EXPLORING REFLECTIVE TRENDS IN ACADEMICALLY AT-RISK STUDENTS THROUGH MICROANALYSIS: IMPLICATIONS FOR SELF-REGULATED LEARNING AND ACADEMIC INTERVENTION

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Abstract

This study sought to examine the nature of reflection-phase processes exhibited by forty-two academically at-risk middle school students during a test reflection activity with mathematics exam scores. Specifically, the nature and types of students' attributions and adaptive inferences during a reflective activity were examined to gain insight into student perceptions of the causes of their academic performance and their perceptions of the ways to improve future performance in mathematics. In addition to exploring within-subject effects, this dissertation sought to identify group differences in students' reflective processes when comparing a group receiving a self-regulation intervention versus a remedial math intervention. A key finding was that the majority of student attributions and adaptive inferences focused on broad categories that were largely non-strategic. Students' attributions and adaptive inferences were also observed to be highly stable over time. Upon comparing interventions, a significant group difference was observed for strategic attributions, however, no other group differences emerged across other attribution or adaptive inference codes. Finally, thematic analyses of attribution and adaptive inference codes revealed that the majority of students' attributions and adaptive inferences were dominated by statements that focused on level of effort. Although less frequent, student's self-reflections were also shown to include references to a limited understanding of material, classroom participation, and help-seeking. Implications for educators and school psychologists are presented as well as limitations of the study and areas of future research.

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Introduction

Adolescence is a period of great developmental change. One of the contexts in which the developmental and social shifts of adolescence can best be observed is in school. As children move into middle school contexts, they often experience greater levels of independence (Eccles & Midgley, 2000; Steinburg, 1990; Wentzel, 1998) along with a shift in the expectations and demands of coursework and the teaching styles of those who teach them (Zimmerman, 2002). In middle school, students are no longer instructed by one teacher in a classroom for most of the day. Rather, they are asked to navigate expectations within different classrooms and teachers for each academic subject (Pickhardt, 2011). Coinciding with structural changes in their learning environment, students also face an increase in the rigor and quantity of homework, projects, and tests (Cleary & Zimmerman, 2004). As a result, of these vast changes experienced during the transition to middle school, students are naturally confronted with challenges and are frequently called upon to evaluate and reflect on their performance.

Defined as the mental consideration of some subject matter, idea, or purpose, often with a view to understand or justify one's beliefs, reflection is the process by which one examines his/her assumptions and assesses his/her convictions (Dewey, 1933; Merriam-Webster Dictionary, 2011; Mezirow, 1991, 2006). However, this is not the way that reflection is typically construed in daily life. Rather, daily reflections tend to reference one's thoughts and do not speak to the process of altering oneself. The ability to engage in a systematic process in which the accuracy and validity of one's beliefs are evaluated and form reflective thoughts is what occurs in self-regulated learning's (SRL) reflection processes (Mezirow, 1991, 2006). As such, for the remainder of this dissertation, reflection is not a reference to the more informal or daily reflections that students might exhibit, but rather the critical reflections within SRL that allow one to act in new ways (Mezirow, 1991, 2006). By providing students with the opportunity to

reconcile and integrate their experiences based on their own understanding, reflection enables students to think critically about their performance and alter their approach to meet learning goals (Bennett, Power, Thomson, Mason, Bartlett, 2016; Billett, 2000; Mason, 2014; Mezirow, 1991, 2006, Zimmerman, 2000).

The skill of reflection is widely recognized as highly valuable for students in school contexts, in part, because it has been found to result in an increase in self-awareness that leads to improved learning and overall better academic performance (Lew & Schmidt, 2011). From a self-regulated learning (SRL) perspective, two specific reflective processes have been identified as critical determinants in academic success: attributions and adaptive inferences (Cleary et al., 2004). Referring to the perceived cause of a task outcome, attributions have been found to have cognitive and affective consequences that are related to one's perception of outcomes as it relates to his/her effort or ability (McClure et al., 2011; Meece, Anderman, & Anderman, 2006; Weiner, 2010). Adaptive inferences, or the adjustments in behavior deemed appropriate following a task, have been found to directly relate to the selection of improved learning strategies (Zimmerman, Bandura, & Martinez-Pons, 1992). Specifically, research suggests that students who produce adaptive inferences following a task regulate themselves better and have better academic outcomes when compared to peers who neglect to do so (Cleary, Callan, Zimmerman, 2012; Zimmerman, 2000). Thus, the attributions and adaptive inferences made by students not only provide insight into the reflective judgements and actions of adolescents but also the influence these processes have on future learning.

The unfortunate reality, however, is that many students do not innately know how to engage in the effective forms of reflection that can lead to behavioral or cognitive shifts. In a study conducted by Lew and Schmidt (2011) it was found that reflection skills cannot be easily

learned even when being given continuous feedback. Rather it is through participation in reflective exercises, exposure to models, and consistent adult supervision that student's reflection skills increase. Opportunities to bolster reflection may not be common for some students and are often not a preferred activity, particularly for students who are at-risk academically and may experience negative thoughts and feelings regarding school and/or academics. As such, a student without the knowledge of how to engage in reflection is more likely to act without questioning their thoughts or behaviors (Brookfield, 1995). With the absence of reflection students ultimately run the risk of engaging in behaviors that are the result of poor decision making and/or bad judgement (Brookfield, 1995).

Current research has assessed student reflections by utilizing measures that allow for students, teachers, and parents to endorse whether they believe a specific student is engaging in predetermined actions or holds certain beliefs. While this form of assessment literature has provided insights into broad categories of students' reflections, there remains limited investigation into the reflective statements of students in an authentic setting, specifically when receiving exam grade feedback. The overall purpose of this dissertation was to examine the nature of middle school students' reflection processes relative to outcomes on course-specific activities. The author used a context-specific assessment methodology, called SRL microanalysis, to gain insight into the most common types of adaptive inferences and attributions made by students, the nature of these reflective-phase processes over time, the extent to which reflective responses are similar, regardless of intervention characteristics, and the patterns found within student's reflective responses.

Overview of Reflection Types

Over the last few decades there has been a growing interest in the ideas of reflection across various professions around the world (Fook & Gardner, 2007; Fook, White & Gardner, 2006). This has led to a wide range and diverse understanding of how reflection is conceptualized. To avoid misunderstanding or confusion, the author will outline the three most popular forms of reflection referenced in educational literature: daily reflection, critical reflection, and SRL self-reflection.

Due to the popularity of the term, reflection may at times be utilized with an assumed meaning (Fook et al., 2006). This most commonly occurs while performing routine tasks, and for this reason is referred to as daily reflections. For example, a student while completing math homework may think back to the lesson that occurred earlier in the day and believe that they are reflecting. While it is true that the student is thinking back to a time and trying to identify information to assist them in completing an assignment, this form of reflection serves to describe an internal thought. Although this reflection enables one to recall previous experiences, daily reflection has not been shown to lead to any shift in academic outcomes (Fook et al., 2006; Fook & Gardner, 2007). Rather, reflection has been shown to influence achievement in contexts where one is asked to actively process his/her action(s), desired outcome(s) and advantageous alternative(s) (Mezirow, 1990).

With origins in the work of Dewey (1916, 1933), the conceptualization of reflection as a process whereby one can assess the way a task has been approached and the influence of one's own perceptions is critical reflection. Specifically, while all reflection implies an element of critique, critical reflection refers to the direct and purposeful act of challenging the conjectures of prior learning (Mezirow, 1990, 2006). Thus, it is critical reflection that propels one towards

action and calls attention to one of the most distinguishing characteristics of the reflective process – being able to analyze one's assumptions to adapt and change (Mezirow, 1990, 2006).

Yet, as Stark and his colleagues (1999) found, many individuals do not know what it means to engage in reflection. With connections known between the benefits of reflection on students' performance, educational research is a popular medium through which reflection processes have been explored. One of the most common places where reflection is discussed is within models of SRL (Zimmerman, 2000). Popular SRL models include the work of Boekaerts (1992, 2000), Borkowski (1992, 2000), Pintrich (2000), Winne (1998), and Zimmerman (2000) (Puustinen & Pulkinen, 2001). Of these models, Pintrich and Zimmerman isolate self-reflection as a unique phase within SRL. As students participate in self-reflection they actively think through how they performed and the underlying reasons why (Zimmerman, 2000). It is in this way that SRL's self-reflection can be shown to conceptualize reflection in the same way as critical reflection. Thus, it is through these forms of reflection that we can reassess the assumptions on which our beliefs are based and act on the newly accessible insight (Mezirow, 1990, 2006). As this dissertation explored students in educational settings, SRL will be outlined in greater detail.

Defining Self-Regulated Learning

SRL is a broad term that references a combination of knowledge, motivation, and autonomy utilized while engaging in a particular task or while trying to meet a specific goal (Pintrich & Schunk, 2002; Ross, 2008; Zimmerman, 2000). From a social-cognitive perspective, SRL is conceptualized as a cyclical process that operates under the assumption that previous behaviors and outcomes serve as reference points by which one is then able to adjust (Zimmerman, 2000). According to Zimmerman (2000), SRL can be conceptualized as a three-

phase cyclical model including forethought, performance, and reflection. Operating in a sequential manner, this model outlines how the three phases interact to influence regulatory thought and action. The three-phases interact as a cyclical feedback loop, whereby forethought phase processes influence performance phase processes, which then, in turn, influence the nature of self-reflection phase processes (Zimmerman, 2000). Conceptually, when reflection phase processes influence subsequent forethought phase, a single iteration of an SRL cycle is considered complete (Zimmerman, 2000).

Overview of three-phase model. The cyclical feedback loop developed by Zimmerman (2000) begins with the forethought phase. It is in the forethought phase that one utilizes his/ her motivational beliefs and engages in task analysis (Zimmerman, 2000). In this context, motivational beliefs include self-efficacy, outcome expectations, intrinsic interest/value, and goal orientation, whereas task analysis references goal setting and strategic planning (Zimmerman, 2000). Consequently, it is in the forethought phase that individuals first set goals and determine the steps needed to achieve their goals. In the performance phase, one employs his/her self-control (i.e., self-instruction, imagery, attention focusing, and task strategies) and self-observation (i.e., self-recording and self-experimentation). It is in this phase that one can engage in behaviors that will optimize his/her performance and learning. Lastly, in the reflection phase one makes self-judgments about his/her learning and performance and exhibit self-reactions to that performance. These types of reflective judgments and reactions will naturally lead students to alter their behaviors in a manner that enables them to enter the forethought phase and continue their learning. Given that the self-reflection phase is the primary focus of this dissertation, the author will focus on the key sub-processes embedded within this phase.

Reflection phase. As the reflection phase is instrumental in altering future cyclical feedback loops it will be explored in greater detail. *Self-judgments* are comprised of self-evaluation and casual attribution. Self-evaluation occurs when an individual assesses their performance based on internal or external standards. On the other hand, casual attributions refer to the perceived cause of a given performance. Making judgments of one's performance are important because they often involve cognitive and affective reactions, such as feelings of satisfaction and adaptive inference thoughts. With judgement connected to one's reactions, they often directly reflect one's level of satisfaction. Within the reflection phase, one's self-satisfaction/affect are referred to as self-reactions. *Self-reactions* determine whether the feedback loop continues in an adaptive or defensive manner. If one is dissatisfied with his/her performance he/she is more likely to consider adjusting their strategies as a form of remediation and therefore engage in adaptive inferences (Zimmerman, 2000). Of particular interest in this dissertation are the types of attributions that students make following performance and the types of adaptive inference they make regarding how to improve.

Attributions. Defined as a process and pursuit of identifying and understanding the casual relationship between actions and behaviors, attributions seek to make sense of the environment (Gaier, 2015; Schunk, Meece, Pintrich, 2014; Weiner, 2010). While there are several theoretical models of attributions (Heider, 1958, Kelley, 1967), Weiner's (1985) model moves beyond the work of his predecessors through the conceptualization of attributions across three dimensions: stability (stable vs unstable), locus (internal vs external), and controllability (controllable vs uncontrollable). For example, a student may reflect on their test grade and attribute the outcome to their own study plans and behaviors for two weeks in preparation for the test. In this scenario, a student is attributing their test grade to their study plan behaviors, which has an unstable,

internal, and controllable characteristic (McClure, et al., 2011). From this perspective, behaviors are the result of affective responses associated with motivation (McClure, et al., 2011; Weiner, 2010). Supporting this perspective is research which has revealed that the nature of one's attributions is a determinant of academic success (Gaier, 2015; Kelley, 1973; McClure et al., 2011; Perry, Hechter, Mebcesm & Weinberg, 1993). Specifically, attributions have been found to have cognitive and affective consequences that are connected to one's perception of outcomes as it relates to his/her effort or ability (McClure, et al., 2011; Meece et al., 2006; Weiner, 2010).

Initially, Weiner identified four general types of attributions each exhibiting a different combination of the dimensions: effort (internal, controllable, and unstable), ability (internal, uncontrollable, and stable), task difficulty (external, uncontrollable, stable), and luck (external, uncontrollable, and unstable; McClure et al., 2011; Weiner, 2010). As other researchers investigated attributions a shift occurred in which other types of attributions were also recognized (McClure et al., 2011). One pattern of attributions that arose was the identification of self-serving bias, whereby a student attributes their failures to external factors and their successes to internal factors (McClure et al., 2011). Additional dimensions that have been found to influence attributions have been collapsed under the label of social attributions and include the following: teachers, peers, and family (McClure et al., 2011). While self-serving bias attributions have been found to preserve self-esteem, social attributions have been found to impact the extent to which a student may attribute an outcome internally or externally, which has been shown to impact academic achievement (McClure et al., 2011).

