbook to go over it or anything. We use Chromebooks like with the different chapters and stuff...if I do study, it’s stressful...Oh my gosh, there’s so much stuff [that] I need to remember. What if these kinds of things aren’t even on the test or quiz? What if they give me things that we haven’t even learned. I don’t necessarily like it.

Graham, on the other hand, said he could agree with studying being so boring he would want it to end. He explained, “I study sometimes on Sundays because I have math on Mondays and Thursdays,” referring to the modified block schedule all of the middle school students, including sixth-graders, had during the pandemic.

Especially on Mondays. That’s how I start my week. I want to make it a good week. I don’t want to make it a bad week, like I don’t know what’s happening. And then, Thursday, they’re like everyone good? Okay. Next lesson. So, I would definitely say studying gets really annoying. But, it can really save you when you have no idea what you’re doing...My dad, he’s an engineer, so he does a lot of math. I would ask him for help sometimes. But, that’s only if...I have no idea of what’s going on. If you don’t like to [study], and you’re caught up with everything, you don’t have to do it.
The researcher asked Graham if he thought that annoying and boring were the same thing. He did not think they were the same thing but said that “when I really understand it and I also have to study, I don’t want to anymore.”

Fiona explained that studying causes her to perceive anxiety not boredom:

I haven’t studied a ton this year, but like what [Elena] said...if I read something...I want to try and remember it. I feel like I’m going to remember things that I don’t need to know...things that aren’t that important...versus things that are super important. And then, it comes time for the test, and I remember how to add 5 + 5...something I don’t need to know...I completely blank...Those are the things I’m scared I’m going to do whenever I study.

When asked about being bored while studying, Jonah had mixed feelings. He shared, “Sometimes, I am bored, but most of the time...no.” However, he could not think of an example of either a time he was bored or a time when he was not. Tiana felt the same way as Jonah, “Sometimes, it gets boring and sometimes it doesn’t.” Tiana was able to explain her thoughts a little more on the topic. She shared, “Sometimes, [when] it gets difficult, I just don’t want to study anymore. When math is hard...when it gets difficult, that’s when it starts to get boring.”

After hearing what Tiana had to say, Jonah agreed: “When math is hard, studying it will be boring. I keep thinking this should be easy. This should be simple.” He thought for a moment and then added, “When it’s pretty easy, it’s boring, too.”

On the other hand, Chris’ response was influenced by another control descriptor – time, in particular, the amount of time spent on a task. They admitted: “Sometimes, I actually do feel that.” However, when asked to clarify, Chris could only think of an example when they had to create a slideshow for science. They explained, “I just remember sitting in the front room typing all of these questions and getting bored. I didn’t even want to do that anymore.” Conversely, Ivy explained her Likert choice through a positive appraisal value. She stated, “I actually kind of
enjoy studying for math class. I enjoy studying by myself, because I feel like when I’m in a group with another person, then it takes longer to finish.” Whether or not the participants “enjoyed studying,” most recognized that homework completion, the executive function of achieving a goal, would end the perception of boredom. However, a different control descriptor, time – frequency and duration – was the topic of conversation for the final focus group question, survey item #31.

**Survey Item #31: My Math Homework Bores Me to Death**

The final and sixth survey item from the AEQ-M that addresses boredom is item #31: “During studying, my math homework bores me to death.” The Likert scale runs from 1 (strongly disagree) to 5 (strongly agree), and the participants had mixed responses to this item. Table 18 shows examples of responses and where they fall in the control-value framework.

While reflecting on survey item #31, focus group responses ranged from disagree to agree, but most participants stated they picked the neutral choice. As with survey item #20, it is important to note that middle school teachers of the target district assign very little to no homework. Participants were told if they did not receive mathematics homework in the current school, they should reflect on a school year when they did. Only Ben, Ava, and Uri shared that they agreed with survey item #31 in their focus group discussions. For instance, Ben said: “It is what I have been saying. Math is the most boring class to me. Yes, I don’t really have math homework, but...math in general...I can’t do it.”
Although all of the descriptors of control-value theory were discussed in the focus groups, the descriptors of control – mathematics skill, executive functioning, intentional distractors, and time – were the themes for addressing survey item #31. Also, the students frequently shared that to them homework meant studying for tests, which included discussion about standardized tests.

Time, both frequency and duration, was the most recurrent control descriptor. For instance, Uri explained, “there’s more work on the homework than there is on the actual assignment.” Ava agreed: “I’ve seen in the movies...it’s probably not true...the teacher [gives the students] 20 pages of problems or else [they’re] getting an F...that wouldn’t bore me to death, but...It would be super stressful.” Elena also mentioned that the amount of time spent on homework influenced her perception of boredom, stating, “The longer I do [homework], the
more bored I will get.” Hazel agreed with her groupmate that homework could be boring. Chris, on the other hand, acknowledged mixed feelings about doing homework. They agreed that the amount or length of an assignment could increase the perception of boredom, “I always really liked bringing home math homework. I remember just wanting to fill out all the problems and circle all the bubbles for the correct answer. I just remember really liking doing that.” However, Chris recognized their thoughts were sometimes contradictory. They continued, “I do not really like doing math itself...but, it doesn’t mean math is horrible...I really hate doing math problems that take a horrible [amount of time]. Sometimes, when we did some [homework] that took a horrible [amount of time], I’m just like...Aargh.”

Sometimes the focus group discussion on survey item #31 was a combination of mathematics skills and executive functioning abilities that with time were used as an explanation.

Ava shared:

We don’t really get homework [in sixth-grade], but...it doesn’t really bore me to death. [It] depends on how long it is. If it’s just like one page...we had these math books [in elementary school] where we would rip the page out, do the homework, turn it in, and it was complete. Simple. It was only about a page long. We had a few word problems, a few normal problems. It was simple.

Declan also commented, I’m always busy in math [class].” He continued: “Like I’ve said, it’s math after math after math...and it’s very...overwhelming, but I get it done. It’s never boring.”

When questioned by the researcher, Declan said he did not associate being overwhelmed with the perception of boredom.

Fiona and Graham disagreed that math homework bores them. Fiona stated, “It depends on what I am doing, but...homework isn’t something that I’m upset about. It gives me something to do in my time.” She continued, “I’m a school person, somebody who like[s] school. [Homework] is something that I learned...I could do it without help.” When the researcher asked
her what would make homework boring, she said without hesitation, “Obviously...too much homework.” Graham acknowledged that during studying, homework was not too boring, but the boredom comes when he finishes his homework: “I’m bored because I’m done with my work. I’m done with this. I’m done with that. What else do I need to do? [I’m] bored when I’m done with everything.”

When survey item #31 lent itself to the discussion of tests, specifically standardized tests, Kobe shared, “Usually, I get bored during tests.” He continued, “I remember in fifth grade, we were allowed every 10 to 20 minutes to get up and go to the water fountain or go to the bathroom. I would keep an eye on the clock. I would take as long as I could.” Ivy agreed, “Yes, especially MAP testing...I find it really hard to focus, because I feel like I’m reading it and I have to re-read it at least five times to understand the question. The first time I read it and I don’t understand. That’s boring.”

The other participants shared their thoughts on testing. Declan, anticipating the end-of-the-year MAP test, shared that “I’m going to be so bored after the test. I’m going to be sitting there, spacing out. Math is so boring after tests.” Ben, recalling that he had not participated in the recent Illinois Readiness Assessment (IRA) had this to say, “It’s not boring during the tests, but after the tests...I was lucky I was in quarantine during the [IRA].” Ava added, “[It’s] worse than MAP testing. There are only a couple of questions, but they are very hard. I usually try to take as long as I can on testing, even though sometimes I want to rush through. Like [Declan] said, waiting at the end [takes] forever.” Chris also agreed that after tests, like MAP, they perceived boredom: “[I’m] just like staring at a paper and [I’m] taking my time to fill it out. If you have questions, the teachers are not allowed to answer them and help you...I don’t like tests. I’ll just be sitting there trying to think about how to answer the problem by myself.”
Many of the participants also shared ways they intentionally distracted themselves from the discomfort of perceived boredom during studying and testing. Ben shared, “On [the] scratch paper...sometimes, they give you scratch paper for [the] MAP test, I take my pencil and draw in the remaining space...I just draw...it’s just dumb.” Uri reminded his groupmates that some preferred intentional distractors were not options during testing. He rhetorically asked, “Can I play games? No. I’m a huge fan of video games. I get bored when I can’t do anything after a test.” However, during studying as homework, many participants found music as a way to distract from perceived boredom. Ivy said, “When I do get assigned math homework, I usually listen to music to try to make it more fun.” Tiana also shared this same strategy along with another in her focus group: “Sometimes, I listen to music...I love music...sometimes, I [have] background noise...like a [TV] show on that I’ve already watched. Then, I don’t have to pay attention too much.” Jonah shared on other strategy for alleviating the perception of boredom: “I [think] of something to get [my] mind off of [being bored] when [I’m] done.” He also referenced television shows along with gaming.

Finally, two participants mentioned the influence of others when considering survey item #31. Ben and Elena liked to work in groups, which usually did not happen studying at home. Ben shared that he did not like most independent work: “Independent Nearpods I like, but anything else independent I don’t like. It has to be as a group. That’s why I really don’t like homework, [be]cause you’re doing it by yourself.” Similarly, Elena stated, “I don’t like to work independently. I like studying or doing homework with people.” For these participants, the influence of others added to the positive appraisal value of homework and studying.
Focus Groups Conclusion

The focus group conversations supported the findings of the AEQ-M survey in that the different mathematics settings elicited different achievement-emotions and different levels of perceptions of those achievement-emotions. Specifically, the students discussed their perceptions of boredom in the mathematics settings and elaborated on the six survey items that discussed boredom in mathematics settings. Their responses in the focus group discussions, which elaborated on their responses to the quantitative survey items, indicated that the perceptions of boredom differed in the mathematics setting of classroom instruction and study/independent learning. Students disagreed that they have a difficult time staying awake in their mathematics classes (classroom instruction) but could describe the feeling of time being altered during mathematics instruction. Students took a more neutral stance while considering homework (studying and/or independent learning), because they did not have mathematics homework in sixth grade but reflected on experiences in elementary school when homework was assigned. Students also disagreed with boredom interrupting studying, describing instances when they persevered. Other survey items on boredom did not create such a difference in perception. For instance, a survey item in the setting of studying and/or independent learning used the phrase “bored to death,” and the participants discussed figurative language and how it evoked speculative reflections.
CHAPTER 6
INDIVIDUAL INTERVIEWS

The individual interview is a vehicle for student voice, a method that reflects the research question and allows the researcher a way to understand the lived experience. The research questions for this study asked the participants to reflect on their responses in their focus groups and their perceived feelings of boredom in their sixth-grade mathematics classes.

Similar to the coding for the focus groups, responses were recorded under six subcategories: four for control and two for value. The skills descriptor is used for times when students make specific reference to their ability or not to perform a mathematics skill. The executive functioning descriptor is used for the self-regulatory or goal-directed behaviors in which the students identify engagement (McCormick & Scherer, 2018; Mooney, 2013). The intentional distractions descriptor refers to the coping strategies students communicated they used when perceiving boredom. The time descriptor represents both the passage of time and the frequency in which the phenomenon occurred. The descriptor, appraisal values, illustrates the positive and negative subjective importance of the activities and outcomes (Pekrun & Stephens, 2010; Story, 2013). Finally, the influencers descriptor characterizes the many people the participants described as influencing their academic success. Control and value were evident in the discussions. The participants shared appraisals of control, or lack thereof, concerning the perception of being able to master mathematics outcomes (Pekrun & Stephens, 2010; Story, 2013). They also reported appraisals of value, using words of like and dislike, concerning the
linking of positive and negative subjective importance to activities and outcomes (Pekrun & Stephens, 2010; Story, 2013). In addition to the descriptors, participants also discussed boredom in general, which includes all instances and grammatical ways the participants used the words boredom/bored/boring in the individual interviews.