In educational settings, students who attribute their academic outcomes to effort have been shown to reflect a mastery orientation that allows students to have an increased sense of control and subsequently higher levels of achievement (Liu, Cheng, Chen, & Wu, 2009;

McClure et al., 2011). As different attributions have been revealed to be related to different motivational goals, research has focused on identifying the impact of external and internal motivational factors (Elliot & Dweck, 1988; McClure et al., 2011). With the predictive relationship between student attributions and outcomes known, the importance of understanding students' perceptions, motivations, and their connection to alterations in behavior and strategy use is clear (Weiner 2010).

Presently, self-report measures, rating scales, and coding of free response statements have been developed to explore causal attributions; however, there is currently a lack of attention placed on assessing the nature of student attributions in natural settings and across time (Russel, 1988). Thus, although research has provided empirical support for the link between types of attributions and important academic outcomes, there is much less research that has explored the range of things to which students attribute their success and the specific ideas they exhibit regarding how to improve their performance. Consequently, the connections between students' identification of attributions and adaptive inferences and the corresponding influences on SRL remain an area in need of continued discovery.

Adaptive inferences. Defined as the conclusions drawn about one's need to alter his/her approach or degree of effort, adaptive inferences are the reflective thoughts students have and the corresponding changes in learning planned for in the following forethought phase (Marsh, Craven & McInerney, 2008). Consequently, it is in one's ability to make adaptive inferences about his/her performance that enables one's reflections to be labeled as critical reflection versus the singular contemplation that occurs in daily reflections (Colthorpe, Zimbardi, Ainscough, & Anderson, 2015). Returning to the previous example, a student who has received their test grade may reflect and determine that their outcome was the result of their study plans and behaviors in

the two weeks in leading up to the test. In this example, if the student were to merely acknowledge that their performance was impacted by their study plan they would simply be engaging in part of the process. For the student to develop an adaptive inference they would need to identify which component(s) of their study plan were incorrect/insufficient and follow this with identifying a means by which it can be improved.

Yet, it is important to note that a student's ability to utilize adaptive inferences may vary across tasks and contexts. Similarly, the nature of a student's attributions may also exhibit variability depending on the circumstances in which it is requested. Due to the contextualized nature of both reflective processes, microanalysis is a primary medium through which they have been assessed.

Measurement of SRL

Over the past several decades, numerous assessment measures have been utilized to study SRL. The measures range from self-report questionnaires, structured interviews, rating scales, behavioral traces, structured personal diaries, think alouds, and microanalysis and all fall into one of two categories: aptitude or event (Cleary, 2011; Winne & Perry, 2000). Aptitude measures tend to be more broad or global in nature and target multiple events or strategies across specific situations (Cleary, 2011). As a result, most aptitude measures utilize likert scale formats to collect data, which results in averaged or aggregated scores (Cleary, 2011). While the process has the statistical advantages of allowing for unique predictors of achievement to be calculated, it is problematic as it presents SRL as a dispositional trait rather than a multicomponent process (Callan & Cleary, 2017). Consequently, these measures minimize the dynamic nature of SRL as well as the influential nature of different contexts and tasks (Cleary, 2011).

In response to the criticisms of the former measures, event measures were developed to allow for SRL to be measured as a dynamic and contextualized process. Regarded as a more context specific measure, event measures allow for the examination of behaviors at a specific time within an identified context (Cleary, 2011; Winne at al., 2000; Zimmerman, 2008). Consequently, event measures target SRL thinking and strategy use during an actual event, instead of retrospectively or prospectively. While many event measures can provide insight into moment-to-moment behavioral interactions, microanalysis is a particularly useful strategy as it enables an in-depth evaluation of self-generated reflection responses (Cleary, 2011). Further, microanalysis allows for one to explore a specific sub-process of reflection, such as attributions and adaptive inferences, in a systematic way.

SRL microanalytic assessments. The development and use of SRL microanalysis consists of five core features: (1) selecting a well-defined task, (2) identifying a target SRL process, (3) developing SRL microanalytic question(s), (4) linking cyclical phase processes to task dimensions, and (5) coding of recorded responses (Cleary, et al., 2012).

A type of self-report measure in that students are asked to provide responses to specific questions, SRL microanalytic protocols utilize a structured interview format. The specific questions to be included in a protocol are customized to a specific learning task or activity. In addition to clarifying the task to be assessed, SRL microanalytic protocols also utilize predetermined questions that target distinct SRL processes within the three-phase cycle of SRL. A key aspect of a SRL microanalytic protocol is that it is administered as students complete a learning activity or as they experience a specific situation. Additionally, while open-ended and forced choice formats have been utilized, microanalytic protocols tend to emphasize the use of free-response questions as they increase accessibility to authentic student thoughts. It is through

the administration of these questions that the links between students' forethought, performance, and reflections can be obtained. The ability to assess the vast array of SRL processes outlined in Zimmerman's (2000) three-phase model, allows researchers to obtain a snapshot of students' thinking as they complete authentic learning activities or tasks. Further, as SRL microanalytic protocols utilize the same underlying processes in their construction as those of the three-phase loop, they are especially equipped to assess it.

Microanalysis is a theoretically-grounded assessment approach that can be directly linked to Zimmerman's three-phase model. As previously noted, it is in the forethought stage that one must determine his/her goals, develop a plan, and set his/her expectations. When reviewing SRL microanalytic protocols the same emphasis on identifying the areas of investigation/ exploration can be observed in the need to have an identified task, targeted process, and developed questions. When reviewing the performance phase, with an objective of completing a designated task to the best of one's ability through observing and controlling his/her actions, a connection can be drawn to SRL microanalytic protocols being developed with the specific task of the performance phase in mind. Thus, like the performance phase, SRL microanalytic protocols are devised with the objective of gaining insight into how one engages in a given task and the evaluation of performance. Further, SRL microanalytic protocols also prompt reflection. Specifically, SRL microanalytic protocols generate questions geared towards assessing planning and performance in the moment and in the future. These questions form a direct link between the reflective thoughts and motivations one devises following reflection and the newly derived plan seen in the forethought phase. Lastly, research has been shown to support this measurement, as the application of SRL microanalytic protocols have been utilized in the assessment of Zimmerman's (2000) three phase model across a wide range of SRL processes and an array of

task and contexts. One frequently studied measure of SRL processes is attributions (Cleary, et al., 2012).

Attributions, which are defined as a key component to the reflection phase of the cyclical feedback model, help to form the link between reactionary behaviors and the proceeding learning and performance (Cleary, et al., 2012). Often utilizing the same initial stem (e.g., what/why do you think you…) followed by an ending that coveys the nature of the task and a specific outcome, microanalytic attribution questions distinguish themselves from alternative measures in their direct links to authentic tasks and their immediate administration following a task (Cleary, et al., 2012). It is through microanalytic protocols that students' judgments of causality can be directly linked to their task performance. Further, as the extent to which one utilizes regulatory behaviors in the cyclical feedback loop has been shown to influence the reflection phase processes (such as attributions and adaptive inferences) and the subsequent SRL phases, the exploration of microanalytic response presents the opportunity to explore the nature and quality of reflections over time and the extent to which they are predictive of changes in strategic behavior and thinking.

Rationale for Study

While the relationship between attributions and student outcomes has been examined in the literature, there is a need for studies to identify the nature of attributions and adaptive inferences in school-aged populations as they engage in authentic classroom-based activities. Presently, there is a growing literature that has utilized microanalysis and explored the impact of attributions (Artino, Cleary, Dong, Hemmer, & Durning, 2014; Cleary et al., 2017; Cleary, & Sandars, 2011; Gandomkar et al., 2016); yet, there is a continued need for studies that assess attributions in conjunction with adaptive inferences. Of the microanalytic studies that have been

conducted, the focus has been on coding responses into broad categories and drawing conclusions based on the patterns of aggregated data rather than conducting an in-depth analysis of actual student responses within or across categories (Cleary & Zimmerman 2001; DiBenedetto & Zimmerman, 2010; Kitsantas & Zimmerman, 2002).

Given the research connecting student reflection with learning in schools (Cleary et al., 2004; Colthorpe et al., 2015; DiBenedetto et al., 2010; Gaier, 2015; Mezirow, 2006) the importance of acquiring a better understanding of reflective judgements can be found in its implications for student interventions, teacher monitoring and instruction, and student outcomes. However, for teachers to best facilitate student reflection, they must first understand the motivational and strategic thinking of adolescents as they evaluate their performance in schools. By developing insight into students' reflective thoughts and the strategies students are most likely to utilize during learning, a teacher can more effectively align academic interventions and learning with students' beliefs. Further, with increased insight teachers are also able to provide strategic feedback which has been linked to increased achievement outcomes and facilitates students' ability to adapt or change their strategic approach to learning. Therefore, by exploring the nature of students structured reflective responses not only will the current literature be expanded, but useful insights into the strategic thinking and strategy use of students at-risk for poor academic achievement can be provided.

The overall objective of this study was to further explore the reflective processes of academically at-risk middle school students as they reflect on mathematics test scores. This study attempted to gain insight into the specific attributions and adaptive inferences students utilize and the patterns of their reflective processes over time. This was accomplished through utilizing a pre-existing dataset derived from an SRL intervention study (Cleary, Velardi, & Schnaidman,

2017). This pre-existing dataset was comprised of data collected from an experimental group (i.e., structured strategic intervention (SREP)) and a comparison group (i.e., structured mathematics intervention (WIN)). Given that a key focus of this dissertation was to examine the attributions and adaptive inferences of students over time, data was utilized from baseline,(before students were divided into comparison groups), post-test (immediately following the completion of interventions) and two-month follow-up (two months following the completion of interventions).

Three broad research questions were targeted in this dissertation. The first question was as follows: **What are the most common types of attributions and adaptive inferences provided by students when asked to reflect on mathematics exam scores prior to receiving interventions?** This overarching question sought to explore students' (both WIN and SREP groups) baseline reflective processes and can be divided into two more specific questions: (1) *What are the most common types of attributions provided by students at baseline/ prior to intervention?, and* (2) *What are the most common types of adaptive inferences provided by students at baseline/ prior to intervention*?

The second broad research question was: **What types of changes occur within the reflection phase processes among students exposed to different types of remedial support services in middle school?** To address this question, students' reflection phase processes at baseline were compared to those at post-test and two-month follow-up across each of the intervention groups. While both intervention groups utilized a structured format, they are distinguished from one another by the instruction given. One intervention group provided students with additional math instruction through a program called What I Need (WIN) while the other intervention group was provided with strategic instruction through utilizing a program

called Self-Regulation Empowerment Program (SREP) which is grounded in self-regulated learning (SRL). For this dissertation, students who participated in WIN were identified as the remedial math group and those who participated in SREP were identified as the SRL training group. This second broad question addresses how the content of responses may vary within each of the intervention groups. Two specific sub-questions were examined separately for each of these two groups: (1) *How do the types of attributions provided by students compare to those at baseline? and* (2) *How do the types of adaptive inferences provided by students compare to those at baseline?*

The third research question was: **Are there group-base differences in the self-reflection phase processes between students participating in remedial math groups (WIN) and those participating in the SRL training groups (SREP)?** This question represents a direct comparison between the types of reflection responses of students across structured mathematic interventions and strategic intervention. Two sub-questions were examined: (1) *How do the types of attributions vary among between students in the WIN group and SREP group and* (2) *How do the types of adaptive inferences vary among between students in the WIN group and the SREP group?*

The final research question asked the following: **What are the specific themes that emerge in high frequency codes for both attributions and adaptive inferences?** The examiner performed a qualitative analysis of the specific responses that students provided. The qualitative analysis consisted of the examiner utilizing the preexisting coding scheme to review the most frequently cited attributions and adaptive inferences made by students. Once the most frequently cited codes were identified an analysis of the individual responses began by identifying the similarities and differences within and between codes. It is through this

exploration that a greater understanding of the types of patterns across student reflections emerged and a framework by which similarities and differences can be evaluated was provided.

Methods

The data used for this study was derived from an extant dataset for an experimental study which examined the effectiveness of a SRL intervention program on the SRL processes and mathematics achievement of 7th grade middle school students (Cleary et al., 2017). Specifically, the experimental study sought to examine the extent to which the SRL intervention lead to improvements in students' (1) self-regulation learning (SRL) strategies, causal attributions, adaptive inference and test preparation tactics; and (2) achievement in mathematics when compared to students who received a remedial mathematics program. Data was collected at various points over the course of two academic years (7th and 8th grades) (Cleary et al., 2017). Throughout data collection the following assessment measures were utilized: archival records, self-report questionnaires, a teacher rating scale, and microanalytic questions. For this dissertation, the information related to the administered microanalytic questions, specifically adaptive inferences and microanalytic attributions, was of primary focus.

Relevant microanalytic responses were retrieved by reviewing the data that was collected through the original studies experimental procedures. These original procedures consisted of employing a stratified randomization procedure to ensure that students from each of the two 7th grade teachers were evenly and randomly assigned to treatment condition (Cleary et al., 2017). The treatment conditions included an intervention group, Self-regulation Empowerment Program, (SREP) and a comparison condition, What I Need (WIN). Participants in each condition attended 30-minute instructional session during the second and third quarters of 7th grade (Cleary et al., 2017). As a result of the middle school operating classes on alternating A-B

day schedules, the frequency of the sessions varied from one to three times per week. In total, 28 sessions were conducted across both quarters (Cleary et al., 2017). This structure allowed participating students to receive approximately 12 additional hours of instruction beyond what they typically received as part of the regular mathematics class (Cleary et al., 2017). This procedure was approved by the participating school districts' Board of Education as well as Rutgers University's Instructional Review Board (IRB) (Cleary et al., 2017).

Original Study Conditions

For a greater understanding of how the pre-existing data was utilized in this dissertation, the following will outline the distinguishing characteristics of both the intervention condition and the comparison condition.

Intervention condition. The intervention condition applied was a modified (25 minute) version of SREP that was customized to 7th grade mathematics activities and course content. The specific modifications included a diminished focus on mathematical content to emphasize students' SRL and motivation skills.

Each session of the SREP condition was administered by pairs of four coaches in group of 5-6 students. These coaches followed a pre-established sequence of modules that provided an instructional guide to the material and content to be taught, modeled and reinforced. This sequence was broken down into foundational modules, RAPPS (*R*eview, *A*nalysis, *P*ractice, *P*lan, *S*elf-direction) modules, and a self-reflection module. The foundational modules served to introduce students to SRL processes and adaptive mindsets. Following the 4-5 foundational modules, the RAPPS instructional format was utilized for the remainder of the instructional session. The format of RAPPS consisted of specific steps that served to assist students in

engaging in weekly cycles of reflection and action through the utilization of guided practice and modelling of regulatory strategies and action. In a given session, students would progress through either two or three of the RAPPS steps, depending on the number of meetings to occur in the larger school week.

The use of the self-reflection module occurred on weeks in which students received a unit exam grade back from their mathematics teacher. In this module students would use a Self-Reflection Graph to evaluate their performance compared to their goal grade and previous grades (Cleary & Platten, 2013). Overall this modules' focus was on guiding student's perceptions of how they performed, why they performed the way they did, and what they might do to change future performance. What made this particularly valuable is that it transpired even when students experienced failure and emphasized the controllability of success and failure through regulatory efforts.

Comparison condition. The comparison condition applied was, WIN, a supplemental math curriculum. This pre-existing remedial program supported academically at-risk students through providing content-specific instruction outside of their regularly occurring class time. The participating students were provided direct instruction from 7th grade mathematics teachers as well as offered opportunities to practice mathematics problems and work collaboratively with peers in a structured setting. Overall, the emphasis of this condition was on increasing students understanding of mathematical concepts and problem solving through offering individualized content specific support.

Sample

The sample consisted of 7th grade students attending the same middle school in an urban school district located in the Northeast region of the United States of America. The sample was

selected from a larger population of students enrolled in four sections of 7th grade algebra classes. From an initial pool of 111 students enrolled across two teachers' algebra classes, 50 students remained eligible after a review of criteria. The specific eligibility criteria included: (1) mathematics report card grades below a B average, (2) New Jersey Assessment of Skills and Knowledge (NJASK) standardized mathematics test score in the marginal to proficient range, and (c) teacher nominations regarding deficiencies in motivation or regulation. Of the 50 students who met criteria, a final sample of 42 students emerged due to six students experiencing scheduling conflicts and two students leaving the school district.

The sample of participants consisted of 40.9% females (n =18) and 59.1% males (n =24). The largest ethnic population identified as Black (45.2%), followed by Hispanic (28.6%), White (11.9%), Asian (7.1%), and Biracial (7.1%). A sizable portion of students met criteria to receive either free or reduced lunch (43.2%).

Measures

All participants were asked to complete the following assessment measures throughout the study: microanalytic adaptive inferences, microanalytic attributions, self-efficacy, and Self-Regulation Strategy Inventory - Maladaptive Regulatory Behavior (SRSI-MRB) subscale. Each of these SRL measures were collected at three-time points (end of 1st quarter, end of 3rd quarter, and end of the school year) that aligned with the pretest, posttest, and follow-up design of the study. Students were also administered a social validity measure and hypothetic test preparation scenario at follow-up. In terms of achievement, students weekly and quarterly exams were collected as well as their standardized test scores. Because outside survey data collected was not allowed by the participating school district, all data was collected and de-identified prior to it being obtained by the residing researchers.

Microanalytic measurement. As this study involved an examination of self-reflection phase processes, attributions and adaptive inferences were examined at the end of the respective quarter. The measures were adapted from prior research (Cleary et al., 2015) and targeted students' perceptions of the causal determinants of their mathematics exam grades (attributions) and the conclusions made about how to excel on future tests (adaptive inferences).

***Microanalytic attributions*.** A single item microanalytic attribution question was administered at pretest, posttest, and two-month follow-up, "What are some of the reasons why you may have gotten a(n) (insert grade) on this test?" This question was administered to gather information about students' perceptions of their performance at a specific time period regarding a particular product. Consistent with other microanalytic assessments (Cleary et al., 2017), the responses were then coded by two raters independently into one of several categories. Specifically, to avoid potential bias, two raters were blind to treatment group conditions. These coders then reviewed student's responses and through consulting a developed coding manual assigned the response into one of the following categories: *self-regulation learning strategies* (i.e., statements indicating students' use of tactics related to learning course material while studying, utilization of planning and/ or goal setting, attempts to solicit help from others, and/or attempts to manage behaviors and learning), *general studying* (i.e., statements reflecting the quality or act of studying, the amount of time spent studying, or the amount of effort expended), *classroom-related behaviors* (i.e., statements reflecting students' class attendance and behaviors during class lectures or activities.), *test-taking skills* (i.e., statements referring to student behavior or tactics used during test performance or approaches to taking the test), *math ability* (i.e., statements referring to the difficulty level of the test or math in general and/ or a student's perceptions of their ability to learn, remember, or master course content, or to get prepared for tests), *specific mathematics task skills* (i.e., statements that reflect specific types of problems or

skills that the student perceives they have to get better at), *teacher skill* (i.e., statements reflecting perceptions about teachers' instructional skills or behaviors*), don't know (i.e.,* statements indicating students' uncertainty about what to do or how to handle the situation), and *other* (i.e., any response or statement that does not fit into any of the other categories, does not seem applicable or appears to be un-codable). The independently coded responses were then compared and found to have a percent agreement of 87%. The data was then converted into an attribution measure through compiling a frequency count of the number of adaptive attributions present within a student's response.

Microanalytic adaptive inferences. A single-item adaptive inferences measure was administered following the aforementioned attribution question, "What do you need to do to improve or to perform well on your next test?" Student responses were then coded using the exact procedure of the attribution measure. An area of discrepancy between the two coding schemes is that the category of teacher skill was removed as it was not relevant to the adaptive inference question. The coded responses were found to have a percent agreement of 90.5% and thus were acceptable and aligned with the microanalytic literature (Clearly et al., 2017). Next, an adaptive inference score was determined through calculating a frequency count of the adaptive strategies found within each individual student response, such that higher scores were indicative of a great use of adaptive inferences.

Procedures

While this study utilized preexisting data, it was reviewed by the International Review Board (IRB) to determine its appropriateness. Upon receiving approval from the IRB, the research questions were explored through utilizing Statistical Package of the Social Sciences (SPSS) software to run descriptive analysis and inferential statistics on the pre-existing data

(Cleary et al., 2017). The descriptive analyses consisted of percentages and frequency counts (*n* values) and inferential statistics included McNemars's tests and Chi-squared tests. Further exploration of research questions occurred through conducting a simplified thematic analysis (TA) of student responses.

Data Analysis. Given the interest in exploring the quality of students' self-reflection phase processes responses and student attribution as they pertain to specific classroom experiences, this study focused exclusively on the two aforementioned microanalytic measures (adaptive inference and attributions). Further, as this study sought to examine the reflection phase processes of both groups prior to the study and after receiving the treatment manipulations, data from both treatment conditions were utilized.

The specific analytic procedure utilized in this study consisted of a qualitative or descriptive analysis of the microanalytic attributions and adaptive inference responses provided by students. Specifically, the written responses of the 42 eligible students were reviewed and common strategies noted. An analysis of responses utilized responses collected at pre-test, post-test, and two-month follow-up to allow for a qualitative assessment of how students' reflections develop over time and to gain insight into whether unique patterns of strategy utilization appear across different environmental contexts (i.e., in differing intervention groups).

Question 1: What are the most common types of attributions and adaptive inferences provided by students when asked to reflect on mathematics exam scores prior to receiving interventions? First, the reflection-phase was examined by identifying the most common types of attributions and adaptive inference. The process of acquiring this data included reviewing individual student responses collected at pre-test, coding them through utilizing a preexisting coding scheme (Cleary et al., 2017), compiling student responses, and reporting the specific

number of times a strategic code was referenced. Each response was then integrated into a table where the specific frequency counts and percentage values for each response were recorded. This was then followed by an exploration of the nature of reflection-phase processes over time and within interventions.

Question 2: What types of changes occur within the reflection phase processes among students exposed to different types of remedial support services in middle school? To acquire this knowledge entailed determining the pattern of attributions and adaptive inferences provided by students within mathematic and strategic interventions. The areas of inquiry include the following: how do the types of attributions provided by students after receiving a structured mathematics intervention compare to those at baseline, how do the types of adaptive inferences provided by students after receiving a structured mathematics intervention compare to those at baseline, how do the types of attributions provided by students after receiving a structured strategic intervention compare to those at baseline, and how do the types of adaptive inferences provided by students after receiving a structured strategic intervention compare to those at baseline?

To obtain student's response data at post-test and two-month follow-up, the same procedure was utilized as above. One difference was that that baseline data was reorganized to distinguish the initial reflective responses of the students in the remedial math group from the students in the SRL training group. Once this data was obtained, the individual student responses given at post-test and two-month follow-up were compared to those at baseline. Through this procedure the specific number of times a strategic code was utilized at baseline, post-test, and two-month follow-up was revealed; thus, presenting the opportunity to look for trends across students' attributions and adaptive inferences use over time. Following this McNemar's tests

were conducted to determine the extent to which the frequency of student's coded responses compared across time within both the SREP and WIN intervention groups.

Question 3: Are there group-based differences in self-reflection phase processes between students participating in remedial math groups (WIN) and those participating in the SRL training groups (SREP)? To continue to expand the understanding of reflective phase responses, an exploration of the responses among students between intervention groups was conducted. The specific inquires included determining how descriptions of attributions provided by students compare between the remedial math group and the SRL training group and how descriptions of adaptive inference provided by students compare between the remedial math group and the SRL training group. Analysis consisted of comparing the number of times a strategic code was referenced at post-test and two-month follow-up across interventions by comparing the recorded frequency counts and percentage values determined for each response category. It is through this exploration that patterns of strategic thinking were explored as well as the potential influence of structured mathematics interventions and strategic interventions. This was then followed by chi-squared analysis to explore whether there were group differences in the codes provided in student's response.

Question 4: What are the specific themes that emerge in high frequency codes for both attributions and adaptive inferences? The final research question further expands our understanding of reflection by looking at individual reflective responses of students within each intervention group and noting any perceived differences in response tendency. Furthermore, trends were revealed regarding the reflective processes of students who obtained structured mathematic and strategic interventions. Description of these trends were provided through conducting a simplified thematic analysis of student generated responses.

Thematic analysis (TA) refers to a method of identifying and analyzing patterns within a given dataset (Braun & Clarke, 2006). Through thematic analysis a greater understanding of the most salient themes can be generated and the meaning of affective, cognitive, and symbolic dimensions of data can be highlighted (Joffe, 2012). To address the area of interest for this dissertation the TA utilized a dual deductive-inductive assessment approach, allowing for the development of themes that align with existing research (deductive) while also reviewing the raw data and integrating new themes that emerge. This was achieved by following the six-phase model of thematic analysis which consists of (1) familiarization with data, (2) generating initial codes, (3) search for themes among codes, (4) reviewing themes, (5) defining and naming themes, and (6) producing a final report (Braun & Clarke, 2006).

The first phase of the TA consists of reviewing all student's responses within a given code and actively searching for patterns within the data. Once a list of patterns had been identified initial codes are generated. Within this second phase the codes are developed that utilize surface information while also generating an accurate sense of the meaning of the data through data reduction and data complication (Braun & Clarke, 2006). Through data reduction, student response are organized into simplified categories through noticing relevant phenomena, collecting examples of these phenomena, and identifying patterns (Siedel & Kelle, 1995). Conversely, data complication strives to re-conceptualize the data through and so new contexts are applied to students' response that allow for the data to be expanded rather than broken down. Next, these initial codes are analyzed for themes. During phase three, it is important to remember that the themes differ from codes in that they are phrases or sentences that describe the data whereas codes are built on over-reaching themes in the data. Once a set of themes had been identified, the codes are then reviewed and refined, initiating phase four. By searching the data

and finding responses that support or refute the proposed themes similar themes are combined and themes that are inconsistent are redefined. It was only when themes were developed that align with the dataset and are believed to accurate capture the meaning of response that the themes were named and a finalized report are generated. In phase five, theme names are formed by looking at the collected examples and identifying what they have in common and what makes them unique. It is then that a final report is created that labels each code, highlights the themes, and provides response examples.

Yet, as this dissertation utilized data that had been collected from a preexisting dataset, in which student responses had been pre-coded, a simplified TA was conducted with the main purpose of gaining greater insight into the themes within each of the pre-determined codes. As such, the simplified TA began with phase three and utilized the original coding scheme in substitute for phases one and two. In instances where a pre-determined code received fewer than three responses TA was not conducted as it was found to be insufficient to make valid comparisons that will enable group-based treads in the data to be revealed (Joffe, 2012).