Another topic that frequently came up in the focus group interviews was testing, in particular standardized testing, and the perception of boredom. The researcher probed this issue in the individual interviews as well. The following are the profiles and interview data of the 11 individual members who participated in the focus groups. Each participant is asked to elaborate again about their responses to the six survey items on boredom, the information they shared in the focus groups, and any other relevant information that is generated by sharing their lived experiences in their sixth-grade mathematics class.

Individual Interview: Ava

The first of the individual interviews was Ava. Table 19 previews responses made by Ava in her individual interview, which highlight descriptors for control and value. One of the initial questions asked the interviewees to discuss the progression of their math learning. Ava revealed she was about two or three years old when she first learned about numbers. She was in preschool when she learned how to count and in first grade when she learned how to add and subsequently how to subtract. Lessons on multiplication were received in third grade followed by lessons on division. Ava shared that she began liking math in early elementary school, around second grade; however, Ava did explain that she was not fond of division: “If we’re doing a gigantic problem...about long division...I’m definitely going to hate it.” She indicated the length of the problem and repeating steps determined her dislike.
The majority of the individual interview centered on clarification and/or elaboration of responses made while participating in the focus group. Ava indicated she was never really bored in mathematics; however, during a dinner conversation her sibling reminded her of times mathematics was boring. Ava explained the repetition, the multiple times a teacher has to re-explain the steps for a mathematics skill fostered the perception of boredom. Ava described one moment: “Why are we explaining this? I know how this works.” Ava went on to share that when she already knows something and then the same topic is repeated, she has to just sit there with nothing to do. She admitted she is prone to stare out the window. Ava said that of all the mathematics skills, multiplication was the one that generated the least perception of boredom.
because “I really like it,” Ava shared another achievement-emotion she felt in mathematics class was anger. She felt anger when she could not do a mathematics skill but it appeared others could. This perception of anger was sometimes followed by sadness and the perception of being stressed. Ava shared that it was important to her to understand math the first time around, saying, “I always try to understand it the first time.” Ava continued describing her experiences in math:

I listen really well the first time, and usually then it works. I know I’m not supposed to but sometimes I just go ahead on my work. I just do it quickly just to get it over with. Then when I’m done...it’s like I already know it. I work fast. I work extremely fast. I’m like, welp, I just sit there just watching.

Ava also discussed working remotely: “When I’m in class, and they give me time to do my [classwork], I’m going to do my [classwork].” She explained what she perceived other students did during remote learning: “Others would go off and play a game I’m like nah, I got to do it. [I] can do things later.”

Ava described how testing is different: “The teachers say [I] can take out a book if [I] want. I take out five.” However, this strategy does not work after finishing standardized testing:

I get done with it very quickly. A lot of teachers say I rush, but I just do it quickly. I read through it, choose the right answer. It only takes me about a minute to do a problem and there’s about 52 problems...It would take me about an hour, which isn’t very long. They provide you with three hours. I’m just sitting there. I could literally read [my book] about a million times over again.

Ava’s normal strategy for curtailing boredom seemed to backfire in this instance. She continued, “When you don’t have anything to do or like you’re having a test and you’re just sitting there and you have nothing to do (shrugs)...time...a minute...can feel like an hour.” Ava added that device breaks, meaning that if she could go to other sites on the district provided computer, it might help with alleviating boredom, but it is not allowed during testing. She reported, “Yes, I’m going to be extremely bored.”
Ava linked boredom with the value appraisal of liking the activity. She gave an example of playing frisbee with a sibling.

There is nothing to do...well, there’s tons of things you can do, but there’s nothing that you want to do. I’m playing frisbee...just standing there throwing and catching...in the sun. It’s tiring. I want to go inside and take a break.

The researcher asked Ava to clarify. She reported that boredom is not liking the activity, so it is perceived as discomfort and tiredness. Situations that did not produce the perception of boredom for Ava were video games that allowed creativity such as building cities: “That never really gets boring.” When discussing working with groups, such as friends, that allowed demonstrations of skills and socializing, she shared, “I can show them how I work fast...and...we can talk about these new shoes or something.”

Ava described the value of mathematics as important because “you need math in the world.” Ava felt mathematics was not valued as much in school, likening it to grades. They clarified this idea, “If you don’t do math, you may fail a grade...it’s not...the end of the world if you just fail one grade”. Ava did say that mathematics was most valued by her parents, as both were teachers. “They’re like, how many grams of sugar are in this cereal? They just pop it (mathematics) on randomly.” Ava described having high control over learning math, “The teacher provides you with all the information you need to get a good grade...I always choose to listen and then get a good grade.” Ava also felt in high control of being able to use or apply their mathematics skills, “like know how many cans of tomato sauce I would buy at the store.”

Although Ava frequently stated in the focus group that she did not get bored in her mathematics class, during her interview, she expressed there were times when she did feel boredom and accurately described boredom as having unpleasant feelings and altering her perception of time (Pekrun et al., 2010).
Individual Interview: Ben

The second individual interview was with Ben. Table 20 previews responses made by Ben in his individual interview, which highlight descriptors for control and value.

Table 20

<table>
<thead>
<tr>
<th>Control-value Theory Components</th>
<th>Descriptor Types</th>
<th>Individual Interview Examples</th>
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<tbody>
<tr>
<td><strong>Control Descriptors</strong></td>
<td>Skills</td>
<td>&quot;When I learned multiplication...I got...a really good grade on it.&quot;</td>
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<tr>
<td></td>
<td>Executive Functioning</td>
<td>&quot;I show my work differently or just do it in my head.&quot;</td>
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<tr>
<td></td>
<td>Intentional Distractions</td>
<td>Fidgets are “kind of like a break without taking a break.”</td>
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<tr>
<td></td>
<td>Time</td>
<td>“I rush through.”</td>
</tr>
<tr>
<td><strong>Value Descriptors</strong></td>
<td>Appraisal Values</td>
<td>&quot;It’s just stuff because nobody enjoys school.”</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>“We used to play school at my house.”</td>
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Ben’s individual interview also began with an exploration of his progression of learning. He revealed he was about three or four years old when he first learned about numbers. “We used to play school at my house,” indicating that he played school at home with his sibling and a parent, although he acknowledged that he might have learned about numbers at an earlier age as
he has a younger cousin who knew how to count. Ben indicated that he learned how to add and subtract in kindergarten and remembered he learned how to multiply in second grade because “when I learned multiplication...I got...a really good grade on it...It’s one of my best memories.” He learned how to divide in third grade.

Ben explained that math was not his favorite subject and this year added to his dislike. He shared that there was not enough variety in mathematics instruction: “We never do anything...different in math...in other classes...we do Blookets³ (online game) that are not related to...we will do a Disney Blooket.” Ben also reported that his definition of boredom is when you are doing something you do not enjoy. He stated, “I can get bored in math class, but [it] doesn’t mean I don’t have anything to do. It’s just stuff because nobody enjoys school.” Ben said that when he already knows how to do something but is expected to do it a different way, it causes him to perceive boredom. He shared:

So, I do it my own way. And then the teacher teaches it [in] a different way. I show my work differently or just do it in my head...show my work even if it is in my head, which is hard.

Ben explained that as work became harder, he also perceived boredom; however, he felt he could alleviate his boredom by using fidgets. Ben stated that fidgets are “kind of like a break without taking a break.”

Ben was asked to describe what boredom felt like. He gave an example of a discussion with his parents, “When I have nothing to do, my parents will tell me there’s plenty to do...but not stuff [I] enjoy.” Ben stated that he perceives boredom more frequently when the mathematics skill becomes more difficult. However, if he does master the mathematics skill and can complete problems more quickly, he explained, “I rush through, because it is easy. I have to

³ Blooket is a web-based quiz game platform for group competition or solo study.
have something to do for the rest of [the] class...actually, I would say easy problems are more boring.” Situations that did not produce boredom for Ben outside of the classroom were video games, watching TV, playing board games, and hanging out with friends. In the classroom, Ben said he would perceive boredom less frequently if the teacher used interactive games like Nearpods, Blooket and Kahoot⁴, clarifying that “doing stuff that exhilarates my mind.”

Individual Interview: Declan

The next individual interview was with Declan. Table 2 previews responses made by Declan in his individual interview, which highlight descriptors for control and value. Declan revealed when he first learned about numbers: “I was four. In preschool, they started making us count numbers up and up and up. Like 1-2-3-4-5, for example.” Declan shared that he started adding in kindergarten and subtraction was taught in first grade. Declan remembered the introduction of subtraction was exciting to Declan: “I was like, Oh (exaggerating excitement).” This was when he first started to like math. His first grade when his teacher helped him realize that math could be used in real life. Declan explained how he started to understand advanced skills without having the skill names for it: “[If] you’re tripling your recipe, you need to add...If you see your recipe is already tripled for you, then you need to subtract.” It wasn’t until Declan was in third grade when he learned how to multiply and divide.

⁴ Kahoot is an online game-based learning platform.
Declan indicated that he struggled in third grade, particularly with graphing and coordinates, but that changed: “I learned to be successful. I learned my lesson through the grade and brought that lesson into fourth grade.” The appreciation came with a change in the math skills: “[Multiplication and division] is completely different than graphing. This could be alright.” He went on to explain, “I didn’t really appreciate [graphing] very much.” Declan also accredited a push-in teacher for making math more easily understood: “She helps out at math in school...she’s pretty awesome.”

Declan was asked to describe what boredom felt like. He stated, “When I’m bored...I’ve got nothing to do...and...I don’t want to do this anymore.” Later, Declan added that “bored means

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<td><strong>Control Descriptors</strong></td>
<td>Skills</td>
<td>“[If] you’re tripling your recipe, you need to add.”</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>“[L]ook at it and copy it...don’t play around.”</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>“If I had a fidget, then I would use a fidget.”</td>
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<td></td>
<td>Time</td>
<td>“[I] think of how consuming that is to [my] time.”</td>
</tr>
<tr>
<td><strong>Value Descriptors</strong></td>
<td>Appraisal Values</td>
<td>“I didn’t really appreciate [graphing] very much.”</td>
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<tr>
<td></td>
<td>Influencers</td>
<td>“She helps out at math in school...she’s pretty awesome.”</td>
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you’re not preoccupied...you’re unoccupied...if that’s a word.” He also felt that the perception of boredom disturbed time. He elaborated on this perception by describing the task of completing multiple difficult questions: “They’re boring because you always have to think things through. If there are 20 questions, think of how consuming this is of [my] time.” The researcher asked if Declan had any strategies to counteract boredom, Declan had this to say, “If [I] had a fidget, then [I] would use a fidget, but that’s not what school is.”

During discussion about situations that did, and did not, produce boredom, Declan shared that focus was not an issue. “You have to log in and watch your teacher...and if it is something that you have to copy, look at it and copy it...don’t play around.” However, Declan did acknowledge that when there were long mathematics problems or too many problems, he would experience boredom. “[I] think of how consuming that is to [my] time.” Declan explained that having something to do after completion of a shorter mathematics assignment was ideal, such as Quizziz or a mathematics practice site called ALEKS.

Individual Interview: Kobe

The individual interviews continued on with Kobe. Table 22 previews responses made by Kobe in his individual interview, which, like the others, highlight descriptors for control and value.

Just as with the other interviews, Kobe’s interview began by responding to questions about the progression of learning math skills. He remembered learning how to count when he was about four years old and in preschool: “I wanna say 5, but I can remember I counted my toes. And, I wanted everything to be perfectly symmetrical and number-wise in preschool. So,
I'm going to go with four.” However, Kobe wanted to give his parents credit for his start with numbers:

I think it was cumulative. As in, my parents showed me some numbers, preschool showed me some numbers. Let's...let's go with preschool for now, because I feel like that was kind of their job to teach me. My parents just told me stuff that I asked.

Table 22

Individual Preview Response: Kobe

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<tr>
<th>Control-value Theory Components</th>
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<th>Individual Interview Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>&quot;I feel like when I was a kid, math was definitely a lot easier.&quot;</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>&quot;I'm going to close this...[and] I'm going to find something entertaining.&quot;</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>&quot;Once I hit 20 questions, my brain decides...[laughs] (fakes exhaustion).&quot;</td>
</tr>
<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>&quot;It's not exactly my favorite subject, either.&quot;</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>&quot;I think it was cumulative between my parents and preschool.&quot;</td>
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</table>

Kobe’s progression through foundational mathematics skills was similar to those of his peers. He stated that he learned how to add and subtract numbers in kindergarten but possibly before:

I remembered I didn't know the actual signs. But, I do know that I knew the idea of if I have like 10 pencils, and I take away 3 pencils, that’s 7 pencils. And, I didn't know the
term for that. But, I did know the line was less.