Results

In this section, the results from the data analytic techniques performed will be examined. As the data from this study is from an extant dataset, no preliminary analyses were conducted to assess the adequacy of the measures or to examine missing data as these had already been performed in the original study conducted by Cleary et al. (2017). All statistical analyses were performed using IBM SPSS Statistical Premium GradPack 24. Both descriptive and inferential statistical procedures were used to address the following three research questions: (1) *What are the most common types of attributions and adaptive inferences provided by students when asked to reflect on mathematics exam scores prior to receiving interventions?;* (2) *What types of*

changes in reflection phase processes occur among students exposed to different types of remedial support services in middle school?; and (3) *Are there group-based differences in the self-reflection phase processes (i.e., attributions and adaptive inferences) between students participating in remedial math groups (WIN) and those participating in the SRL training groups (SREP)?* A fourth research question was generated to provide a descriptive exploration of the specific types of responses given on reflection phase measures, *What are the specific themes that emerge in high frequency codes for both attributions and adaptive inferences?* A simplified thematic analysis procedure was used to analyze the data.

Statistical Analyses

Research Question #1: What are the most common types of attributions and adaptive inferences provided by students when asked to reflect on mathematics exam scores prior to receiving interventions? To address this question, baseline data for both attributions and adaptive inferences across both intervention groups were integrated. Descriptive statistics (i.e., frequencies, percentages) were calculated for each of the coding categories within attributions and adaptive inferences (see Table 1). Percentages were calculated to gain a greater understanding of the frequency counts represented in the categories across both attributions and adaptive inferences. For attribution, frequencies and percentages across the following eight categories were presented: (1) SRL strategy, (2) general studying, (3) classroom related behaviors, (4) test-taking skills, (5) math perception, (6) teacher skill, (7) don't know, and (8) other. A similar coding scheme was used for adaptive inferences with the lone exception being teacher skill. Teacher skill was not a codable response for adaptive inferences given that adaptive inferences pertain to the conclusions that a student makes regarding ways to improve his or her performance. In addition, as students' responses were able to be receive more than one code, the

summing of all percentages often extends beyond 100%. It is for this reason that the two forms of descriptives (i.e., frequencies, percentages) was important; for, it allowed for students' responses to be interpreted appropriately.

Table 1

Frequencies and Percentages of Students Attributions and Adaptive Inferences

Response Category	Attributions *n* (%)	Adaptive Inferences *n* (%)
SRL strategy	3 (6.8)	16 [a] (36.3)
General studying	26 (59.1)	33 (75)
Classroom related behaviors	4 (9.1)	9 (20.5)
Test-taking skills	2 (4.5)	3 (6.8)
Math perception	14 (31.8)	1 (2.3)
Teacher skill	2 (4.5)	N/A (N/A)
Don't know	1 (2.3)	0 (0)
Other	10 (22.7)	5 (11.4)

Note. N = 42 (students at baseline, prior to SREP or WIN intervention), N/A Not applicable due to irrelevant code.
[a] Two students' response included more than one SRL strategy code.

Regarding attributions, descriptive analysis showed that all eight categories were endorsed by at least 1 student. The most common response was *general studying* which pertains to broad responses that were not indicative of specific SRL strategies (i.e., "I did not study long enough"); approximately 59% percent (n = 26) of students endorsed this category. The second and third most frequent attributions were student *perceptions of math* skills (i.e., "I am not good at math", "I didn't know how to do some problems") with 31.8% (n =14) and *other* (i.e., "I was tired", "I didn't feel confident") with 22.7% (n = 10). The remaining five categories all occurred at a frequency of less than four and included the following: *classroom related behaviors* (n = 4, 9.1%), *SRL strategy* (n = 3, 6.8%), *test-taking skills* (n = 2, 4.5%), *teacher skill* (n = 2, 4.5%), and *don't know* (n = 1, 2.3%).

Concerning adaptive inferences, all but one of the seven possible categories were endorsed, *don't know*. This means that when students were asked how to improve their performance on their next exam, at least one student endorsed SRL strategy use, general studying, classroom related behaviors, test-taking skills, math perception, and other adaptive inferences. The most common response was *general studying* (i.e., "I need to study more", "I need to become a better studier"), with 75% (n = 33) of students endorsing this category. The second and third most frequently endorsed codes for adaptive inferences *were SRL strategies* ("I need to know how to memorize my math skills", "I feel like I need to stay after school for extra help") with 36.3% (*n* = 16) and *classroom-related behaviors* (i.e., "I think I should ask questions in class if I don't know something", "When the math teacher says to take notes then take notes") with 20.5% (*n* = 9). It should be noted that of those who endorsed the SRL strategy code, two students identified more than one SRL strategy to improve their future exam performance. The next most commonly endorsed response was *other* (i.e., "I need to improve on everything"), which was endorsed by 11.4% of the students (*n* = 5). The remaining three categories occurred at a frequency of three or less: *test taking skills* (*n* = 3, 6.8%), *math perception* (*n* = 1, 2.3%), and *don't know* (*n* = 0, 0%).

Research Question #2: What types of changes occur within the reflection phase processes among students exposed to different types of remedial support services in middle school?

The second question separately examined shifts in the types of attributions and adaptive inferences provided by students over time (i.e., baseline, post-test, two-month follow-up). Separate descriptive and within-group analyses were performed for each of the intervention groups (i.e., SREP, WIN). Descriptive statistics (i.e., frequencies, percentages) were calculated across the previously mentioned codes for attributions and adaptive inferences. Because this

study utilized frequency data and given that the second research question examined frequency data over time, McNemar's tests were utilized to assess the change in students' reflection phase responses across baseline, post-test, and two-month follow-up. Specifically, McNemar's tests explored the changes in the frequency of codes from baseline to post-test, post-test to two-month follow-up, and from baseline to two-month follow-up.

SREP group Attributions. The first descriptive analyses conducted examined the frequencies and percentages of attribution responses for SREP students across baseline, post-test, and two-month follow-up (see Table 2).

Table 2

Frequencies and Percentages of Attributions for Students Receiving SREP Intervention Across Baseline, Post-test, and Two-Month Follow-Up

	Baseline *n* (%)	Post-test *n* (%)	Two-month follow-up *n* (%)
SRL strategy	0 (0)	9 [a] (40.9)	4 (18.2)
General studying	13 (59.1)	14 (63.6)	16 (72.7)
Classroom related behaviors	0 (0)	1 (4.5)	2 (9.1)
Test-taking skills	1 (4.5)	1 (4.5)	1 (4.5)
Math perception	9 (40.9)	8 (36.4)	4 [b] (18.2)
Teacher skill	1 (4.5)	1 (4.5)	1 (4.5)
Don't know	1 (4.5)	0 (0)	1 (4.5)
Other	5 (22.7)	2 (9.1)	1 (4.5)

Note. N = 22 students; a = two students' responses included more than one SRL strategy code.
[b] One student's response included more than one SRL strategy code.

From a purely descriptive perspective, of all the attribution codes used by students in the SREP group, *SRL strategy* was the code that exhibited the greatest variation. At baseline, SRL strategy was never endorsed by students (0%) but was endorsed by nine students at post-test (40.9%), and four students at two-month follow-up (18.2%). Further, at post-test two students were shown to endorse more than one SRL strategy code. Although a similar range in response frequency was not found in *general studying* it was identified by students at the greatest

frequency: baseline (*n* = 13, 59.1%), post-test (*n* = 14, 63.6%), and two-month follow-up (*n* = 16, 72.7%). *Math perception* (baseline: *n* = 9, 40.9%; post-test: *n* = 8, 36.4%; two-month follow-up: *n* = 4, 18.2%;) and *other* (baseline: *n* = 5, 22.7%; post-test: *n* = 2, 9.1%; two-month follow-up: *n* = 1, 4.5%) codes appeared to decrease in frequency over time. Further, minimal variation across time points was observed for *classroom-related behaviors, test-taking skills, teacher skill,* and *don't know* codes.

McNemar's tests were conducted to determine if the observed changes in frequency of codes were statistically significant. Three codes were used in the analysis: SRL strategy, math perceptions, and other. These codes were selected as they appeared to occur at frequencies which varied the most across baseline, post-test, and two-month follow-up. For *SRL strategy*, a statistically significant difference was found between the number of students who endorsed it at baseline and post-test ($p = .004$). Changes in SRL strategy between post-test and two-month follow-up ($p = .267$) and baseline and two-month follow-up ($p = .125$) were not found to be statistically significant. Further, the observed changes in attribution codes for both *math perceptions* (baseline and post-test [$p = 1.00$], post-test and two-month follow-up [$p = .453$], baseline to two-month follow-up [$p = .625$]) and *other* (baseline and post-test [$p = 1.00$], post-test and two-month follow-up [$p = .453$], baseline to two-month follow-up [$p = .625$]) categories were not statistically significant.

WIN Attributions. Descriptive statistics for WIN attributions were collected in the same manner as SREP attributions and are presented in Table 3. It is important to note that at baseline there were twenty-two students enrolled SREP but at post-test and two-month follow-up there were twenty students enrolled in SREP.

Descriptively, of all the observed attribution codes for WIN students, *classroom-related behaviors* demonstrated the greatest shift in frequency. At baseline *classroom-related behaviors* was endorsed by five students (22.7%) but was not endorsed by any students at post-test (0%) or two-month follow-up (0%), potentially revealing a downward trend. Two additional codes demonstrated changes that were somewhat variable over time: *math perception* and *other* codes. While *SRL strategy* codes appeared to decrease in frequency over time and *don't know* and *teacher skill* codes appeared to increase over time, the changes were minimal. Lastly, the code of *general studying* was shown to occur at the greatest frequency across baseline (*n* = 13, 59.1%), post-test (*n* = 13, 60%), and two-month follow-up (*n* = 14, 70%).

Table 3

Frequencies and Percentages of Attributions for Students Receiving WIN Intervention Across Baseline, Post-test, and Two-Month Follow-Up

	Baseline *n* (%)	Post-test *n* (%)	Two-month follow-up *n* (%)
SRL strategy	3 (13.6)	1 (5)	1 (5)
General studying	13 (59.1)	13 (65)	14 (70)
Classroom related behaviors	5 (22.7)	0 (0)	0 (0)
Test-taking skills	1 (4.5)	3 (15)	0 (0)
Math perception	5 (22.7)	6 (30)	3 (15)
Teacher skill	1 (4.5)	1 (5)	3 (15)
Don't know	0 (0)	1 (5)	0 (0)
Other	5 (22.7)	1 (5)	1 (5)

Note. N = 22 students at baseline; N = 20 in post and two-month follow up (2 missing cases).

Similar to the analyses with the SREP group, McNemar's tests were conducted to determine if the observed shifts in attribution codes were statistically significant. Upon reviewing the frequencies of students' attributions within the WIN group the following codes were selected: classroom-related behaviors, math perception and other. McNemar's tests revealed that the changes in *classroom-related behaviors* were not statistically significant

between baseline and post-test (p = .125), post-test and two-month follow-up (p = .125), or baseline to two-month follow-up (p = .125). Similarly, no statistically significant changes in frequency were found for *math perception* (baseline and post-test [p = 1.00], post-test and two-month follow-up [p = .453], baseline to two-month follow-up [p = .625]) and *other* codes (baseline and post-test [p = .375], post-test and two-month follow-up [p = 1.00], baseline to two-month follow-up [p = .375]).

SREP group adaptive inferences. The third set of analyses examined the frequencies and percentages of adaptive inferences for students who received the SREP intervention across baseline, post-test, and two-month follow-up (See Table 4).

Table 4

Frequencies and Percentages of Adaptive Inferences for Students Receiving SREP Intervention Across Baseline, Post-test, and Two-Month Follow-Up

	Baseline	Post-test	Two-month follow-up
	n (%)	*n* (%)	*n* (%)
SRL strategy	7 [b] (31.8)	12 [c] (54.5)	8 [b] (36.3)
General studying	17 (77.3)	14 (63.6)	17 (77.3)
Classroom related behaviors	4 (18.2)	1 (4.5)	5 (22.7)
Test-taking skills	2 (9.1)	3 (13.6)	1 (4.5)
Math perception	0 (0)	0 (0)	0 (0)
Don't know	0 (0)	0 (0)	0 (0)
Other	2 (9.1)	1 (4.5)	2 (9.1)

Note. N = 22 students.
[b] One student's response included more than one SRL strategy code; [c] Three students' responses included more than one SRL strategy code.

Reviewing the descriptive data, *SRL strategy* (baseline: n = 7, 31.8%; post-test: n = 12, 54.5%; two-month follow-up: n = 8, 36.3%) and *classroom-related behaviors* (baseline: n = 4, 18.2%; post-test: n = 1, 4.5%; two-month follow-up: n = 5, 22.7%) were shown to have the greatest variability across time points. Minimal variability was shown over time across the

remaining codes. Further, *General studying* was observed to consistently be the most frequently endorsed adaptive inference and *math perception* and *don't know* were observed to consistently be the least frequently endorsed adaptive inference (n = 0, 0%).

Consistent with the analysis followed for students' attributions, McNemar's tests were conducted to examine the within-group differences for adaptive inferences that were the most variable over time. As such, McNemar's test were conducted on SRL strategy and classroom-related behaviors. The changes in *SRL strategy* between baseline and post-test (p = .180), post-test and two-month follow-up (p = .289), and baseline and two-month follow-up (p = 1.00) were not found to be statistically significant. Similarly, McNemar's tests revealed no statistically significant differences between the frequency at which *classroom-related behaviors* was endorsed between baseline and post-test (p = .375), post-test and two-month follow-up (p = .125), and baseline and two-month follow-up (p = .063).