Kobe learned how to multiply numbers in third grade and was introduced to division at the end of third grade: “I was definitely very confused with long division in 3rd grade...long division kind of confused me for a bit.” Clarifying, he added, “I feel like when I was a kid, math was definitely a lot easier.”

Kobe shared that math was not his least favorite subject, but he also wanted the researcher to know: “it's not exactly my favorite subject, either.” He noted:

As a little kid, when math was a lot more newer to me, as a concept, I was a lot more excited for it than I am now... I think I started to dislike it in maybe first or second grade, when it got less entertaining and more business.

Kobe added that homework added to his dislike: “I remember one time, in I think 4th grade, for whatever reason I lost my homework. And, I was absolutely terrified to tell Mrs...my teacher.”

He also added that he thought his teachers were confused this school year when they said they were not assigning any homework: “Now that we’re online learning, all work is homework.”

Kobe explained that he rarely got bored in his mathematics class or in any other class; however, he also shared that boredom could make him tired: “I think...I might...I might doze off a bit, if I was really bored. My brain physically thinks...Uuugh! And then, I don't think. I just kind of lay or sit there...or stand there.” However, Kobe quickly added: “You know what? MAP tests! MAP test is the most boring. Because, once I hit 20 questions, my brain decides...Uuugh (fakes exhaustion).” He also shared that perceiving boredom sometimes initiated day-dreaming: “I just started imagining dumb situations that end up happening to me. Or, I'll just kind of zone everything out.”
Kobe has many interests, one of which is reading: “I think I learned how to read at an age where it just came to me naturally.” He shared that he would use reading as a way to distract himself from perceiving boredom:

I was that one doofus, in the back, who would pull out his book, at some point. Like, in between...like when the teacher was trying to focus on this one student, teaching him how to do something. I would pull up my book during, in the corner, and just kind of look down.

He also felt he was pretty good at distracting himself, especially at home when he was bored:

“When I was bored...I would just kind of dive into the mess (indicating his bedroom). And, usually, my intent was, alright...I’m going to clean this...[and] I’m going to find something entertaining.”

Individual Interview: Chris

The fifth individual interview was with Chris. Table 23 previews responses made by Chris in their individual interview, which, like the others, highlight descriptors for control and value.

Chris is a sixth-grade student who self-identifies as non-binary. Throughout Chris’ profile, the pronouns they and them are used to honor Chris’ identity. During the questions about their progression of learning math, Chris revealed that similar to the other participants they were in preschool when they first learned about numbers. They remembered learning how to count during preschool and the following summer.

I learn[ed] my numbers in preschool, like 3 and 4 and that stuff. But, like, between the break of preschool and kindergarten, my mom started getting out these puzzles. Like, she had this puzzle which was like a number one square and a 2 square. There are small squares and there's about 100 squares.
Chris thought they were in kindergarten when they learned how to add, however, they stated they probably were in first grade when they learned how to do subtraction. Chris learned how to do multiplication and division in third grade. They described when they knew they really liked math: “Since I learned that I can just make things that...I learned that decimals...they can be used as money. And that just makes things way simpler. Because, it's just adding decimals is kind of like adding money.”

Table 23
Individual Preview Responses: Chris

<table>
<thead>
<tr>
<th>Control-value Theory Components</th>
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<th>Individual Interview Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>“I learned I can make things...it's just like adding decimals is kind of like adding money.”</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>“You have to finish this problem.”</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>“I start picturing things I’m afraid of,” they paused, “because I’m bored.”</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>“If there’s too many questions, I’ll get exhausted and be like I’ll never finish all of these questions.”</td>
</tr>
<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>“I enjoy most classes.”</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>“Between the break of preschool and kindergarten, my mom started getting out these puzzles.”</td>
</tr>
</tbody>
</table>

Chris is an active student enjoying activities that allow them to be outside like basketball, soccer, and track. They also enjoy school. While trying to think of a low point of the week or a
least favorite class, they stated, “I mean it’s kind of hard, because I enjoy most classes.” Chris is also what they described as a good student: “I learned I can make things...it’s just like adding decimals is kind of like adding money.” They also felt they were motivated in class: “I’m saying, see you can do this. You have to finish this problem. Now, there’s only this many left.”

When Chris was asked to describe what boredom felt like, they gave typical answers like daydreaming, staring off into space, and “sometimes, I just feel exhausted.” They continued: “Whenever I'm bored, I just start spacing out and thinking about things.” When asked to elaborate, Chris shared, “I start picturing things I’m afraid of,” they paused, “because I’m bored.” They added, “So, that's how my body stops me from being bored. But, I guess if I were bored, I [would also] just start staring at things and thinking of things to try and get myself not to be bored.” Chris continued with another unique response to perceiving boredom, saying they get an unusual feeling in their mouth:

There's just this weird taste that gets in my mouth, for some reason. I don't know why. I think it's probably because it's me telling myself to wake up. Or else, the teacher’s gonna call on [me] and ask [me] a question. And, [I’d] be like, wait what?

Chris indicated these perceptions of boredom usually occur when there are a lot of math problems. They stated they felt like, “I’m never going to get all these math problems done...The most boring thing about math are the problems that take forever to solve.” With that being said, Chris added another way they supported themselves emotionally whenever they struggled. They explained,

During math, I’ll be [thinking] this problem is gonna take forever...and, I'm like, but wait. Look how far I've gotten on this problem. And, that's mostly what I do with running. When you're running a lap around in track, you’re like the lap. (gestures the starting and stopping point) And then, when you're right here, usually that's when you start feeling like, oh this lap is gonna take forever. I'm going to be running forever. So, you need to be able to emotionally support each other. Maybe...not each other...but
yourself. To say, like, oh look how far you've gotten and all that stuff. And keep pushing.

The number of questions came up several times during the interview. When asked if the number of questions, too few or too many, contributed to the perception of boredom, Chris explained, “It’s usually both of those...If I’m really good, there’s not enough. I’ll just be sitting there bored. But, if there’s too many questions, I’ll get exhausted and be like I’ll never finish all of these questions.”

Individual Interview: Fiona

After Chris, the individual interviews continued with Fiona. Table 2 previews the responses made by Fiona in her individual interview, which, like the others, highlight descriptors for control and value. Fiona is also an active student, enjoying time spent outside playing basketball or swimming. She also likes acting, musical theater, and quiet time spent reading. She and her friends often pretend to be the characters in their favorite books.

Like the other participants, Fiona revealed she was very young, around preschool age, when she learned about numbers and counting. “I actually went to this home preschool. They obviously...probably taught me.” Fiona remembered that she learned how to do addition in kindergarten, and at the very end of kindergarten, she learned how to subtract numbers. She remembered being taught how to multiply numbers in third grade but learned grouping earlier. “Actual multiplication, with the [times symbol] would probably be [in] third grade...with the whole 4+4+4+4 is probably younger.” Fiona remembered learning how to divide numbers in fourth grade. She also shared that in the summers between grades, her parents would provide other mathematical resources. “I always have these books...summer Bridge books that I do in
the summers...They’re little...like transitions...learning what you already know [and] getting ready for the next year’s math.” She added, “Both of my parents are good at math, but my dad...he would check over it...tell me what I did wrong...and then I’d fix it.” She continued sharing, “I’m somebody who likes to have good grades. After I finish my homework, I would go straight to my dad. I would ask him to check over it.”

Table 24

Individual Preview Responses: Fiona

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<tr>
<th>Control-value Theory Components</th>
<th>Descriptor Types</th>
<th>Individual Interview Examples</th>
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<tbody>
<tr>
<td>Control Descriptors</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skills</td>
<td>“I kind of find it easy and fun.”</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>“After I finish my homework, I would go straight to my dad. I would ask him to check over it.”</td>
</tr>
<tr>
<td></td>
<td>Intentional Distractions</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>“It’s hard to focus when the [teacher] is explaining [it again].”</td>
</tr>
<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>“I’m more a letters versus numbers person.”</td>
</tr>
<tr>
<td></td>
<td>Influencers</td>
<td>“Both of my parents are good at math.”</td>
</tr>
</tbody>
</table>

Although Fiona likes school, she clarified why the subject of mathematics was not her favorite. “I’m more a letters versus numbers person.” She explained:

When it comes to regular math problems, I’m fine if I understand it. I kind of find it easy and fun. They...started giving more complicated...more than one-step problems...I really
don’t want to do it anymore...I’m just not excited anymore for it.

However, Fiona did mention she enjoyed it when she saw connections between previous skills and new skills. Reflecting back to elementary school, “I remember this from five years ago. That makes so much more sense, now.”

Fiona felt there was a fine line when it came to the challenge of learning mathematics skills and boredom: “If the material is really hard, [I] just don’t want to do it...If it gets too easy and I get it done, then it gets kind of boring and [I’m] like now what do I do?” Repetition also initiated the perception of boredom for Fiona. She shared, “When I’m in class and the teacher needs to explain something...another time...to makes sure that everybody understands...I understand it. It’s hard to focus when the [teacher] is explaining [it again].” Fiona described what boredom felt like: “It’s hard to concentrate. You want to do something else...your bored mind just wanders off into...another galaxy.” Fiona also explained that boredom can be cyclical ”because you don’t want to do it, your [mind] just kind of wanders off. And then, you come back. And, you’re realizing you totally missed what the teacher is saying...you don’t understand it...you try and do it...you’re like this is boring.”

Fiona felt that having a good relationship with the teacher helped reduce the boredom. “I liked all of my elementary teachers...I’ve loved them...I have never really liked math...I love my teachers...that’s what makes it better...It’s not specifically any one thing that they do.”

Individual Interview: Elena

Fiona’s friend, Elena, was the next individual interviewee. Table 25 previews the responses made by Elena in her individual interview, which, following the protocol of the others, highlight descriptors for control and value.
Elena was part of the first group who returned to school, face-to-face, when some of the restrictions were lifted from the Covid pandemic. When asked about her favorite part of the year, it was this return that stimulated her response: “My favorite part would probably be just being around a bunch of people that I can relate with. In our class, everyone’s super nice. Everyone’s funny and awesome. We all have things that are in common.”

Table 25

Individual Preview Responses: Elena

<table>
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<tr>
<th>Control-value Theory Components</th>
<th>Descriptor Types</th>
<th>Individual Interview Examples</th>
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</thead>
<tbody>
<tr>
<td><strong>Control Descriptors</strong></td>
<td><strong>Skills</strong></td>
<td>“I got all of them right.”</td>
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<tr>
<td></td>
<td><strong>Executive Functioning</strong></td>
<td>“I’ve never really had to study too much.”</td>
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<td></td>
<td><strong>Intentional Distractions</strong></td>
<td>“[If] it’s in a jingle...I get things stuck in my head.”</td>
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<tr>
<td></td>
<td><strong>Time</strong></td>
<td>“When they repeat it, it still doesn’t get stuck in my brain.”</td>
</tr>
<tr>
<td><strong>Value Descriptors</strong></td>
<td><strong>Appraisal Values</strong></td>
<td>“I realized I didn’t really like [mathematics].”</td>
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<tr>
<td></td>
<td><strong>Influencers</strong></td>
<td>“My favorite part would probably be just being around a bunch of people that I can relate with.”</td>
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</table>

Elena’s formative years were not much different than the other participants. She revealed that she was about three or four years old when she first learned about numbers. “I used to have
this little book...I would count ladybugs in the book.” She continued, “learning about numbers [was] more towards two...[and counting] more towards.” Elena stated that she learned how to add numbers in kindergarten and how to subtract numbers in first grade. She added that she learned how to do multiplication and division in third grade but also explained that around third grade she realized she did not like math because of testing. “Once we started with the MAP test, it got really hard. You had to practice all these things...multiplication...division. I think that’s when I realized I didn’t really like [mathematics].” However, around this same time she also had her favorite mathematics memory. “There was like Rocket Math or something, where we had a test and then we filled out online things...I got all of them right, and I was really happy about that.” Elena’s worst memory in mathematics class happened this school year, in sixth-grade, while working on an interactive site called GoFormative.5 “I couldn’t figure out one question at all...I got really upset. I really stressed over it.” Elena was able to resolve the situation by asking the teacher, but it was not something with which she felt comfortable.

Elena indicated during the focus group that she learned better with math jingles and games. She shared:

I’m a very visual person. If I see things, I remember them more. [If] it’s in a jingle...I get things stuck in my head really...easily. I think a game is like a fun thing. And...in my brain [it] associates math with fun...They help me learn about [mathematics].

However, she clarified her focus group response about how repetition can bring about the perception of boredom. “When they repeat it, it still doesn’t get stuck in my brain...I don’t understand it like five times...they repeat it over and over...and I get bored...and frustrated.” In contrast, she also noted that when she knew the mathematics skill and the teacher continued to

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5 GoFormative is a web-based tool that allows teachers to create and distribute digital formative assessments, tasks, or assignments that are easily accessible from any electronic device.
explain, “I’m like, yeah, I understand this...I get bored when they are explaining stuff that I already know.” She clarified, “I’ve never really had to study too much.”

Elena was asked to describe what the boredom felt like. She mentioned experiencing feeling tired and having a difficult time focusing on instruction. She explained that boredom arises when she does not want to do something.

If I’m doing something I don’t want to do, I get bored. I do get more tired. I’m not as concentrated on things. Then the longer I do it, the more bored I get. So, I’m like, bleh (posture slumps). I stop thinking of good things.

Elena explained that she experienced boredom in her mathematics class when she was subjected to lecture while learning a new mathematics skill. “When [the teacher] would say this means this, and that means that it’s easier for me to forget it...I forget stuff easily and I get bored.”

Elena found a strategy that helped with the uncomfortable feelings of boredom was daydreaming: “[I] think of things that happened earlier, things that I do enjoy...that’s kind of what goes through my mind instead of actually thinking about the thing I’m doing...I don’t want to think of the thing that gets me bored.” Situations that did not produce boredom for Elena were when the teacher provided games and jingles. She contended that learning the skill of finding equivalent ratios was just enough of a challenge that she wasn’t bored. “I enjoyed ratios because they weren’t too hard. Yet, they were a little more complicated than elementary school.”

Individual Interview: Hazel

The next individual interviewee is Hazel. Table 26 previews the responses made by Hazel in her individual interview, which, once again, followed a similar protocol to the others, highlighting descriptors for control and value.
Hazel’s individual occurred two days before the end of the school year. Hazel’s interview progressed slightly off-script as she had mixed feelings about the school year and wanted to debrief for a few minutes. “I kind of just can’t wait for school to get out. It kind of seems pointless that I have to go to school...to do any work.” She complained that her least favorite thing about school was receiving a lot of assignments, without receiving an appropriate amount of time to complete the assignments: “The deadline is too close to when it starts.” Her frustration seemed to be coupled with not being able to find the time to do the things she enjoyed. Hazel shared she had plenty of interests outside of school. “I like going to the playground, and I like to ride my rollerblades. I like to make art...and play music. I play the cello.”

After this initial discussion, Hazel shared with the researcher that she was really young, before preschool -- two or three years old, when she started learning about numbers. Her dad helped her to learn how to count: “He’s really smart with math. He’s a professor.” Throughout this part of the interview, Hazel frequently made references to her father. Her progression through foundational math skills was similar to her peers’. She learned how to add numbers in kindergarten, subtraction in second grade, multiplication in third grade, and division in fourth grade. When deciding whether she liked or disliked math, Hazel told the researcher that it “depends”. The researcher asked Hazel to clarify. “I like math that’s...what’s the word...chances.” She rephrased, “I like probability...and I like ratios.”
When asked, Hazel described how she perceived boredom. She characterized it as a sensation of time slowing down and her thoughts wandering. “It just feels like (slowing down her speech) it’s just a waste of time. I just want to sit there and not listen...I brainstorm weird food combinations.” She said this feeling happened most frequently when the teacher gave too many assignments without allocating enough time. Hazel also shared that she perceives boredom when the teacher is giving instruction: “The hardest part of learning is when [the teachers] are just talking. I like to see things. It helps me know how...to problem solve it...and that it’s actually right.” She acknowledged boredom can also occur for her during review: “A lot of being bored in math class is...knowing old stuff.” However, Hazel was quick to add there were situations that

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<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>“I know what the questions are...it’s just hard to do all the steps and get every step right.”</td>
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<tr>
<td></td>
<td>Executive Functioning</td>
<td>“I don’t really need to study a lot.”</td>
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<td></td>
<td>Intentional Distractions</td>
<td>“I brainstorm weird food combinations.”</td>
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<td></td>
<td>Time</td>
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<tr>
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<td>Influencers</td>
<td>“He’s really smart with math. He’s a professor.”</td>
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</table>
did not produce the perception of boredom in her mathematics classroom. She specifically mentioned her interactions with her teachers: “I think my favorite part is my teachers because they're really fun, and they play games, and they help me learn well.”

Individual Interview: Graham

Shortly after Hazel’s individual interview was Graham’s. Table 27 previews the responses made by Graham in his individual interview, which, once again, followed a similar protocol to the others, highlighting descriptors for control and value. Graham was very eager in his individual interview to share many stories about his experiences in school. Like the other participants, he divulged that he was about three or four years old when he learned about numbers. Graham’s parents were a huge influence on his interactions with numbers: “My parents would always help me with numbers. [They] were like how many weights am I lifting. We do it with my little brother, too...he’s three.” Graham’s progression of learning math skills was similar to the others. He recalled learning how to add in kindergarten: however, he also associated that time with when he was introduced to a curriculum called Jolly Phonics:

It’s weird to say it...I haven’t said it in a long time. I knew how to write words and then...when we learned...going on to 1 + 1, (Graham exhaled in frustration), and then they said, if you have one slice of pizza and you have another slice of pizza, how many pieces of pizza do you have? I’m like (dramatically starts thinking). I’ve got two slices. Yeah, definitely first grade. That’s when I learned about numbers.

Graham said he also learned how to subtract numbers in first grade, while he learned how to multiply in third grade and to divide in fourth grade. By the time Graham was in fourth grade, he started to find math interesting. He then added when he started to really enjoy mathematics, “Once I was in 5th grade and 6th grade...I just thought [math] was amazing!”
Graham elaborated about feeling like other students monopolize the teacher’s time. He felt it took away from his learning: “All the other kids are chatting in the back….we’re pay[ing] attention...but there was this one kind of hard question for all of us.” Graham explained how the teacher helped the whole class with that one problem: “We’re doing it...we’re all done.” Those students who were not listening earlier first want help with one problem and then all of the problems. Graham shares his frustration: “I took them that long to do [question] one...[they] need help on number two...like, bro, we just did 15 minutes of ALEKs [and] it took you that time to do number 1.” Graham continues to share his frustration: “Pay attention...and don’t just say I

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<td><strong>Control Descriptors</strong></td>
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<td>“If you have one slice of pizza and you have another slice of pizza, how many pieces of pizza do you have?”</td>
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<tr>
<td></td>
<td>Executive Functioning</td>
<td>“We’re pay[ing] attention.”</td>
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<td></td>
<td>Intentional Distractions</td>
<td>“I occupy myself with music...it’s unreal.”</td>
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<td></td>
<td>Time</td>
<td>“We just did 15 minutes of ALEKs.”</td>
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<tr>
<td><strong>Value Descriptors</strong></td>
<td>Appraisal Values</td>
<td>“I just thought [math] was amazing!”</td>
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<td></td>
<td>Influencers</td>
<td>“My parents would always help me with numbers. [They] were like how many weights am I lifting.”</td>
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</table>
need help.” Graham explained that his classmates needed to be more specific about what they did not understand. “Say, can I have some assistance with the part you don’t understand.”

Graham recounted that he associates the perception of boredom with discomfort of knowing how to do something quickly and not having anything else enjoyable to do, “Once [I] know it...we did an entire lesson on it...I’m bored...I’m done with my work. What else is there to do?” Graham had a strategy though, “I occupy myself with music...it’s unreal.” He also said he found classes like STEM were not enjoyable, which in turn made him feel bored. In fact, he described his STEM class as a low point in the week: “I can’t really focus. I just can’t get into STEM. I don’t know why.” He also explained that he was bored in mathematics class when there was not enough work and the work was too easy.

Situations that did not produce the perception of boredom for Graham were watching movies like the one shown at the end of the school year: “It was just fun.” He also thinks games like Mindcraft are fun, especially when he gets to play with his best friend. “I think she’s so happy when she plays it...it’s super fun.” It also helped to have something to do when he was done with his work: “I like action...I need action.” He also felt mathematics and school were not as boring when he connected with a teacher. He remembered his second grade teacher being really nice: “Man, I loved her.” Graham also enjoys the way his current mathematics teacher presents instruction: “She makes it fun.”

Individual Interview: Ivy

The next to the last individual interview was Ivy’s. Table 28 previews the responses made by Ivy in her individual interview, which, once again, followed a similar protocol to the others, highlighting descriptors for control and value.
Ivy, who was interviewed on the last day of the school year, revealed she had mixed feelings about the year: “It wasn’t even a real school year, because we were out of school for over six months.” However, she was excited that the district had just announced the 2021-2022 school year would provide in-person learning for all of the students.

Table 28

Individual Preview Responses: Ivy

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<tr>
<th>Control-value Theory Components</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>“In preschool, they would teach us how to count to 10. And then, they would teach us how to count to 10 in Spanish.”</td>
</tr>
<tr>
<td></td>
<td>Executive Functioning</td>
<td>“If I turn [my work] in early, I can have the teacher check it over, and I could go back and fix it...any mistakes.”</td>
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<tr>
<td></td>
<td>Intentional Distractions</td>
<td>N/A</td>
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<tr>
<td></td>
<td>Time</td>
<td>“Long division is really boring to me...or when we have to study multiple things and they’re really really long.”</td>
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<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>“Once I got the hang of [math], I really liked it.”</td>
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<tr>
<td></td>
<td>Influencers</td>
<td>“[Grandma] was usually the one trying to teach me stuff.”</td>
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</table>

Like the other interviewees, the next part of the discussion centered on Ivy’s progression of learning. She started learning about numbers around four years of age: “In preschool, they would teach us how to count to 10. And then, they would teach us how to count to 10 in Spanish.” However, she also remembered learning from TV shows and from her family, her
grandmother in particular: “[Grandma] was usually the one trying to teach me stuff.” Ivy learned to add numbers in kindergarten and to subtract in first grade. She learned how to multiply is third and began to learn about division at the end of third grade, but mostly in fourth grade. Ivy felt she could go to either mom or grandma to get help with math. Ivy stated she liked math; “It’s fun.” She found the challenge enjoyable: “I was really bad at it at first. I didn’t understand [math] at all. But, once I got the hang of [math], I really liked it.”

Ivy described the feeling of boredom as a sensation of being tired, a proclivity to daydream, and an inability to concentrate. She said she also starts to get fidgety: “I can’t sit still in my chair. I shift a lot.” Although Ivy stated she is fidgety, she did not take advantage of teacher-provided fidgets. She stated that skill difficulty can provoke boredom: “When it’s too hard, I find it more boring...I just give up halfway and I just kind of forget about it.” Repetition triggers the perception of boredom. For instance, “Long division is really boring to me...or when we have to study multiple things and they’re really really long.” Ivy identified too much time spent on learning a new skill could lead to the perception of boredom, especially when the teacher goes over a skill for longer than a week: “I tend to not concentrate as much because it is really boring.” However, Ivy clarified the amount of time a teacher gave for students to complete their work was beneficial: “I prefer too much time, because if I turn [my work] in early, I can have the teacher check it over, and I could go back and fix it...any mistakes.”