WIN group adaptive inferences. Descriptive analyses were also conducted to examine the frequencies and percentages of responses for the various adaptive inference codes for WIN students across baseline, post-test, and two-month follow-up (see Table 5). As previously noted, there was a discrepancy in the number of students in the WIN group at baseline (N = 22) when compared to post-test and two-month follow-up (N = 20).

Of the adaptive inferences provided by student in the WIN group, *SRL strategy* was the code that demonstrated the greatest shift (baseline: n =91, 40.9%; post-test: n = 7, 33%; two-month follow-up: n = 2, 10%). *Classroom-related behaviors* and *other* codes were shown to also vary in frequency across time points. *General studying* was shown to be the most frequently endorsed code by students accounting for 16 participants at baseline (72.7%) and 14 participants at both post-test and two-month follow-up (70%) whereas, *don't know* was shown to be the least

common code endorsed by students across all time points (*n* = 0, 0%). *Test-taking skills* and *math perceptions* were revealed to have minimal variability over time.

Table 5

Frequencies and Percentages of Adaptive Inferences for Students Receiving WIN Intervention Across Baseline, Post-test, and Two-Month Follow-Up

	Baseline *n* (%)	Post-test *n* (%)	Two-month follow-up *n* (%)
SRL strategy	9 [b] (40.9)	7 (35)	2 (10)
General studying	16 (72.7)	14 (70)	14 (70)
Classroom related behaviors	5 (22.7)	1 (5)	6 (30)
Test-taking skills	1 (4.5)	2 (10)	0 (0)
Math perception	1 (4.5)	2 (10)	0 (0)
Don't know	0 (0)	0 (0)	0 (0)
Other	3 (13.6)	1 (5)	4 (20)

Note. N = 22 students at baseline; N = 20 in post and two-month follow up (2 missing cases).
[b] One student's response included more than one SRL strategy code.

McNemar's tests were conducted to determine within-group differences across a select set of adaptive inference codes. Based on the observed frequency of students' adaptive inferences, McNemar's test were conducted on *SRL strategy* and *classroom-related behaviors*. McNemar's tests revealed that the changes in *SRL strategy* were not statistically significant between baseline and post-test ($p = 1.00$), post-test and two-month follow-up ($p = .063$), or baseline to two-month follow-up ($p = .125$). Similarly, no statistically significant changes in frequency were found for *classroom-related behaviors* between the following times: baseline and post-test ($p = .125$), post-test and two-month follow-up ($p = .125$), or baseline to two-month follow-up ($p = .687$).

Research Question #3: Are there group-based differences in self-reflection phase processes between students participating in remedial math groups (WIN) and those participating in the SRL training groups (SREP)? The third research question examined intervention group differences (SREP vs WIN) at post-test and two-month follow-up across the various codes for attributions (i.e., what students identify as the reason for their math test grade) and adaptive inferences (i.e., what students identify as actions they can take in the future to improve their math grade). Descriptive statistics are presented in Table 6 and Table 7, respectively.

Based on these two tables, there were three high-frequency attribution codes (i.e., SRL strategy, general studying, and math perception) and four high-frequency adaptive inference codes (i.e., SRL strategy, general studying, classroom-related behaviors, and other). These high frequency codes were inspected further using chi-squared tests at post-test and two-month follow-up. That is, the chi-square tests were used to examine the group differences in the frequency of these codes for students' attributions between the intervention group (i.e., SREP, WIN).

Table 6

Frequencies and Percentages of Students Attributions Between Intervention Groups Across Post-test and Two-Month Follow-Up

	Post-test		Two-month follow-up	
	WIN	SREP	WIN	SREP
	n (%)	*n* (%)	*n* (%)	*n* (%)
SRL strategy	1 (5)	9 (40.9)	1 (5)	4 (18.2)
General studying	13 (65)	14 (63.6)	14 (70)	16 (72.7)
Classroom related behaviors	0 (0)	1 (4.5)	0 (0)	2 (9.1)
Test-taking skills	3 (15)	1 (4.5)	0 (0)	1 (4.5)
Math perception	6 (30)	8 (36.4)	3 (15)	5 (22.7)
Teacher skill	1 (5)	1 (4.5)	3 (15)	1 (4.5)
Don't know	1 (5)	0 (0)	0 (0)	1 (4.5)
Other	1 (5)	2 (9.1)	1 (5)	1 (4.5)

Note. N = 42 students: WIN *n* = 20; SREP *n* = 22.

Table 7

Frequencies and Percentages of Students Adaptive Inferences Between Intervention Groups Across Post-test and Two-Month Follow-Up

	Post-test		Two-month	
	WIN *n* (%)	SREP *n* (%)	WIN *n* (%)	SREP *n* (%)
SRL strategy	7 (35)	12 (54.5)	2 (10)	8 (36.3)
General studying	14 (70)	15 (68.1)	14 (70)	17 (77.3)
Classroom related behaviors	1 (5)	1 (4.5)	6 (30)	5 (22.7)
Test-taking skills	2 (10)	3 (13.6)	0 (0)	1 (4.5)
Math perception	2 (10)	0 (0)	0 (0)	0 (0)
Teacher skill	0 (0)	0 (0)	0 (0)	0 (0)
Don't know	0 (0)	0 (0)	0 (0)	0 (0)
Other	1 (5)	1 (4.5)	4 (20)	2 (9.1)

Note. N = 42 students: WIN *n* = 20; SREP *n* = 22.

Across the three high frequency attribution codes, one statistically significant difference emerged at posttest. In comparing the frequency of *SRL strategies* between the SREP and WIN intervention groups, a significant interaction was found (χ^2 (2) = 7.547, p = .023) with a medium effect size (Φ = .42). Thus, students who received the SREP intervention were more likely to make SRL strategy attributions (40.9%) than the students who received the WIN intervention (5%). Additional chi-squared tests were calculated to examine differences in the frequency of *general studying* and *math perceptions* attribution codes across the two intervention groups posttest. No statistically significant differences were found for *general studying* (χ^2 (1) = .008, p = .927) or *math perceptions* (χ^2 (1) = .191, p = .662) at post-test. Further, no significant group differences emerged across the *SRL strategy* (χ^2 (1) = 1.736, p = .188), *general studying* (χ^2 (1) = .038, p = .845), or *math perceptions* (χ^2 (2) = .935, p = .626) when examined at two-month follow-up between SREP and WIN intervention groups.

Similar chi-square procedures were followed to assess group differences in adaptive inferences at both posttest and two-month follow-up. When comparing the differences in the frequency of *SRL strategy* (χ^2 (3) = 3.554, p = .314), *general studying* (χ^2 (2) = 1.230, p = .541), *classroom-related behaviors* (χ^2 (1) = .005, p = .945), and *other* (χ^2 (1) = .005, p = .9458), no statistically significant differences emerged between SREP and WIN intervention groups. Further, when comparing SREP and WIN group interventions, no significant difference emerged between *SRL strategy* (χ^2 (2) = 4.192, p = .123), *general studying* (χ^2 (1) = .287, p = .592), *classroom-related behaviors* (χ^2 (1) = .287, p = .592), and *other* (χ^2 (1) = 1.018, p = .313), two-month follow-up.

Research Question #4: What are the specific themes that emerge within the high frequency codes for both attributions and adaptive inferences? The fourth research question involved a more qualitative exploration into the nature or types of responses provided within various attribution and adaptive inference codes. Unlike prior analyses, this question addressed attributions and adaptive inferences together to gain a greater understanding of reflective phase processes in a more general sense. The rationale behind this decision is twofold. Firstly, the overarching purpose of this dissertation was to obtain a greater understanding of reflective phase processes for middle school students. In prior questions, this was achieved by isolating two distinctive reflective phase processes (i.e., attributions and adaptive inferences) and conducting descriptive and statistical analyses. The fourth research question was distinct because it examined the qualitative variations in student responses and thus utilized simplified version of thematic analysis (Braun & Clark, 2006). By integrating responses across the two reflection phase processes, this researcher was able to develop a clearer sense of overarching patterns of responses within a given code (e.g., SRL strategy, general studying). Another reason for

combining students' attributions and adaptive inferences was to enhance the number of responses that could be analyzed for a given code. For a thematic analysis to evaluate patterns in responses a higher number of responses was desired. Armed with this rationale, all student responses were combined regardless of the reflective phase process originally assessed and the period of time collected.

Upon examining the reflection phase data, two tiers of "high frequency" codes were identified. In the first tier (i.e., high frequency), this researcher identified all the codes within which 40% or more of the participants provided a response for any of the three-time points (i.e., either baseline, post-test, or two-month follow-up). The criteria of 40% was chosen for two primary reasons: (1) to enhance claims about "high frequency" when discussing students' response themes, and (2) so that patterns would only be drawn from responses that occurred at a frequency of nine or greater; increasing the acceptability of emerging trends. Three codes met this criterion during as least one of the three-time points: *SRL strategy*, *general studying*, and *math perception* (see Tables 1, 6, & 7). The second tier included codes that were used at relative lower frequency; defined as responses occurring between approximately 20% and 39% of the time. The percentage parameters for the second tier were chosen to allow for the exploration of codes that although occurring at a "reasonably" high frequency should be viewed with some caution upon interpretation. Finally, codes with a percentage below 20% were not assessed given concerns with the meaningfulness of potential patterns.

Two phases of analysis were conducted across the high frequency and moderate frequent codes. In phase one, the different themes within a given category or subcategory were identified (see Table 8). In phase two, responses with multiple codes were explored to increase the ease at which patterns could be identified.

Table 8

Breakdown and Relevance of Common Themes in Overall Responses Across a Combination of Attributions and Adaptive Inferences

Coded category	Theme	*n* (%)
SRL strategy	Using technology	2 (0.58)
	Comprehensiveness	4 (1.16)
	Employing a technique/skill	4 (1.16)
	Reviewing materials	2 (0.58)
	Advanced studying	3 (0.88)
	Allotting specific time	8 (2.34)
	Noise reduction	4 (1.16)
	Disorganized	1 (0.29)
	Structured extra help	6 (1.75)
	Asking others	18 (5.26)
	Fatigue	3 (0.88)
	Conscientious	7 (2.05)
	Insecurity	4 (1.16)
	Limited effort	2 (0.58)
General studying	Inattention	7 (2.05)
	Level of effort	165 (48.25)
	Disinterest	2 (0.58)
Math perception	Limited understanding of material	27 (7.89)
	Math difficulty	6 (1.75)
	Enhancing calculation/procedures	6 (1.75)
Classroom-related behaviors	Distraction	10 (2.92)
	Participation	18 (5.26)
	Care	4 (1.16)
Other	Contentment	5 (1.46)
	Fear	5 (1.46)
	Pride	5 (1.46)

Note. N = 342 student responses given whereby each student can provide more than one code.

Tier 1 analysis. To gain the greatest understanding of each of the high frequency codes, a descriptive or qualitative analysis was performed to identify different themes or types of responses specific to the code. Descriptive information was obtained by first combining all student response data across intervention groups, time-period, and reflective phase processes. After determining the total number of student responses (N = 342) each themes frequency was then found by comparing its rate of occurrence to the total. This type of exploratory analysis was conducted for SRL strategy, general studying, and math perception.

SRL strategy. This code represented students' statements indicating the use of specific tactics to learn course material, to plan or set goals, to organize academic materials, to management time, to gain help, or to self-manage. Due to of the complexity of SRL strategy codes, additional subcategories were also utilized, within the original coding scheme, to identify underlying themes (Cleary et al., 2017). When compared to all codes issued for students' responses, SRL strategy accounted for approximately 20% of responses (see Table 8). Of the students' responses coded within SRL strategy use, a total of 68 individual codes occurred across baseline (n = 20), post-test (n = 32), and two-month follow-up (n = 16). Of these codes, 20 were attributions (29.4%) and 48 (70.6%) reflected adaptive inferences. The common themes that emerged from a review of SRL strategy were captured by sub-categories reported by Cleary et al. (2017): transformation learning tactics, rehearsing/memorizing, time management/planning, environmental structuring, materials organization, help seeking, and emotional/mental self-control (see Table 9).

Of the SRL strategy subcategories, many (approximately 35%) of the responses indicated that students believed that their performance was hindered by or could be improved through help-seeking strategies. For help seeking, two themes emerged: (1) *structured extra help* and (2)

asking others (see Table 9). Responses pertaining to *structured extra help* emphasized seeking help through participation in learning groups or one-on-one instruction. An example of a student's response within this category would be, "I need to get a tutor." Through the theme of seeking help students' reveal that they are aware of specific avenues through which they can obtain help within school (i.e., after school programs) as well as in their larger communities (i.e., tutors). In addition to *structured extra help*, students also indicated that help seeking included the specific act of *asking others*. The second theme of *asking others* emerged in help seeking both explicitly and implicitly. In some instances, a student's response would overtly state who and what the student was asking (i.e., "ask the teacher questions") while at other times the student's response would only imply they would be asking other (i.e., ask for help"). The theme of *asking others* was also shown to be paired with another coded response16 out of a possible 18 times (88.9%). Further investigation revealed *general studying, test taking skills, classroom related behavior*s, and *other* SRL strategies as the coded responses that were paired with *help seeking.* The code most often paired with help seeking was *general studying* (*n* = 18, 75%) followed by *other* strategies (*n* = 6, 25%). Both *test taking skills* and *classroom-related behaviors* were paired with help seeking in only one instance.