Ivy shared several ideas about how math was more interesting to her. She likes to work with manipulatives. In fact, she had a fond memory about jelly beans and kindergarten: “The teacher would give us snacks, jelly beans...and we would do adding jelly beans.” Ivy also explained that she enjoys math better when she is allowed to work with other students, which makes learning less boring: “I really like having other kids there. If I have trouble on something,
I can ask a couple of people first before I ask the teacher.” Although Ivy described the value of mathematics as important, she did not feel she was in control of learning and applying mathematics skills: “I’ve got some room to grow.”

Individual Interview: Jonah

The very last individual interview was Jonah’s. Table 29 previews the responses made by Ivy in her individual interview, which, once again, followed a similar protocol to the others, highlighting descriptors for control and value.

Table 29

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<th>Control-value Theory Components</th>
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<th>Individual Interview Examples</th>
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<tbody>
<tr>
<td>Control Descriptors</td>
<td>Skills</td>
<td>“If it’s fractions converted into decimals, it’s like I don’t want to do this.”</td>
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<tr>
<td></td>
<td>Executive Functioning</td>
<td>&quot;I don’t always need to study.&quot;</td>
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<td></td>
<td>Intentional Distractions</td>
<td>“I think about what I will do after school.”</td>
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<td></td>
<td>Time</td>
<td>“It’s boring when we were still doing stuff from third grade...we were repeating lessons that we did before.”</td>
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<tr>
<td>Value Descriptors</td>
<td>Appraisal Values</td>
<td>“If it’s long division...it’s like...yeah, that’s kind of fun.”</td>
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<td></td>
<td>Influencers</td>
<td>“I go to my dad.”</td>
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</table>
Jonah’s interview started about two hours after school got out on the last day. Jonah shared his excitement over receiving a sucker from the crossing guard: “It was the best part of today.” Following the icebreaker, Jonah discussed his progression of learning. He believed he was about four or five years old when he learned about numbers. He learned how to count and add numbers in kindergarten. Jonah did not go to preschool: “I watched a lot of Umizoomie,” a children’s television series that focuses on mathematical concepts using both live action and computer animated characters. The rest of Jonah’s foundational skills followed the typical pace of his peers’. He learned to subtract numbers in second grade, multiplication in third grade, and division in fourth grade. When asked if he liked or disliked math, he said, “I dislike math, but it’s not the worst thing in the world.” Jonah did not share what subjects might be worse, but added, “Meh, math is just not my thing.” Later in the interview, Jonah stated that he was pretty good at long division when asked what mathematics skill was least boring: “If it’s long division...it’s like...yeah, that’s kind of fun.” After a moment, he added, “If it’s fractions converted into decimals, it’s like I don’t want to do this.” When questioned about studying and boredom, Jonah didn’t feel it was necessary: “Sometimes [I get bored] when studying, but I don’t always need to study.” When the researcher asked who Jonah goes to when he needs help with his math, he said, “I go to my dad.”

Jonah was not sure he knew how to describe what boredom felt like. After the researcher gave him some examples, he said, “Like, I’m real tired. I want to mess around with stuff, and I just kind of space out...sometimes.” Jonah thought his skill level at solving mathematics problems could lend to the perception of boredom, “When [I’m] doing a really easy...simple...question it’s boring, [but] sometimes, when they are hard, too.” Repetition of skills, in particular those taught in previous years, were also boring: “It’s boring when we were
still doing stuff from third grade...we were repeating lessons that we did before.” More complicated mathematics skills make it hard to remember the steps, “I just forget it over time.”

Jonah thought more frequent breaks would alleviate the perception of boredom. When the researcher asked how long Jonah thought he could sustain independent work on mathematics, he said, “10 to 20 minutes.” Jonah thought fewer problems would also be helpful, but he did not suggest a number. When Jonah was feeling bored, his strategy was daydreaming: “I think about what I will do after school.” The activities that he preferred to do instead of mathematics was riding his bike, watching shows, and playing video games. After a pause, Jonah gestured to a shelf of books and said, “I have a lot of books that I’m going to need to read.”

As the interview wrapped up, Jonah seemed to relax and started chatting with the researcher more informally. He reminded the researcher about how unique this school year had been, in particular, the participants had spent three-quarters of the year learning remotely. It was not lost on the researcher that this unique setting impacted academic-emotions, specifically boredom, as much as any traditional setting.

**Individual Interviews Conclusion and Summary**

The individual interviews provided an opportunity for participants to elaborate on their responses during their focus group interviews. These elaborations included discussion on which settings and activities evoked the perception of boredom, strategies the participants used when boredom was perceived. The interviews provided the researcher with data that better showed how some participants could experience boredom but did not equate that perception to finding the core class of mathematics boring.
The individual interviews also allowed more discussion on the perception of boredom in testing, specifically standardized tests like MAP and the IAR. As the evidence of the individual interviews show, these sixth-grade mathematics students were able to voice their perception of boredom, within the context of control and value, in the three academic settings: classroom, studying and/or independent learning, and testing. This discussion was important as this data was not provided by the survey analysis, since there was no survey item on boredom in testing. The following chapter is a discussion of these findings, synthesizing the quantitative and qualitative results.
This study was designed to answer the overarching question: How does the achievement-emotion of boredom relate to the academic agency of middle school mathematics students? During the time the data were collected for this study, the institution of education, along with all other aspects of society, was functioning under strict regulations of a Covid 19 pandemic, which made for a unique setting to conduct a study. Collecting data in the setting of a pandemic was considered while also applying the components of control-value theory.

The major components of control-value theory address how achievement-emotions impact academic outcomes and provide a framework for analyzing emotions (Pekrun, et al., 2007). Control-value theory maintains that when engaging with an object of focus, appraisals are based on control and value that elicit an emotion connected to achievement (Pekrun, et al., 2002). “This central part of the theory can be summarized by the proposition that students experience emotions when they feel in control of or out of control of activities and outcomes that are subjectively important to them” (Pekrun, 2016, p. 132). The following is a discussion of the study’s findings, which includes consideration of the impact of a pandemic as a backdrop for receiving instruction, testing, and academic agency. The discussion will be followed by recommendations for teachers as stakeholders.
Discussion

The findings offer a rarely given opportunity for sixth-grade students to voice their lived experiences, such as learning during a pandemic and perceptions of boredom in mathematics classes. This chapter includes discussion about the study’s themes: Covid 19 pandemic, testing, and academic agency. It also makes recommendations for sixth grade mathematics teachers, states limitations of the research, and suggestions for further study.

The first phase of the study, which used the AEQ-M survey (Pekrun et al., 2005), presented students with survey items on achievement-emotions, including boredom, in three different settings: classroom, studying and/or independent learning, and testing. The statistical findings were similar to those of Pekrun (2006) and his colleagues (Pekrun et al., 2011). The perception of boredom was perceived to different degrees in each of these three settings. However, during the implementing of and discussions in the focus groups and individual interviews, an additional setting stood out, and that was the challenge of learning in a pandemic.

Schooling and Boredom During Covid 19

This study investigates the achievement emotion of boredom within the context of sixth-grade mathematics and its three settings. However, an unexpected fourth setting occurred during the time of the study, which could not be included in the data analysis of the quantitative phase. However, this indisputably unusual lived experience for these participants was discussed during the qualitative phase in the focus groups and in the individual interviews. Students were receiving instruction and attending school remotely during the Covid 19 pandemic. As a result of this, a discussion of it is included in this dissertation.
News of a potential pandemic began to surface in the last months of 2019, and by late winter in 2020, Covid 19 took hold and changed everyone’s life. On Friday, March 13, 2020, instructional staff were told to be prepared in the event the district would switch to remote learning. That evening the district’s interim superintendent sent a letter to all staff, but specifically instructional staff, as well as the district’s families that remote instruction would begin Monday, March 16, 2020. At the time of the email, the plan was set for two weeks of remote learning; however, the students in the target district completed the 2019-2020 school year receiving instruction remotely.

Students in the target district did not re-enter the buildings until February 15, 2021, almost a full year from the start of remote learning. Even then, the instruction was a hybrid mix of remote and face-to-face learning. To accommodate the hybrid schedule, students were divided into groups and days called A and B. Morning classes were taught on Mondays and Tuesdays, afternoon classes were taught on Thursdays and Fridays, and all classes were given a short amount of time on Wednesdays. Afternoons were set aside for virtual office hours. This was not an unusual schedule for hybrid learning in schools across the nation (Gross et al., 2020; Center on Reinventing Public Education, 2020). Office hours were not mandatory, so the participants did not see it as a time to connect with their instructors. As Uri explained it, “It takes more time. Because after [school], can I play games? No.” Jonah added, “We [can] go to office hours if we need help with tests,” but he added that he went to his dad if he needed help with math.

Miller (2021) noted that educators at this time were working to (re)build the teacher-student caring relationships that, based on control-value theory, provide value to actions and outcomes in the form of attaining recognition from teachers while persisting in studying (Pekrun,
The isolation created remote learning and a total reliance on technology, made teacher-student caring relationships difficult (Miller). The sixth-grade mathematics students in this study shared in the focus groups and individual interviews how this form of instruction impacted academic agency while perceiving the achievement-emotion of boredom, specifically their sense of value.

Means and Neisler (2021) along with research by the National Academies of Science, Engineering, and Medicine (2017), Jaggars and Xu (2016), and Dabbagh et al. (2019) found that online instruction that included choice, interactivity, feedback, scaffolding for student self-regulation and reasoning could add value as well. However, the students in these studies who reported value (and therefore a lack of perceived boredom) in the online forms of instruction and learning had also volunteered to participate in online learning programs. For students attending school in the target district during the pandemic, remote learning was not a voluntary choice and interactive sites that had been readily available to the instructors were now limited. The technology coordinator (personal correspondence) explained that one more added challenge was creating secure platforms; therefore, choice of sites, interactivity, feedback, and scaffolding were not freely obtainable and limited the ways the instructors could deliver curriculum and interact with their students.

The participants in the current study identified how remote learning changed their relationships with their instructors, reduced the value of the learning activities, and presented the potential to increase their perception of boredom. They explained their loss of connectedness. For these participants, their years in elementary school had been face-to-face instruction and mathematics manipulatives could be provided without fear of spreading the Covid virus. Chris shared, “We get way less help in middle school.” The researcher asked if Chris felt this was
because of Covid. Chris responded, “My [elementary] teacher would help us. They helped us by bringing out blocks or…or calculators.” Uri added, “We have calculators [now], but the teachers would give us more attention.” Declan shared, “It feels like the teacher gives up…Watch this movie…[It] never helps.”

The shortfalls included, but were not limited to, performance outcomes, personal interactions, and individual access to technology. Prior research has shown that students with less preparation for online learning earn lower grades (e.g., Bettinger & Loeb, 2017; Means & Neisler, 2021: Xu & Jaggars, 2011, 2013). Additionally, although online courses can be viewed as more flexible in meeting the needs of personal schedules, these same courses offered fewer opportunities to interact with peers and the instructors (Bali & Liu, 2018; Horspool & Yang, 2010; Means & Neisler; Platt et al., 2014), which can be attributed to loss of value (Pekrun, 2006). Another shortfall can be holding students accountable for academic performance and deadlines when computing devices and/or internet connections are unavailable in some households (Asch, 2020; Means & Neisler). Means and Neisler (2021) found that “more than 1 in 6 students experienced frequent internet connectivity issues and/or hardware and software problems severe enough to interfere with their ability to continue learning in their courses (p. 8). These challenges were evident in the homes of the study’s participants. The students with multiple family members using Wi-Fi noted their connections could be sluggish and frequently interrupted. Declan complained, “The Wi-Fi [is] slow…it takes forever to load.” Chris agreed, “the internet [goes] up and down,” and Ben shared that waiting for Google Meets to load often led to other distractions, “I’ll play on my phone.” For Ben and many students in the target district, having Chromebooks that were not connecting quickly to the Internet was a technical
shortfall; however, it was one shortfall that was quickly addressed by the target district’s technical department.

Testing was another setting in which the participants perceived the achievement-emotion of boredom, as presented in Chapter 4. According to Pekrun et al. (2005), boredom can be perceived when control is either high or low, but the value of the activity does not exist.