The second most frequently endorsed SRL strategy sub-category was emotional/mental self-control (23.5%; see Table 9). Across these responses, four separate themes emerged: (1) *fatigue,* (2*) level of conscientiousness*, (3) *insecurity* and (4) *limited effort*. In responses that were found to embody the *fatigue* theme, students either directly used the words "tired" or "sleep" to describe his/her attributions or adaptive inferences (i.e., "I was tired that day"). The most common theme within the subcategory of emotional/mental self-control was *conscientious* (see Table 9). Responses that were found to demonstrate *conscientious* were those in which a student

indicated that they needed to "focus more" and/or take his/her studies more seriously (i.e., "I think I need to focus on what I'm doing", "I need to focus more and get more serious about my grades"). For others, responses revealed underlying *insecurity* (see Table 9). This theme of *insecurity* was distinguished by the presence of self-deprecating remarks that depicted themselves as nervous, anxious, or lacking confidence (i.e., "I was a little stressed and was thinking of how the test grade was going to be"). Lastly, a student's response within the subcategory of emotional/mental self-control was also shown to have a theme of *limited effort* (see Table 9). The theme of *limited effort* took the form of student's describing their attributions and adaptive inferences directly as the result of limited effort, laziness, or lacking persistence (i.e., "Sometimes I give up and have difficulties"). Yet, when reviewing the themes that were demonstrated in this subcategory, one should be cautious in generalizing these themes in other settings as only *conscientious* occurred at a rate that accounted for 10% of students' responses within the code of SRL strategy, which as a whole only account for approximately 20% of all coded responses provided by students across attributions and adaptive inferences (see Table 8).

Responses reflecting time management/planning accounted for approximately 16% of students' responses within the SRL strategy code. Two underlying themes emerged: (1) *advanced studying* and (2) *allotting specific time* (see Table 9). Responses that demonstrated *advanced studying* indicated the desire to study before an exam but was absent of any greater details (i.e., "I think I need to continue studying a few days before the test"). Student responses that described planning a specific time or amount of time to study were those the embodied a theme of *allotting specific time* (i.e., I should take time off my daily plans to study for 30 mins so I can do a better job next time"). Yet, as stated previously one should utilize caution when generalizing these themes as only the theme of allotting specific time was present in greater than

ten percent of the SRL strategy codes and together they account for less than 4% of all participants' responses (see Tables 8 & 9).

The remaining subcategories of transformational learning tactics, rehearsing/ memorizing, environmental structuring, and materials organization all accounted for less than 10% of the SRL strategy responses (see Table 9). For this reason, the themes that emerged within these individual subcategories will be described together, as none of these themes was occurred at a frequency greater than four times. Further, due to the limited frequency at which the following codes and underlying themes occurred, one should be cautious in their interpretations.

Within the subcategory of transformational learning tactics two themes emerged: (1) *using technology* and (2) c*omprehensiveness* (see Table 9). The theme of *using technology* was demonstrated when a student's response specifically stated the use of an online application or technological device (i.e., "use more apps") whereas the theme of *comprehensiveness* was demonstrated when a student's response indicated a need to review and practice materials in greater depth or with a heightened focus (i.e., "I should go back to the chapter that I didn't understand fully when my teacher explained to me"). Combined both themes of *using technology* and *comprehensiveness* accounted for approximately 9% of SRL strategy coded responses and less than 2% of all participant responses (see Tables 8 & 9). Similarly, the subcategory of rehearsing/ memorizing also accounted for approximately nine percent of SRL strategy coded responses and 2% of all participant responses (see Tables 8 & 9). The two themes that emerged from within the subcategory of rehearing/ memorizing were (1) *employing a technique/skill* and (2*) reviewing materials* (see Table 9). The students' responses that embodied the theme of *employing a technique/ skill* described the desire to learn unidentified steps, skills, or techniques that would assist them in mathematics (i.e., "I need to know and memorizing my math skills").

The theme of *reviewing materials*, described the responses that included the action of reviewing written classwork or the lack thereof (i.e., “I did not prepare for the test”). The next subcategory, environmental structuring included responses that all fell in the theme of *noise reduction* (see Table 9). Accounting for approximately 6% of student responses of SRL strategy coded and approximately 1% of all participants responses, the theme of *noise reduction* described student’s responses that directly stated a desire to increase time spent in quiet spaces and decrease the presence of distractions (i.e., “Maybe when I study to turn off my distractions”; see Tables 8 & 9). The final subcategory of SRL strategy, accounting for less than 2% of SRL strategy responses and less than 1% of all participants’ responses is material organization (see Tables 8 & 9). It is in material organization that a theme of *disorganization* was described through the explicit description of materials as messy (i.e. “Couldn’t study my notes because my notes was messy”).

Table 9

SRL Strategy Themes Across a Combination of Students' Attributions and Adaptive Inferences

Code sub-category	Theme	*n* (%)	Example
Transformational learning tactics	*Using technology*	2 (2.9)	"The reason I got a 93 is because the day before I clicked on virtual nerd"
	Comprehensiveness	4 (5.9)	"Study not just on one question, but on the whole chapter"
Rehearsing/memorizing	*Employing a technique/skill*	4 (5.9)	"Make some type of way to remember how I did the problem"
	Reviewing materials	2 (2.9)	"I reviewed my notes and studied. I also reviewed the classwork and homework."
Time management/ planning	*Advanced studying*	3 (4.4)	"Study the day before"
	Allotting specific time	8 (11.8)	"Decided to actually study for 15 min."
Environmental structuring	*Noise reduction*	4 (5.9)	"I need to study more in a quiet place"
Materials organization	*Disorganized*	1 (1.5)	"Couldn't study my notes because my notes was messy"
Help seeking	*Structured extra help*	6 (8.8)	"I feel like I just need to maybe stay after school for extra help."
	Asking others	18 (26.5)	"I should ask questions when I need help"
Emotional/ mental self-control	*Tired*	3 (4.4)	"I need more sleep"
	Conscientious	7 (10.3)	"I think I need to work on being more serious and focused"
	Self-doubt	4 (5.9)	"I need to have more confidence and try to push myself more."
	Limited effort	2 (2.9)	"I struggle with being lazy"

Note: $n = 68$; percentages reflect how each of the associated themes were embodied in SRL strategy.

General studying. This code reflected students' statements pertaining to the quality of their study efforts and/or the amount of time spent learning course content. When compared to all codes issued for students' responses, general studying accounted for approximately 50% of total participant responses. A total of 174 individual codes occurred across baseline (n = 59), post-test (n = 54), and two-month follow-up (n = 61). Of these codes, 82 (47.1%) were students' attributions while 92 (52.9%) pertained to adaptive inferences. The common themes that emerged from a review of general study were *level of effort, inattention,* and *disinterest* (see Table 10).

Table 10

General Studying Themes Across a Combination of Students' Attributions and Adaptive Inferences

Theme	*n* (%)	Example
Level of effort	165 (95)	"Because I never tried."
Inattention	7 (4)	"I need to focus more and try a little harder and study harder."
Disinterest	2 (1)	"In my opinion, I did not care about math. Teachers, always keep saying "math is everywhere!" I always thought it was a bunch of baloni, and that I didn't need to study."

Note: n = 174 total student responses coded as general studying.

Accounting for 95% of participants' responses with the General Studying category was the theme of *level of effort*, which included responses about lack of preparation (i.e., study more), desire to study harder or longer (i.e., "keep studying hard and aim for 110%"), utilization of notes (i.e., "I think I need to study more by reviewing my notes"), and a need to increase understanding and attention (i.e., "I forgot there was going to be a test, therefore, I didn't

study"). The other two themes of *inattention* and *disinterest* both accounted for less than 5% of the response within the general studying category. A theme of *inattention* involved student responses reflecting a lack of focus and/or lack of attention to his/her studies. The theme of *disinteres*t was used to describe student responses reflecting a believe or want to improve his/her academic performance. When reviewing responses with the themes of *inattention* and *disinterest* one should be cautious with their interpretations as these two themes account for less than 3% of all participants' responses (see Table 8). Conversely, the theme of *level of effort* accounts for nearly half of students' responses and as such represented the majority of students' reflective thoughts (see Table 8).

With an understanding of each of the themes within the general studying category, phase two analysis examined the extent to which the general studying code co-occurred in students' overall response pattern. In phase two analysis, general studying was shown to often occur with all codes except don't know (see Table 11). In total, 47% of the one-hundred seventy-four general studying responses occurred with another code. (see Table 11). In some instances, general studying was also shown to occur with two additional codes, including the following coding pairs: (1) SRL strategy/ math perception, (2) SRL strategy/ classroom-related behaviors, and (3) classroom-related behaviors/ math perception. There was even an instance in which general studying occurred in a student's responses with three additional codes (test taking skills, math perception, other). Further analysis demonstrates a pattern in which general studying is only an aspect of students' reflective thinking when addressing attribution and adaptive inference questions.

Table 11

Frequency with Which General Studying Code Co-occurred with Other Codes

Co-occurring code	*n* (%)	Example
SRL strategy	30 (35.6)	"I did not study. *I was tired that day*."
Test taking skills	7 (8.5)	"*I was rushing* and I didn't put that much effort in to it."
Classroom-related behaviors	21 (25.6)	"Study, *come to school and class on time* and put in full effort."
Math perceptions	15 (18.3)	"*I was out a few days before and I didn't get to understand the concept*. I also didn't study for the quarterly too."
Other	9 (11)	"I got this grade because I was not focused & *I was thinking about what my grade would be & how my parents would react*."

Note. n = 82, total student responses in which general studying occurred with other codes. Italicized text indicates the part of the response that represents the co-occurring code.

Math perception. This code was used to represent statements that reflected student perceptions of math difficulty, their perceived ability, and/or the specific types of problems/skills they wished to improve. When compared to all codes used for students' responses, math perceptions accounted for approximately 11% of participant responses (see Table 8). Of the students' responses coded as math perceptions, a total of 39 individual codes occurred across baseline (n = 15), post-test (n = 16), and two-month follow-up (n = 8). Of these codes, 36 (92.3%) were student's attributions and three (7.7%) were student's adaptive inferences. Upon reviewing this specific code, three themes emerged: (1) *limited understanding of material*, (2) *perceived math difficulty*, and (3) *enhancing calculations/ procedures* (see Table 12).

The majority of student responses with the math perceptions category reflected the theme of *limited understanding* (69.2%; see Table 12). The theme of *limited understanding* was utilized to reflect a lack of knowledge (i.e., "Don't know how to solve the problem") or implied a lack of knowledge (i.e., "I was guessing my answers"). This code was also shown to account for nearly 8% of all participants' responses, making it the second most frequently endorsed response theme (see Table 8). The remaining two themes each accounted for approximately 15% the responses coded as math perceptions (see Table 12). The theme of *math difficulty* was shown in responses in which a student stated that they were having trouble with math or weren't good at math (i.e., "It was a little hard"). Lastly, the theme of *enhancing calculation/ procedures* was used for responses reflecting math content areas that students needed to improve or had excelled at (i.e., "Didn't know ow to find the diameter when they have me the circumference"). When reviewing these themes caution should be taken when attempting to generalize as the code of math perceptions as a whole only accounted for approximately 11% of all of students' responses (see Table 8).

Table 12

Math Perception Themes Across a Combination of Students' Attributions and Adaptive Inferences

Theme	*n* (%)	Example
Limited understanding of material	27 (69.2)	"I never really understood what was being taught"
Math difficulty	6 (15.4)	"Because I'm not good at math."
Enhancing calculation/procedures	6 (15.4)	"I need to improve on open ended questions like charts and word problems."

Note. $n = 39$ total student responses coded as math perception.

Tier 2 analysis. A similar analysis was performed on the codes that occurred at only a moderate level of frequency: classroom-related behaviors and other.

Classroom-related behaviors. This code was used to describe responses that reflected class attendance and behaviors during class activities. When compared to all codes issued for students' responses, classroom-related behaviors accounted for approximately 9% of participants (see Table 8). Of the students' responses coded classroom-related behaviors, a total of 32 individual codes occurred across baseline (n = 13), post-test (n = 6), and two-month follow-up (n = 13). Of these codes, seven (21.9%) were student's attributions and twenty-five (78.1%) were student's adaptive inferences. Upon a review of student responses that were identified with the code classroom-related behaviors several themes emerged: (1) *distraction,* (2) *participation,* and (3) *care* (see Table 13*).*

Accounting for over half of the student responses within the classroom-related behaviors category was the theme of *participation* (see Table 13). The theme of *participation* reflected attributions and adaptive inferences pertaining to asking question, taking notes and attending class (i.e., "I think I should ask questions in class if I don't know something"). Accounting for approximately 31% of responses coded as classroom-related behaviors was the theme of *distraction* (see Table 13). The theme of *distraction* embodies the student responses that identify daydreaming or being inattentive as the reasons for the former academic performance or the areas in which the can improve in the future (i.e., "I need to pay a little more attention in class"). Lastly, the theme of *care, which* describes the student responses that emphasize the need to review his/her work, accounted for approximately 12% of the responses coded as classroom-related behaviors (i.e., "Make sure I did all my questions").

Table 13

Classroom-related Behaviors Themes Across a Combination of Students' Attributions and Adaptive Inferences

Theme	*n* (%)	Example
Distraction	10 (31.3)	"I daydreamed in class"
Participation	18 (56.3)	"Come to school and class on time and put in full effort."
Care	4 (12.5)	"I Take my time. Don't rush when I see other kids done."