Testing and Boredom

Testing is one of the three settings for the AEQ-M (Pekrun, 2005). While the survey items within the setting of testing address eight achievement-emotions, boredom is not included. Pekrun (personal correspondence, 2021; Appendix F) disclosed that this decision was due to the belief that testing was too high stakes for the perception of boredom to occur. State and federal standardized testing (in this case, the Illinois Assessment of Readiness [IAR] (Illinois State Board of Education, 2019) and the Measure of Academic Progress [MAP] test (Northwest Evaluation Association, 2016) is a high stakes way to assess students’, teachers’, and schools’ performances (Olsen, 2020) and is considered essential for creating a snapshot of students’ educational needs (ESEA, 1965; Olson). The high stakes perspective may be true for stakeholders, like teachers and administrators, but the focus group and individual interview findings show these students perceived boredom in the test-taking setting of mathematics, particularly during standardized tests like the MAP and IAR. For instance, Jonah stated he anticipated perceiving boredom prior to taking the standardized tests as well as after the tests were completed. Jonah shared how he felt before the test. “I know it’s going to be hard. I keep thinking…this should be easy.” The researcher asked Jonah how he felt when tests were hard. “When it’s like hard, it’ll be boring.” The researcher inquired about after a test like MAP,
how did Jonah feel? “My [mind] is telling me something…get your mind off it, after you’re done. But, I can’t listen to music.” Ivy agreed with Jonah adding, “When we do get assigned math homework, I usually listen to music to try and make it more fun. We can’t listen to music during tests.” Jonah followed up with, “Tests are boring most of the time.”

In a different conversation about testing and boredom, Hazel shared that it was difficult to concentrate because of the boredom caused by algorithm requirements during tests: “It’s just so hard to do all the steps and get every step right.” Difficulty, which is characterized by minimal control over an activity (Pekrun, 2006), was also a precursor to the perception of boredom for Elena. When the topic of MAP testing presented itself in her interview, she had this to say: “MAP tests are the worst. I really don’t like MAP tests. They’re hard. Very stressful. Once we started with the math MAP test, it got really hard, and [I] had to practice all of these things.” When the researcher asked Elena if the perception of stress and boredom were the same experience, Elena stated, “I’m bored because it’s hard. I’m stressed because I know I am supposed to do well.” The expectation for students like Elena and the other participants comes from influencers, such as parents, teachers, and peers. The value of a task often comes from these influencers.

The participants’ responses reflect boredom perceived in relation to control-value theory: the students’ control of a skill is low (or high) and they see no value in the task. For instance, Jonah struggled to explain when he perceived boredom, finally stating, “Maybe when [I’m] doing a really easy…simple…question or something.” The researcher asked a clarifying question: “So, for you, when the questions are really easy, you get bored?” Jonah agreed but added, “Sometimes, when they are pretty hard, too…It doesn’t matter.” The researcher asked Jonah to clarify what didn’t matter. Jonah stated, “The tests.”
In this study, the perception of boredom was identified by the participants prior to, during, and/or after a test. The participants shared that often the value of their mathematics experiences, such as testing, came from their peers, family members, and specifically teachers rather than from testing situations. When the participants perceived boredom, some reminded themselves of these influencers and the value shared by them. For instance, in Ava’s interview, she stated her perception of value for classroom tests as “I just feel like it’s more important…the teachers explain it to you…I should have been listening.” Ava did not want to let her teachers down. After further thought and discussion, Ava elaborated on her perception during high stakes testing, like IAR. She noted, “It’s not as important in the world. It’s not like you’re going to be homeless, if you don’t do well on [the IAR] …It’s not the end of the world.” Ben explained similar experiences in his individual interview. He shared how he perceived boredom during testing, both classroom and high stakes tests like the IAR. First, he discussed his sense of control over mathematics skills. He reported, “Hard problems…makes it more difficult…I really don’t get it and it’s hard.” The researcher asked Ben if he valued or thought tests were important. He disclosed, “They are important to my parents…If I get a bad grade or something, I would redo it.” After some consideration, Ben added, “You can’t redo the big tests.” The participants shared that the value of their mathematics experiences came from their peers, family members, and specifically teachers rather than from the testing situations. Their recognition of, understanding of, and ability to influence their perception of boredom in multiple situations illustrates their use of self-regulation to achieve academic agency, the final theme.
In this study, the data were analyzed to answer the overarching research question: “How does the achievement-emotion of boredom relate to the academic agency of middle school mathematics students.” Larson and Angus (2011) describe agency as the ability to set and achieve mathematics related goals while navigating the attributes of boredom. According to Pekrun et al. (2010), the attributes of boredom are described in terms of unpleasant feelings capable of altering the perception of time and reducing the physiological feelings of motivation. Csikszentmihalyi (1975) contends that people use patterns of behaviors to reduce those unpleasant feelings and give structure to the experience of boredom. For these sixth-grade students, these patterns of behaviors included a range of physical movement from restlessness in a chair to the student deliberately getting up and walking from their desk to a pencil sharpener or wastebasket. Other patterns of behaviors also included chewing on a pen or the rhythmic tapping of a pencil as well as talking to a neighbor or blurting out random noises, reading a book, daydreaming, or doodling. Csikszentmihalyi suggests that this liveliness, no matter how inappropriate, provides an interruption from boredom by combining awareness and action in the confines of a specific activity.

This interruption provides the opportunity of academic agency, set and achieve scholarly goals, to get follow through on the mathematical expectation. The awareness, the perception of boredom is uncomfortable. If the student perceives boredom, control, whether high or low, is irrelevant; it is the lack of value that comes into play. Agency allows the student to create a situation that is within his or her control and chooses an activity they value, changing, even for the moment, their comfort level and the achievement-emotion perceived.
In the current study, Ben shared he valued movement but used fidgets in his classes, like mathematics, where physical activity is not conducive to a productive learning environment. The enterprise of choosing and using the fidget is an example of Ben exercising control (Pekrun, 2000, 2006; Pekrun et al., 2007; Pekrun et al., 2002; Pekrun & Stephens, 2010; Story, 2013), while providing unobtrusive movement. Fidgets provided Ben with a sense of physical activity, something he values, so for the time being, his perception of boredom was replaced with enjoyment of an activity (Csikszentmihalyi, 2000, Pekrun, 2006). Pekrun, agreeing with Csikszentmihalyi, argues that enjoyment in turn can foster engagement and creative problem solving, which is an essential attribute for success in mathematics. Furthermore, Ben’s use of control and value in his mathematics environment gave him academic agency, the ability to set and achieve scholarly goals (Larson & Angus, 2011). Analysis of the data collected in this study paints a picture of how control and value, along with a student’s ability to modify behavior (self-regulation) helped students like Ben maintain academic agency.

Ben’s academic agency and pattern of behaviors illustrates the components of control-value theory (Pekrun, 2006) as well as patterns of behavior that are associated with Schunk’s (2012) processes of self-regulation. Self-regulation allows the student to achieve academic agency by pushing past, which is an act of control, peripheral factors such as the perception of boredom. The basic system of self-regulation includes 1) self-observation, 2) self-judgment, and 3) self-reaction. In addition to this system of self-regulation, one can take into consideration Pekrun’s (2006) appraisal antecedents of control-value theory that produce achievement emotions: prospective outcomes, retrospective outcomes, and activity.
Triad for Boredom Agency

The major finding of this study is the triad for boredom agency. The researcher of this study developed the triad concept by combining components of control and self-regulation. The triad for boredom agency illustrates the cyclical pattern of behavior demonstrated by the participants of this study. This researcher developed the triad by analyzing the qualitative data provided by the participants’ elaborations of perceiving boredom in the focus group and individual interviews. The researcher found the triad of combined patterns of control appraisals and self-regulation was repeated as many times as needed for the student to find agency.

First, the student acknowledges the perception of discomfort, identifying it as boredom. Coinciding with acknowledging the perception of boredom, the student recognizes it is hindering either the attainment of success or the avoidance of failure. Second, the student compares their current performance to their goal and considers whether the outcome is caused by the self or external circumstances. Finally, the student chooses a cognitive or behavioral response by pulling from a set of tools that will allow the individual to focus for the moment on the action rather than the outcome. This combined pattern of three behaviors distracts the student from or interrupts the student’s perception of boredom (see Figure 15).

The first pattern of behavior the researcher observed about academic agency was the students’ ability to self-observe or identify the discomfort that comes with boredom. The student self-regulates by adapting his or her behavior in the presence of external factors. For instance, Ava gave an example of self-regulation while also self-identifying that she perceived boredom during classroom instruction when the teacher was repeating instructions given earlier in the week. Ava identified when it happens “we’re just doing things we already know…that’s the
most boring part for me. I can just sit there…or…I go ahead on my work…I do it quickly, just to get it over with…then I just sit there…just watching.” When Ava says, “We’re just doing things we already know…that’s the most boring part,” she is demonstrating the process of self-regulation: self-observation. Ava has also made an assessment of an activity as having no value, hence articulating her perception of boredom and prepping herself to consider prospective outcomes. She has assessed that the current task will not attain success or avoid failure.

Figure 15: Triad for boredom agency.

Ava then continues move to the second behavior in the triad for boredom agency. She makes a judgment of herself, recognizing that boredom has the potential to interfere with a goal, such as learning a mathematical skill. With this self-judgment, Ava considers ability to control the outcome. She states, “I can just sit there…or…I go ahead on my work.” Ava has assessed and decided that she has control when she explains, “I do it quickly.”
Ava’s decision to work ahead leads to the third of the observed behaviors of the triad of agency in boredom. She engages in a self-reaction or behavioral response that will provide a distraction or interruption of the perception of boredom. In the example that Ava gave, she shares, “I go ahead on my work…I do it quickly, just to get it over with…then I just sit there…just watching.” Ava has chosen several activities—working ahead, sitting, and just watching—both cognitive and behavioral responses. Her control is high in this scenario. If there is value, the perception of boredom can be alleviated for the time being. For Ava, that act of choosing to work ahead, to sit, and to watch has value in the moment.

Most of the participants were able to identify their own perceptions of boredom. They could identify unpleasant feelings such as the perception of time being altered and reduced physiological feelings of motivation. The participants could assess whether these perceptions could be mitigated by appropriately disrupting external circumstances while controlling outcomes such as gaining success and/or avoiding failure. Finally, most of the participants were able to share the activities they used to temporarily assuage if not completely eliminate their perception of boredom, even if for a short period.

This study’s researcher developed the concept of the triad for boredom agency, outlining its working pieces—identification, assessing, creating control and value—to provide an understanding of how students achieve academic agency when confronted with the perception of boredom. Fostering academic agency may require educators to revise how they address boredom in the sixth-grade mathematics classroom. The phrase “I’m bored” tells instructors the student is actualizing the first step in the triad for academic agency when confronted with the perception of boredom. Instructors will do well to scaffold this first step to self-judgment and then self-reaction, so the student has control while providing value through choice and changing the
achievement-emotion perceived from boredom to something more positive like enjoyment. The data collected in this study on academic agency, control, and value provide a base for sixth grade mathematics teachers to consider when planning for testing days.

Recommendations for Middle School Math Teachers

Pekrun (2006) contends that all achievement-emotions are perceived as a result of one’s control of and value for the object of focus. Therefore, the perception of boredom is the result of either high or low control paired with no value placed on the object of focus. This study investigated the connection between academic agency and the perception of boredom. The ultimate intent of synthesizing the findings was to help stakeholders understand and support the academic agency of sixth-grade mathematics students when they are faced with the perception of boredom.

The researcher is one of those stakeholders, a sixth-grade mathematics instructor. During completion of this study, the researcher found she was reconsidering some of her instructional practices and applying information she had gleaned from her participants’ responses. She thought about what students had discussed about control and value and reflected on how students experienced boredom before, during, and after a mathematics activity such as tests and in particular the big tests like IAR. The researcher considered how she could meaningfully scaffold control and value with self-regulation, creating academic agency for her students.

The researcher reflected on Pekrun’s (2006) definition of control and whether subjective control (personal preference or choice) or action control (ability to initiate, perform, and/or master a skill) coupled this with the information provided by the participants. This marriage of ideas helped the researcher create a classroom environment in which students had more
opportunities for both subjective and action control. Currently, student choice includes, but is not limited to, flexible seating, movement breaks, choice in interactive skill building sites, listening to music, and the use of fidgets. Flexible seating was identified by Kobe as a desired option, explaining the advantage of remote learning: “I can sit on the floor.” Movement breaks were important to Chris who shared, “I like running around.” Interactive skill building sites also gave students a sense of control. Ben shared he was fond of Blooket because they “didn’t feel like math.” He then shared another learning site, “I like when we’re doing GoFormative, we can do it ahead…if I can’t get a question, [I] skip over that question and go over it with you.” Since the interviews, the researcher has added another mathematics skill-building interactive site to her repertoire the students may choose. Allowing students to have opportunities to listen to music while working in math class was an easy way to incorporate choice and subjective control. It was Tiana who reminded the researcher of this: “I do love music; some background noise.” Finally, adding a fidget bucket to the researcher’s classroom was another quick and easy way to provide subjective control, remembering what Declan had shared in his interview: “If [I] had a fidget, then [I] would use a fidget.”

The researcher has also tried to increase her students’ opportunities for action control by expanding the formats for mathematics skill building. For instance, the researcher provided student-created interactive journals to scaffold skills. In these journals, students could create the tools frequently seen in poster form on the mathematics classroom walls. The first page in the journal is dedicated to a multiplication chart. Instead of simply printing out a chart, the students created their own, expanding on the traditional 12 x 12 chart seen in most purchased commercial posters. Another page in the journal includes vocabulary frequently seen in word problems, but the students generated definitions that had more meaning for them. Now that many restrictions
were relaxed or even lifted, the researcher once again could provide and use mathematics manipulatives to support learning new skills. One example of this is fraction towers, 3-dimensional cubes that fit together illustrating comparisons of fractions, decimals, and percentages. Peer collaboration allows for groups students, those who have mastered a skill along with those who are approaching mastery, to work together to solve mathematical problems. Collaboration with peers not only provided productive struggle (Russo et al., 2021), but control of action and value, as well. These peers were influencers who added value to the experience, which helped alleviate the perception of boredom and allowed for the perception of more positive achievement-emotions like enjoyment (Pekrun, 2006). An example was given by Ava, “I want to be in a group with people. I can show them how I work…then, we can talk.” These peer collaboration groups work well for studying before a test as well as reflecting on and correcting tests.

This study has influenced the researcher and how she prepares her students for testing, especially when discussing standardized tests. Frequently the protocol for proctoring standardized tests limits the control both students and teachers have over the amount of time allotted for the tests and how breaks are distributed. Addressing value during standardized tests like the IAR is also difficult, as instructors and students do not see the scores until the following school year. For students, this lack of immediate feedback obscures any potential value, so during the standardized testing, the students were allowed to choose from a variety of fidgets before testing began and were allowed to use the fidgets during the entirety of the test. Students were given activity packets with an assortment of student-interest exercises, such as hidden pictures, doodling, mazes, Sudoku, etc. Part of the standardized testing protocol requires collecting all materials at the end of the testing session, so the researcher shared information
about the packets to guarantee she was in compliance. Students could also choose to read a book, which had always been an option in the testing protocol. The choice of fidgets and activities after the completion of the test provided the students with a sense of control, which in turn provided some value before, during, and after test-taking. Adding control and value should reduce or eliminate their perceptions of boredom, providing the student a path to academic agency.

Limitations and Suggestions for Future Research

While the findings for this study, which sought to explore the perception boredom and academic agency in sixth-grade mathematics classrooms, have firm implications for the teaching policies and practices in relation to middle school students, additional research will strengthen and clarify the current findings. Many of the suggestions for future research are based on this study’s limitation that the participants volunteered from two middle schools in a single district. The results were collected from a very specific grade level and may not be similar in other middle school grades. Furthermore, although the sample size was sufficient for qualitative data collection, the qualitative findings were based on self-report data from 11 sixth-grade mathematics students. A similar study with participants from more school districts would expand the demographic base and offer more diverse perspectives from a variety of communities. Although the target district is demographically diverse, a larger pool of participants would allow for comparisons among and across racial, cultural, gender, and socio-economic demographic groups.

This study would have been further strengthened with the addition of specific survey items on the AEQ-M (Pekrun et al., 2005) survey. The quantitative data on the achievement-
emotion of boredom were collected through Pekrun’s AEQ-M survey, measuring achievement-emotions in three classroom settings: classroom instruction, studying and/or independent learning, and testing. However, there were no survey items on the achievement-emotion of boredom in the section of testing. The findings of this study demonstrated that for sixth-grade mathematics students, the perception of boredom was perceived prior to, during, and after test taking. Future studies on the achievement-emotion of boredom may benefit from creating a survey similar to Pekrun’s AEQ-M but also include survey items on boredom in the setting of testing.

This study triangulated quantitative and qualitative data of the participants’ perceptions in a single school year; however, a longitudinal study could clarify how academic agency is positively or negatively affected by the perception of boredom over a period of years, from sixth grade through high school graduation. The data in the current study were collected during a year of non-traditional modes of instruction, heavily reliant on technology and limited personal connection to teachers because of a pandemic. If this study had been conducted to include multiple opportunities for collection of both quantitative and qualitative data, it would not be restricted to the experiences of these students in one point in their academic careers. A longitudinal study with the same participants over multiple points in the future could offer comparisons of perceptions of boredom throughout middle school and into high school. This comparison could then take into consideration control and value participants possess for mathematics and its settings, along with self-regulation, in the face of cognitive and emotional development.

Additionally, the focus groups and individual interviews generated conversations about the perception of other emotions, such as stress, that are not listed as an achievement-
emotion. Although the participants recognized that stress and boredom were not same, the two were frequently paired without enough specificity to explain the perceptions separately. Future studies could look at why stress is paired with boredom or if stress is an achievement-emotion on its own. Continuing to pursue these topics with additional data collected could further contribute to literature on how control and value, academic agency, and the perception of boredom are connected.

**Conclusion**

This study fits into Pekrun’s (2006) theory by providing data, which support that control and value do mediate the achievement-emotion of boredom, students perceive boredom in the classroom settings of classroom instruction and studying and/or independent study, and there is a significant difference between these settings, with boredom being perceived more in classroom instruction. This study adds to Pekrun’s (2006) research, through the qualitative analysis, by providing dialogue of lived experiences of sixth-grade students who perceive boredom during testing, even more so than in the setting of classroom instruction.

The researcher came into this study with a preconceived notion about the perception of boredom. The notion was that boredom was bad, and that it could negatively impact academic success. The research literature mostly supports this. Boredom is capable of altering the perception of time and reducing the physiological feelings of arousal (Pekrun et al., 2010). It can be caused by a lack of challenge (Csikszentmihalyi, 1975) or a low perception of ability (Lichtenfeld et al., 2012). Control-value theory (Pekrun, 2006) explains the achievement-emotion of boredom as the result of high or low control coupled with the lack of value for the object of focus. And yet, most of the sixth-grade mathematics students in this study, who could
identify boredom and share their experiences perceiving boredom, were able to navigate the negative attributes of this perception. Their end of the quarter grades indicated they were successful in their mathematics class, despite perceiving boredom. On the surface, it appeared that boredom did not impact academic achievement.

It wasn't until the end of the study, after the analyses were finished, that the researcher, as a teacher, understood that academic agency helped the sixth-grade mathematics student navigate learning while perceiving boredom. Understanding this process helped the researcher, as a teacher, identify a course of action. The perception of boredom is a learning opportunity. Now, when a student announces they are bored, this researcher, as a teacher, knows better how to scaffold development. She will help the student recognize that perceiving the uncomfortable feeling of boredom is the first step in academic agency. The researcher will guide the student through understanding what parts of an outcome are due to external circumstances and those over which the student has control. The researcher, as a teacher, will help the student build a figurative toolbox outfitted with student-choice distractions, which in turn will provide control and value. This triad should help to circumvent the perception of boredom, replacing it with a more positive achievement-emotion, such as enjoyment.
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APPENDIX A

RECRUITMENT LETTER
Dear Sixth-grade Mathematics Students and Parents/Guardians:

As a graduate student at Northern Illinois University, I am conducting research as part of the requirements for a doctoral degree in Curriculum and Instruction. The purpose of my research is to understand how the achievement-emotion of boredom impacts academic outcomes.

**Students:** If you are currently enrolled in a sixth-grade mathematics class, are willing to participate in my study, and have parental/guardian permission, you will be asked to do the following:
- Respond to questions on the Achievement Emotion Questionnaire for Mathematics. There are 60 questions about your perceived emotions in mathematics
- Participate in a focus group with up to seven peers to answer questions about your perceived emotions regarding mathematics
- Participate in an individual interview to answer questions about your perceived emotions regarding mathematics

Your name and/or other identifying information will be requested as part of your participation; however, the information will remain confidential.

**Parents:** Please read and sign the attached permission forms for each phase of the study. The phases include: AEQ-M Survey, Focus Group, Individual Interviews

Respectfully,
Tammy Judkins
CRMS Math Teacher
Key Information

- This is an assent form for your participation in a survey on achievement-emotions in mathematics (i.e. enjoyment, anxiety, anger, boredom, hopelessness, pride).
- This is a voluntary research study on the perceptions of achievement-emotions, particularly boredom, perceived by sixth-grade students during mathematics.
- This six week study involves students responding to questions in a survey about achievement-emotions felt during mathematics instruction, independent learning, and test-taking. **Some students will also participate in focus groups and individual interviews.**
- The benefits include possibly benefitting from psychological insight about your perceived achievement-emotions in the sixth-grade mathematics class while participating in focus groups and individual interviews as well as benefiting from an optimize learning environment as a result of the data obtained; the risks include triggered negative memories or other emotions that are upsetting to the participant(s). The school support staff will be available to work with students if this occurs.

I agree to participate in the research project titled Achievement-Emotion, Boredom, and Academic Outcomes being conducted by Tammy Judkins, a graduate student at Northern Illinois University.

I have been informed that the purpose of the study is to explore sixth-grade students’ perspectives regarding their achievement-emotion experiences in sixth-grade middle school mathematics learning environments.

I understand that if I agree to participate in this study, I will be asked to do the following: complete a 72-question likert-response survey through Google Forms; participate in a focus group meeting, which will be recorded for accuracy; and finally, interviewed about mathematics experiences.

I am aware that my participation is voluntary and may be withdrawn at any time without penalty or prejudice, and that if I have any additional questions concerning this study I may contact Tammy Judkins at [phone number].

I understand that if I wish to receive further information regarding my rights as a research subject, I may contact Dr. Elizabeth Wilkins [phone number], or the Office of Research Compliance at Northern Illinois University at 815-753-8588.

I understand that the intended benefits of this study include allowing middle school students the chance to share their perspectives on their experiences and achievement-emotions in the sixth-grade middle school mathematics setting. This information should help educators continue to develop assignments and activities that are interesting, worthwhile, enjoyable, and promote academic success for adolescent students.

I understand that all information gathered during this study will be kept confidential by allowing students to choose pseudonyms (fake names) so that real names will not be used in the publication. Information from student responses will be used strictly for research and academic
purposes. Students will also not be asked information of an intimate or controversial nature, but rather simply on achievement-emotions they perceive during mathematics.

I understand that my participation in this project does not constitute a waiver of any legal rights or redress I might have as a result of my participation, and I acknowledge that I have received a copy of this assent form.

**I agree to participate in the study**

Student Signature: ________________________________________________

**I agree to be audio and/or video recorded as part of the focus group process**

Student Signature: ________________________________________________
APPENDIX C

AEQ-M
(Pekrun et al., 2005)
Feeling and Thinking about Experiences in Math:
Achievement Emotions Questionnaire – Mathematics

This questionnaire concerns your feelings and thinking about mathematics at school. There are no right or wrong answers. We are simply trying to find out how you feel and think about your experiences in math. We are interested in your personal opinions, so please be candid in your responses. Your identity and your answers will be kept strictly confidential. The information will be used for research purposes only and will not be available for any other reasons.

The questionnaire consists of 60 items organized into three sections. All items are to be answered electronically on the provided Google Form. Please be sure to click on the bubble of your answer that corresponds to the item number in the questionnaire. Make sure to answer each question.