Note. $n = 32$ total student responses coded as classroom-related behaviors; *n* (%) represent students' responses within the math perceptions code.

Other. This code was issued to describe student responses that did not fit into any other category and/or appeared to be un-codable. When compared to all codes issued for students' responses, other accounted for approximately 8% of participants (see Table 8). Of the students' responses coded other behaviors, a total of 28 individual codes occurred across baseline ($n = 15$), post-test ($n = 5$), and two-month follow-up ($n = 8$). Of these codes, 15 (53.6%) were student's attributions and 13 (46.4%) were student's adaptive inferences. Upon a review of student responses that were identified with the code other several themes emerged: (1) *contentment,* (2) *fear*, and (3) *pride* (see Table 14).

Each of the three themes (i.e., contentment, fear, pride) identified within the category of other occurred at a frequency of five times and accounted for approximately 41% of the responses in the other category (see Table 14). The *contentment* theme was utilized to describe the student responses coded as other that expressed a student's belief that they did not need to change their current behaviors (i.e., "So the same for the last test"). The theme of *fear,* was utilized to describe student responses that focused on how others may perceive their performance

and the consequences of underperforming (i.e., "Because if I keep getting these grades I would fail math"). Lastly, the theme of *pride* was used to describe student responses that demonstrate his/her desire to improve their performance to elicit feeling of self-worth and satisfaction (i.e., "Make myself and my parents proud of me"). Yet, these themes should be interpreted with caution as each of them account for approximately 1.5% of participants' responses (see Table 8).

Table 14

Other Themes Across a Combination of Students' Attributions and Adaptive Inferences

Theme	*n* (%)	Example
Contentment	5 (41.7)	"I don't think I need to improve."
Fear	5 (41.7)	"I was thinking about what my grade would be & how my parents would react."
Pride	2 (16.6)	"Because if I do better, it will a better chance that I could get honor roll and I could feel proud of myself and more better learning in school."

Note. $n = 12$ total student responses coded as other, other responses of this code ($n = 16$) did not appear to have a common theme; *n* (%) represent students' responses within the math perceptions code.

Discussion

The importance of reflection has been emphasized by researchers and educators due to the central role it plays in theoretical models of SRL and because it has been linked to academic performance and success (Cleary et al., 2004; McClure et al., 2011). Research into reflection has also revealed it to be a complex process that students often struggle to acquire and master. Further, while studies have developed numerous ways to assess and categorize reflective data, there remains a need for studies to conduct in-depth assessments of the reflective thoughts of students to promote a greater understanding of reflection and to inform educational interventions (Vandevelde, Van Keer, Schellings & Van Hout-Wolters, 2015). The need for increased understanding of reflection is especially true for students who are academically at-risk, as they

are those who seek to gain the most from informed intervention practices. Therefore, the purpose of this dissertation was to gain a greater understanding of the reflective processes (i.e., attributions, adaptive inferences) of academically at-risk students through examining their responses to microanalytic questions during a test reflection activity. This study is important as it expands (a) the use of microanalytic reflection phase questions, (b) how microanalytic data have been examined, and (c) the nature of students' reflection phases processes in authentic, school-based situations.

Expanding the utilization of microanalytic phase questions is important as it allows for researchers to collect information about critical sub-processes of reflection as individuals engage in some specific learning activity (Cleary, 2011). SRL microanalysis de-emphasizes the need for students to engage in retrospective thinking and recall, thereby increasing one's insight into real-time student reflections. Yet, despite the benefits of microanalysis, it has only been used sparingly in reflection studies for roughly the past twenty years (Panadero, 2017). Further, many of the studies that have utilized microanalysis have only explored students' attributions as they are engaging in non-academic tasks, such as basketball free throwing or dart throwing, and have largely ignored students' adaptive inferences (Cleary & Zimmerman, 2001; Kitsantas et al., 2000; Kitsantis & Zimmerman, 1998; Zimmerman & Kitsantas, 1997, 1999). Of the studies that have included adaptive inferences a majority also included participants engaging in non-academic tasks (Cleary et al., 2006; Kitsantas & Zimmerman, 2002). Consequently, through this dissertation, this researcher was able to show how microanalytic protocols can serve as a useful tool for understanding students' attributions and adaptive inferences during specific situations in an academic context (e.g., mathematics).

The current dissertation also represents an advance over earlier microanalytic studies because it expanded the nature of the coding schemes used for the reflection questions (DiBendetto & Zimmerman, 2010; Gandomkar et al., 2016). That is, consistent with the data provided by Cleary et al. (2017), the attribution coding scheme involved eight descriptive categories, while for adaptive inference the number of categories was seven descriptive categories. The current dissertation also delved deeper than Cleary et al. (2017) to understand the nature and frequency of the specific attribution and adaptive inference response in depth. This dissertation expanded on the work of Cleary et al. (2017) by exploring what students believe contributed to their successes and failures (i.e., attributions) and the ways in which students believe they could improve their performance in the future (i.e., adaptive inferences) simultaneously by (1) identifying the most frequently endorsed reflections, (2) determining the change rate and significance of each reflection response code, and (3) revealing themes across both reflective processes. The specific finding of this unique process will be discussed in greater detail.

Nature of Academically At-Risk Students' Attributions and Adaptive Inferences

For the first research question, the most common types of attributions and adaptive inferences provided by students were evaluated to gain a more nuanced understanding of students' thinking when engaging in classroom test reflection activities. When examining student sresponses prior to receiving an intervention (i.e., SREP, WIN), it was found that the most frequent attributions about their test performance involved *general studying* (59.1%) and *math perceptions* (31.8%). In other words, prior to receiving a strategic or remedial math intervention, students were most likely to believe their performance on a mathematics test was due to their studying habits and/or their ability to understand mathematic concepts. Interestingly students

rarely provided responses reflecting SRL strategies (6.8%). The finding that students place greater emphasis on general attributional statements aligns with prior research for at-risk students. In Vandevelde et al. (2015) the regulatory habits of eight academically at-risk students were assessed over two consecutive school years and revealed that at-risk students engage in SRL but only on a superficial level. Similarly, in Balduf (2009) academically at-risk students were asked to reflect upon their performance and were found to attribute their underachievement to inadequate study skills, poor time management, and limited motivation.

Yet, while it is not uncommon for at-risk students to provide broad attributions for their performance, it has important implications for their future learning and success (Cleary & Zimmerman, 2004). Research has demonstrated the benefits of students exhibiting strategic thinking while trying to meet the expectations of their learning environments (Colthrope et al., 2015). Not only is strategic thinking positively correlated with self-efficacy and motivation (Kitsantas et al., 2000), it has been linked to students' ability to adapt (Bennett et al., 2016; Mason, 2014) and students' independence (Asaro-Saddler & Saddler, 2010). Further, students who engage in strategic reflections interact with their environments as self-regulated learners (Zumbrunn, Tadlock, & Robert, 2011). This is important as self-regulated learners have been shown to seek out additional resources and information (Clarebout, Hortz & Schnotz, 2010; DeBruin, Thiede, & Camp, 2011) and manipulate their environments to meet their needs (Kolovelonis, Goudas, & Dermitzaki, 2011) both of which are adaptive. Lastly, as attributions are a sub-process of the self-reflection phase found within the SRL cyclical feedback loop, a student's inability to engage in strategic thinking would also hinder their ability to change former ineffective academic approaches in subsequent forethought and performance phases

(Zimmerman & Schunk, 2011). In research this has been exemplified in the sustainability of at-risk students' reflection phase processes (Vandevelde et al., 2015)

With the knowledge that a majority of students' attributions were non-strategic and poorly aligned with adaptive SRL, it was interesting to find that more than a third of students provided *adaptive inferences* responses reflecting SRL strategy (36.3%). It appears than that while students make limited associations to SRL strategy and their prior performance, when prompted to discuss the ways to improve future performance they are more inclined to make reflections that identify SRL strategy. Upon reviewing students' adaptive inferences, the most common response made by students was general studying (75%). Classroom-related behaviors were also shown to be endorsed at a relatively high frequency (20.5%). Thus, students mostly believed their grades could be improved on future mathematics exams by refining their study habits, increasing their utilization of strategies and enhancing their prosocial and scholarly behaviors within the classroom (i.e., taking notes and/or engaging in class discussions). As prior research has demonstrated that students are often encouraged to try harder (i.e., general studying), told that they will do better once they know more about the academic subject (i.e., math perceptions), and/or asked to think about how engaged they are in class (i.e., classroom-related behaviors), the adaptive inferences uncovered in this study align with previously uncovered reinforcement practices (Prawat, 1992). Specifically, teachers have been shown to commonly utilize behavioral techniques, such as reinforcement, to optimize students achievement and behavior (Akin-Little, Eckert, Lovett, & Little, 2004; Kruger et al., 2016). Given that environmental factors have been shown to impact students' reflection (Hadwin, Winne, Stockley, Nesbit, & Woszczyna, 2001; Perry, 1998; Reeve & Jang, 2006), it is possible that students' reflection processes in this study were also impacted by similar factors.

Research has also shown that while academically at-risk students receive greater initial assistance from teachers in the classroom, these students also have more negative interpersonal relationships with their teachers due to teachers increased negative affect (Welsh & Domitrovich, 2005). One reason this may occur is that teachers tend to misrecognize their role in ensuring student engagement, which in turn can result in limited or lacking social connectedness (Nairz-Wirth & Feldmann, 2017). For academically at-risk students these interactions not only impact the acquisition of strategic thinking in reflection, but they also increase the risk of students becoming less engaged in their academics and even dropping out of school (Chen, Fan, & Jury, 2017; Finn, 1989; Lamb & Markussen, 2011).

Shifts in SRL Responses Over Time

Understanding the possible negative student outcomes associated with nonstrategic reflections has resulted in a rise in the exploration and implementation of interventions that increase strategic thinking (Cleary & Kitsantas, 2017). Yet, there remains a continued need to understand how various forms of intervention impact students' reflections. For this reason, this study expanded the first question and sought to identify the types of attributions and adaptive inferences provided by students over time within a remedial math intervention (WIN) and a strategic intervention (SREP). Descriptive and inferential statistics were found to further support existing research.

When reviewing the attributions and adaptive inferences made by students in the WIN group (i.e., students who did not receive an SRL intervention), no statistically significant within group shifts were observed for any of the codes. Thus, at a group level, the nature of students' reflection phase processes were shown stable over time when they did not receive any type of SRL or strategic intervention. In other words, without intervention support, academically at-risk

students will demonstrate a fairly poor quality of strategic thinking necessary to identify faults in their learning processes and to devise future academic plans that are adaptive.

Yet, in reviewing the changes in SREP students' reflection phase processes, students' reflections were shown to exhibit positive shifts in regulatory or strategic quality. The current study found that approximately 40% of students displayed an increase in their belief that their implementation and execution of strategies was the reason for their performance at post-test. This increase in students' attributing their performance to strategy utilization makes sense given that while students were enrolled in the intervention the importance of strategic thinking was emphasized (Cleary et al., 2017). However, two months following the end of the SREP intervention, students' strategic attributions decreased by approximately 20%. It is important to note that the observed decrease in students' strategic attributions may not have been an accurate representation of students' abilities due to the time of year in which is occurred – Spring. During the Spring students' learning environments can shift as a result of standardized testing and changes in classroom expectations and thus the observed decreases may reflect this change in school climate rather. Yet, the observed pattern of student's reflective responses increasing with intervention and regressing in its absence supports prior research in two ways: (1) it reinforces our understanding of reflection as a part of the larger regulatory process of SRL and (2) it demonstrates that students' reflections can become more adaptive when provided with opportunities to increase their strategic thinking (Zimmerman, 2008). Specifically, it is possible that once students were no longer exposed to an environment that explored strategic thinking that their utilization decreased due to a lack of consistent reinforcement. As such, students' attributions and adaptive inferences can be shown to connect to the larger SRL cyclical feedback loop; as students' who received the strategic intervention were continually reminded of the

specific steps they can take to be more strategic and then shown how to apply that reasoning while they plan and engage in learning (Cleary et al., 2017; Zimmerman, 2013). Further, students were shown to continue to endorse SRL strategies following the intervention. Although this change in response frequency was not found to be significant, it is interesting to note that students' SRL strategy attributions went from accounting for 0% of participants responses to approximately 18% of participants responses. This finding suggests that once students are taught ways in which they can engage in learning strategically that some of them are likely to retain such skills and thinking patterns. This idea is supported by the very nature of SRL as a cyclical feedback loop whereby past and current learning will eventually impact future thinking and behavior (Panadero, 2017).

Another objective of this study was to determine if there were any group-based differences in the attributions or adaptive inferences made by students. Results revealed one meaningful difference between the WIN and SREP intervention groups at post-test. Specifically, students who had received a strategic intervention were statistically more likely to make SRL attributions when compared to students who had received a remedial math intervention. The significant difference in students' reflection was represented by students' responses in the remedial math group endorsing SRL strategy 5% of the time whereas students' responses in the strategic group endorsing SRL strategy approximately 41% of the time. Additional analyses revealed that there were no other significant differences between the reflective responses of students between the two intervention groups across post-test and two-month follow-up.

Consequently, the descriptive and inferential data collected in this study was shown to further support the notion that the majority of academically at-risk students' reflective thinking will not change over time and will tend not to view their performance in terms of SRL strategies.