Your participation in this study is vital to its overall success, and your time given in completing this questionnaire is very much appreciated.

Thank you for your Support!
2005 R. Pekrun, T. Goetz, A. C. Frenzel. All rights reserved.

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**AEQ-M**

**PART 1 – CLASS-RELATED EMOTIONS**

Attending classes in mathematics can induce different feelings. This part of the questionnaire refers to emotions you may experience during math classes. Before answering the following questions, please recall some typical situations of being in a math class that you have experienced. Read each item carefully and respond using the scale provided. Record your answers clicking on the corresponding bubble for each question, 1 through 19.

**BEFORE CLASS**
The following questions pertain to feelings you may experience before attending math classes. Please indicate how you typically feel before you attend a math class.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</table>

1. I look forward to my math class.
2. When thinking about my mathematics class, I get nervous.
3. When thinking of my math class, I get queasy.
4. Math scares me so much that I would rather not attend school.
DURING CLASS
The following questions pertain to feelings you may experience DURING math classes. Please indicate how you typically feel during math classes.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</table>

5. I enjoy my math class.
6. I can’t concentrate because I am so bored.
7. I worry if the material is much too difficult for me.
8. The material we deal with in mathematics is so exciting that I really enjoy my class.
9. I am annoyed during my math class.
10. When I say something in my math class, I can tell that my face gets red.
11. I think the mathematics class is boring.
12. I enjoy my class so much that I am strongly motivated to participate.
13. I am so angry during my math class that I would like to leave.
14. I am so bored that I can’t stay awake.
15. I get angry because the material in mathematics is so difficult.
16. When I say something in my math class, I feel like embarrassing myself.
17. I get irritated by my math class.

AFTER CLASS
The following questions pertain to feelings you may experience AFTER having attended a math class. Please indicate how you typically feel after math classes.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
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<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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18. I think I can be proud of my knowledge in mathematics.
19. I am proud of my contributions to the math class.

PART 2 – LEARNING-RELATED EMOTIONS

Studying and doing homework assignments in mathematics can induce different feelings. This part of the questionnaire refers to emotions you may experience when studying and doing homework in math. Before answering the questions on the following pages, please recall some typical situations of studying and doing assignments in math which you have experienced. Read each item carefully and RESPOND USING THE SCALE PROVIDED. Record your answers CLICKING ON the corresponding bubble for each question, 20 THROUGH 37.

BEFORE STUDYING
The following questions pertain to feelings you may experience BEFORE studying and doing
homework in mathematics. Please indicate how you typically feel before you begin to study or do an assignment in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</table>

20. Just thinking of my math homework assignments makes me feel bored.
21. I’m so scared of my math assignments that I would rather not start them.

**DURING STUDYING**

The following questions pertain to feelings you may experience **DURING** studying and doing homework in math. Please indicate how you typically feel during studying and doing assignments in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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22. When doing my math homework, I am in a good mood.
23. I start sweating because I am worried I cannot complete my assignments in time.
24. My mathematics homework makes me angry.
25. I’m so bored that I don’t feel like studying anymore.
26. I am tense and nervous.
27. When I discuss the homework assignments with my classmates, I avoid eye contact.
28. I am happy that I understand the material.
29. I get angry because my math homework occupies so much of my time.
30. I worry whether I will ever be able to completely understand the material.
31. My math homework bores me to death.
32. I am very motivated because I want to be proud of my achievements in mathematics.
33. When I don’t understand something in my math homework, I don’t want to tell anybody.
34. I am so angry that I would like to throw my homework into the trash.
35. I enjoy doing my math homework so much that I am motivated to do extra assignments.

**AFTER STUDYING**

The following questions pertain to feelings you may experience **AFTER** having studied or done homework in mathematics. Please indicate how you typically feel after having studied or done assignments in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<td>5</td>
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</tbody>
</table>
36. After having done my math homework, I am proud of myself.
37. I am embarrassed about my lack of knowledge in mathematics.

PART 3 – TEST EMOTIONS

Tests and exams in mathematics can induce different feelings. This part of the questionnaire refers to emotions you may experience when taking tests or exams in mathematics. Before answering the questions on the following pages, please recall some typical situations of taking tests or exams in math which you have experienced. Read each item carefully and **RESPOND USING THE SCALE PROVIDED**. Record your answers **CLICKING ON** the corresponding bubble for each question, **38 THROUGH 60**.

BEFORE TAKING THE TEST / EXAM
The following questions pertain to feelings you may experience **BEFORE** taking a test or an exam in mathematics. Please indicate how you typically feel before taking a test or an exam in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</table>

38. I am very nervous.
39. Because I look forward to getting a good grade, I study hard for the test.
40. I feel down.
41. Even before I take the math test I worry I could fail.
42. I keep thinking that I don’t understand the material.
43. When I have an upcoming math test, I get sick to my stomach.
44. I keep thinking that I will never get good grades in mathematics.
45. I am so anxious that I would rather not take the math test.

DURING TAKING THE TEST / EXAM
The following questions pertain to feelings you may experience **DURING** taking a test or an exam in mathematics. Please indicate how you typically feel during taking a test or an exam in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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46. I enjoy taking tests in mathematics.
47. When taking the math test, I am tense and nervous.
48. I am annoyed that the teacher asks such difficult questions.
49. During the math test, I feel hopeless.
50. I am ashamed that I cannot answer my math teacher’s questions well.
51. I am so anxious that I can’t fully concentrate.
52. I would prefer to give up.
53. I am so angry that I would like to tear the exam paper into pieces.
54. I think that things are going great.
55. When taking the math test, I worry I will get a bad grade.
56. I have no energy.
57. I start sweating because my performance on the math exam embarrasses me.

AFTER TAKING THE TEST / EXAM
The following questions pertain to feelings you may experience AFTER taking a test or an exam in mathematics. Please indicate how you typically feel after taking a test or an exam in math.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
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<th>Agree</th>
<th>Strongly Agree</th>
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</table>

58. After a math test, I am proud of myself.
59. I am proud of how well I have done on the math test.
60. After taking a test in mathematics, I feel ashamed.

Demographics Question
61. What is your name: first and last?
62. What pseudonym would you like to go by?
63. What is your gender?
64. What was your final grade in math last year?
65. What is the grade you are receiving this quarter?

Thank you for participating in our research on mathematics emotions!
APPENDIX D

FOCUS GROUP QUESTIONS
Feeling and Thinking about Experiences in Math:
Achievement Emotions Focus Group – Mathematics

This focus group interview concerns your feelings and thinking about mathematics at school. There are no right or wrong answers. I am interested in your personal opinions, so please be candid in your responses. Your identity and your answers will be kept strictly confidential. The information will be used for research purposes only and will not be available for any other reasons.

The focus group interview will last approximately 60 minutes. The interview will be recorded for research purposes only.

Your participation in this study is vital to its overall success, and your time spent completing this focus group interview is very much appreciated.

Thank you for your Support!

Introduction:

- Hello, my name is Ms. Judkins and I am a middle school math teacher and also a student at Northern Illinois University. I am doing research on the emotions students feel in their math classes. I would like your help in my research. If you are willing to help, besides participating in this focus group, I would like to invite several of you to be interviewed individually. The questions I will ask you are about the emotions you may feel in your math classes. I will not be asking you to do math. You may decide not to answer any question and you may stop your participation in the focus group at any time. You may also decide not to continue to participate in my research.

Ice Breaker/Warm-up

- Let’s start by listing as many words that come to mind when I say the word “math.”

Initial Questions

- How do you feel about math now that you’re in middle school?
- Describe a difficult day in your math class.
- What things in your math class help or hurt your ability to learn math?
- What are some of the differences between the way your middle school math teacher teaches you math and the way your elementary teachers taught you math?
- Tell me about a time when you felt like you really understood something taught in your math class.

AEQ-M Question Elaborations

- I am going to read some of the questions that were on the AEQ-M survey that you took. Tell me what that question made you think about.
  - I can’t concentrate because I am so bored.
  - I think the mathematics class is boring.
  - I am so bored that I can’t stay awake.
  - Just thinking of my math homework assignments makes me feel bored.
I’m so bored that I don’t feel like studying anymore.
My math homework bores me to death.

Wrap-up
What pseudonym would you like to go by in my research?
You will need to remember your pseudonym in case I ask for this in the future.
Thank you for participating in this focus group and for taking the time to help me with my research. I will be contacting a few of you to see if you would like to do an individual interview. If you need to contact me about the questions in the focus groups, my email is:

The layout and design of this interview protocol was adapted from


Initial focus group questions were taken from

AEQ-M Question Elaboration focus group questions were taken from
Feeling and Thinking about Experiences in Math:
Achievement Emotions Individual Interview – Mathematics

This individual interview concerns your feelings and thinking about mathematics at school. There are no right or wrong answers. I am interested in your personal opinions, so please be candid in your responses. Your identity and your answers will be kept strictly confidential. The information will be used for research purposes only and will not be available for any other reasons.

The individual interview will last approximately 60 minutes. The interview will be recorded for research purposes only.

Your participation in this study is vital to its overall success, and your time spent completing this individual interview is very much appreciated.

Thank you for your Support!

Introduction:
- Hello, I just want to remind you who I am again. My name is Ms. Judkins, and I am a middle school math teacher and also a student at Northern Illinois University. I am doing research on the emotions students feel in their math classes. I would like your help in my research. The questions I would ask you are about emotions you may feel in your math classes. I will not be asking you to do math. You may decide not to answer any question, and you may stop your participation in the individual interview at any time. You may also decide not to continue to participate in my research.

Ice Breaker/Warm-up
- Tell me again what pseudonym you chose for yourself during the focus groups.
- How was your week?
- Tell me about a high/low moment from this week.
- What do you like to do for fun when you are not at school?
- What is your favorite/ least favorite part of school?
- What is your least favorite part of school?

Initial Questions
- I am going to ask you to think about when you were younger and the experiences you had with math...
  - How old do you think you were when you first learned there were things called numbers?
  - How old do you think you were when you first learned how to count?
  - Where did you learn about numbers?
  - Who did you go to when you needed help with math?
  - When/in what grade did you learn how to do
    - Addition
    - Subtraction
    - Multiplication
● Division
  ● How old were you when you started to like/dislike math?
  ● Tell me your best/worst memory about learning math.
  ● What are you currently working on in math?

Bridge to Focus Group Questions
  ● I noticed in the focus group you responded to ____________ question with ____________ Can you tell me a little more about that? (Repeat as needed.)

Wrap-up
  ● What questions do you have for me about my research or the questions I have asked you?
  ● Thank you for participating in this individual interview and taking the time to help me with my research. If you need to contact me about the questions in the focus groups, my email is tammy.judkins@d428.org

The layout and design of this interview protocol was adapted from


Bridge to Focus Group questions for the individual interview were partly taken from

Dear Tammy,

thank you for your interest in the AEQ. Enclosed please find the manuals for the AEQ and the AEQ-M, and please feel free to use the instruments in your research.

If you could inform me about any possible findings of your research once it is completed, this would be appreciated. I am especially interested in your analysis of boredom during test taking - we have usually left this out in our prior research, assuming that the stakes are too high for students to feel bored during tests, but this may be wrong in many cases.

Best wishes for your work,

Reinhard Pekrun

---

Reinhard Pekrun <pekrun@imu.de>  
Jul 8, 2020, 1:22 AM

to me •

I think it’s a good idea to investigate how students feel during remote learning. It’s to be expected that online, remote, and blended learning will be used more often in the future, not only for reasons of the pandemic recurring etc. but also because it can save costs. Is consistent with calls for parent-directed home schooling etc. - but there are so many obvious disadvantages.

Good luck with collecting data!

Best wishes, Reinhard Pekrun

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Reinhard Pekrun <pekrun@imu.de>  
Oct 27, 2020, 10:27 AM

to me •

Dear Tammy,

we didn’t include boredom in the test emotions section, because boredom occurs less frequently during tests and exams.

Yes the original AEQ-M items were in the German language, please see enclosed. However, the English AEQ-M scales have been validated many more times by now than the original German instrument.

Best wishes,

Reinhard