Rather when reviewing the data for student's reflections, it appears that regardless of whether a student received an intervention that increased their exposure to strategic thinking or reinforced their mathematics concepts they were more likely to engage in reflective thinking represented by very broad and general comments about their level of effort. Yet, despite this knowledge, there remains a need to know the specific patterns found within students reflective thinking to increase the relatability and effectiveness of academic interventions.

Emergent Themes Across High Frequency Attribution and Adaptive Inference Codes

Although microanalysis and its associated coding schemes have helped researchers develop a more nuanced and clear understanding of the nature of students' reflection phase processes (Cleary, 2011, 2012), no researchers to date have examined students' responses within the various codes across both attributions and adaptive inferences. Upon review of students' responses, three high frequency codes (40% or more participants) and two moderately endorsed codes (between 20% and 39%) were targeted to review the specific themes within each code for students' attributions and adaptive inferences. SRL strategy, general studying and math perceptions were shown to be the most frequently endorsed codes. For example, SRL strategy, general studying, and math perceptions were endorsed by 40% or more of the students at either baseline, post-test, or two-month follow-up. Classroom-related behaviors were also found to be codes that were endorsed at a relatively high frequency by students, accounting for between 20% and 39% of students' responses at either baseline, post-test, or two-month follow-up.

With an understanding of the actual reflective responses that students make, the fourth research question sought to uncover and highlight the underlying themes and patterns within students' reflective processes. To achieve this goal, the responses for both attributions and adaptive inferences were combined to provide a more nuanced picture of the nature of students'

reflecting thinking patterns. Through a simplified thematic analysis, 26 individual themes were found across all five categories; however most of these codes occurred at a frequency that accounted for between less than 1% and 2% of all participants responses. There were two categories that were the exception, however, and that were shown to include high frequency themes: (1) general studying and (2) math perceptions. General studying and math perceptions codes revealed that academically at-risk students engage in reflective thinking that predominately includes themes of *level of effort* (*n* =165, 48.2%), and *limited understanding of material* (*n* = 27, 7.9%; see Table14). Students responses also included themes that were part of SRL strategy (i.e., *asking others*) and classroom related behaviors codes (i.e., *participation* & *distraction*), but the frequency of these later themes only occurred at a moderate level (see Table14). As such, only the themes of *level of effort and limited understanding of material* will be discussed in greater detail in this section, with the most emphasis being on *level of effort* as it was shown to occur in nearly half of all of students' responses.

When reviewing the themes of *limited effort* and *limited understanding of material*, students are once again shown to engage in reflections that are general, simple, and non-informative about how to strategically change or adapt. Evidence of students' lack of adaptive reflective responses can be found in that the themes of *limited effort* and *limited understanding of material* are used to describe responses that equate student's beliefs regarding their prior performance and potential future efforts to statements of "try hard" and "I didn't understand." However, as an argument can be made that the theme of *limited effort* present in students' reflective responses processes might be indicative of students' developmental shifts towards the more adaptive mastery orientation, it is also possible the theme of *limited understanding of material* also demonstrates students' attempt to focus on the acquisition of skills. Thus, although

at-risk middle school students by and large engage in reflections that are absence of strategic thinking, this does not mean that their reflection phase processes are void of any adaptive qualities.

Rather, what if what was being observed in the reflective responses of these students was not an anomaly but rather indicative of how the underlying processes of students' reflections operate. Further, what if in some instances effort attributions could serve to motivate students by reminding them of their control over former reflective phase processes and their unstable nature (Weiner, 1985). Support for effort attributions being positive connected to motivation can be found in research that has revealed attributions to not only be a determinant of academic success (McClure et al., 2011) but to also have cognitive and affective consequences related to the perception of outcomes (Meece et al., 2006). Additionally, research has found that students who attribute their academic outcomes to effort operate within a mastery orientation (Liu et al., 2009). As mastery orientations enable students to have an increased sense of control, it has also been linked to improved academic performance (McClure et al., 2011). Consequently, the theme of *limited effort* may not only indicate that academically at-risk students lack regulatory reflections but rather their abundance may be more indicative of students' focus on learning the new skills necessary to improve their academic outcomes.

An in-depth investigation into the theme *level of effort* revealed it to be the most reoccurring response pattern among student. It was also the theme that occurred most frequently with other codes. Specifically, students' responses that included a theme of *level of effort* were also shown, at times, to endorse either strategic thinking, test-taking skills, classroom behaviors, math perceptions, or other codes. This perhaps can be descriptive of students reflective thinking. It is possible that when students are asked to reflect on their performance and determine why

they received a specified academic grade and/or is asked to identify ways in which they can improve their performance, they not only think of their level of effort but think of the areas in which their efforts need to be improved. While this would not be identified as a student employing an SRL strategy, due to the lack of specificity or plan, it does hint at students' ability to refine their understanding of their current and future performance. The pattern of co-occurring response codes indicates that while a student may not be engaging in highly specific strategic thinking, they may be able to identify the areas in which they believe they should increase their efforts. Consequently, one could state that a student who endorses reflective thoughts pertaining to effort is being adaptive. Evidence of efforts connection to strategy utilization can be found in this study whereby the theme of *limited effort* was associated with students' responses containing SRL strategies, which are associated with enhancing students' ability to meet academic objectives (Bennett et al., 2016; Mason, 2014). Yet, while reflections of effort may be adaptive they lack the ability to inform students how they need to improve – which is often the support that academically at-risk students are in the greatest need of receiving.

Limitations and Areas for Future Research

This dissertation expanded upon the Cleary et al., (2017) study by conducting in-depth analyses that included descriptive and inferential statistics and a simplified thematic analysis of the originally collected microanalytic data. There were, however, limitations in this study that warrant consideration.

The first limitation of this study was the generalizability of the findings across contexts and other samples. Aspects that impacted the generalizability of this study were the relatively modest sample size, specific recruitment criteria, and area of academic focus. With a sample size that ranged from 42 participants for the first and fourth research questions and between 20 and

22 participants for research questions two and three, high variability in the number of possible students' responses was observed. The main limitation of the present sample size was its impact of interpretation as the findings in small samples require larger effect size to reveal significance (Hackshaw, 2008). It is therefore possible that significant results were not detected because of there being low power. Naturally, the small sample size also resulted in fewer student responses when assessing for themes in question four. This led to a restricted exploration of themes as it was at times challenging to decipher whether an observed theme was truly representative of the coded responses and academically at-risk students' reflective thinking.

The generalizability of this study's findings was further limited as the sample was also highly selective and narrow. That is, the students recruited for the original study were selected to participate once they had met the following criteria: (1) enrollment as a seventh-grade student, (2) mathematics report card grades below a B average, (3) standardized mathematics test score in the marginal to proficient range, and (4) teacher nominations regarding deficiencies in motivation or regulation. Further, this study focused on academically at-risk students enrolled in an urban middle school. Although the restricted sample of this study expanded the current understanding of reflection phase processes (i.e., attributions, adaptive inferences), future research should explore the reflection phases processes of students in other academic contexts, across grades, and with various disabilities (e.g., learning disabled & gifted). This is especially important as numerous studies have demonstrated SRL to be a contextualized process (Cleary, 2011; Hadwin et al., 2001; Magi, Mannamaa, & Kikas, 2016; Zimmerman 2008) and because there is a limited understanding of how students' reflections may vary among those with learning disabilities (Swanson, Harris, Graham, 2003). Research conducted by Graham and Harris (2005) also revealed interventions often do not automatically lead to more efficient strategy utilization

among students with learning disabilities. Similarly, while performance in mathematics has been shown to relate to students' future academic success, asking students to engage in reflective thinking in other academic courses would allow for a greater understanding of the ways in which SRL and associated processes are differentiated within students.

A second limitation of this study was the fairly narrow assessment of students' reflections. In this study, two microanalytic questions were used to assess students' test reflections. While this study was focused on obtaining a deeper understanding of the nature of two reflective responses, the use of only one microanalytic attribution question and one microanalytic adaptive inference only allowed for this researcher to draw conclusions based on a limited range of questions.

Further, this researcher only used SRL microanalytic questions that involved hand-written self-reports. Although these self-reports provided valuable insights into students' strategic thinking, this form of assessment is at risk of containing response biases. Practically speaking this was reduced as the microanalytic procedures of this study relied on an open-response format. However, it is still possible that students' responses may have been influenced by students' desire to provide answers that were believed to be preferable. To reduce biases, when possible future studies should integrate responses from multiple sources (e.g., teachers & parents). That is not to say that former studies have not relied on multiple responders. Yet, in the instances in which data has been gathered from numerous sources, the studies often utilize similar measures (e.g., rating scales) or lack an in-depth analysis of specific regulatory processes. Therefore, there remains a need for researchers to use a combination of assessment instruments in future research. Additional support for the implementation of multiple assessments can be

found in that it has been identified as the preferable way to assess SRL as a process and to obtain data that it both comparable and reliable (Boekaerts & Corno, 2005).

A third limitation of this study was that it explored students' reflective phase processes to the exclusion of other SRL phases (i.e., forethought and performance). Operating as a part of a larger cyclical feedback loop, by only gathering data about student self-reflection this researcher was not able to draw any conclusions about how reflection intersected with other regulatory processes, such as planning or self-monitoring. An isolated assessment of students' reflections also led to results that could only offer an understanding of one component of regulatory learning. Further, by only focusing on students' attributions and adaptive inferences, other important reflection phase processes, such as self-evaluation and self-satisfaction (Zimmerman & Campillo, 2003), were ignored. Future research should include measures that target self-evaluations and self-satisfactions to not only expand current knowledge of these reflection phases processes, and because they have been linked to higher levels of self-efficacy – which has been shown to be a key to academic self-regulation (Cleary, Callan, Malatesta, & Adams, 2015; Schunk & Pajares, 2005) In a study conducted by Lee, Lee and Bong (2014) results appeared to suggest that academic self-regulation depended not only on students self-efficacy but also on students interest in the subject. Further, as students' academic self-regulation has been shown to be promoted through encouraging self-efficacy and subject interest, future research should continue to explore their connection to SRL (Lee et al., 2014).

Lastly, although this study employed a simplified thematic analysis to uncover themes in students' reflective phase responses there is a need for future research to continue to engage in an in-depth analysis of students strategic thinking. This is especially true as this study was the first of its kind. Thus, future studies should seek to engage in research endeavors that allow for the

expansion of this new way to analysis microanalytic data. Through these efforts, the generalizability of the current study's findings can be improved and insights into students' strategic thinking will be gained, enhancing future interventionalists ability to develop programs to combat students lack of strategic thinking.

Implications for School Psychologists

As a study that sought to expand our understanding of students' reflective phase processes, the findings have strong implications for all professionals involved in student learning. The findings suggest that academically at-risk middle school students, regardless of whether they have received any school-based interventions, engage primarily in non-strategic reflections. Yet, while students were observed to primarily engage in non-strategic reflections, students reflective phase processes also displayed their ability to be altered through the implementation of school-based interventions. In particular, students were found to endorse regulatory attribution (i.e., SRL strategy) when receiving a strategic intervention. However, prior research has revealed that teachers do not regularly incorporate strategic thinking into their instruction (Grigal, Neubart, Moon, & Graham, 2003; Wehmeyer, Agran, & Hughes, 2000) and that school psychologist seldomly assess students' regulatory processes or implement strategic intervention (Cleary, 2009; Cleary, Gubi & Prescott, 2010). Consequently, an implication for school psychologists, reinforced by the findings of this study, is that their engagement and consultation with teachers can play a vital role in increasing their ability to stimulate strategic thinking of their academically at-risk students.

Given that the direct assessment of students' reflection is often a key component in regulatory interventions (Cleary & Platten, 2013; Graham & Harris, 2009) knowledge of frequently endorsed attributions and adaptive inferences would likely be advantageous. For

instance, knowing that students most commonly reference "a need to try harder" mindset when reflecting on how they can improve their future performance should reinforce the premise that school psychologists attempt to align their proposed interventions with students' thinking. Further, understanding that students' reflection phase processes are sustained over time enables school psychologists to set realistic goals and manage teacher expectations. However, knowledge that students acquisition of regulatory strategies is increased when provided with exposure to strategic interventions can also assist in inspiring teachers to try new interventions and serve as a way to motivate students. As teacher enthusiasm has been shown to be influential on intervention success (Potter & Bye, 2014) and students' motivation has been shown to be related to more effective self-regulation (Zimmerman & Schunk, 2008) the importance of these two phenomena is evident.

For school psychologist, additional implications from this study include the importance of emphasizing strategy development, the need for continuous intervention implementation for students, and the value of both the former and the latter occurring in tandem.

Conclusions

The results from the current dissertation provide some of the first insights into the ways in which academically at-risk middle school students engage in reflective phase processes. When asked to reflect, students' perceptions of their prior academic outcomes and future performance were dominated by non-strategic responses. This finding was consistent across intervention groups, reflective phase processes, and time points – with one exception. While minimal statistical significance was found between the endorsement of different codes across intervention (i.e., SREP, WIN) and time (i.e., baseline, post-test, two-month follow-up), SRL strategy attributions were found to occur at a significantly greater frequency among students who

participated in a strategic intervention when compared to students who participated in a remedial math intervention. Students were therefore found to be more inclined to identify strategic reasons for their performance outcomes when they engage in activities that promote awareness and utilization of strategic thinking. However, once students were no longer enrolled in a strategic intervention they were shown to revert to engaging in reflections that were not regulatory, demonstrating the stability of students' reflections and the potential impact of intervention on students' acquisition of strategic thinking. Investigation into the most common attributions and adaptive inferences identified SRL strategy and general studying to be among the most common responses across both reflective phase processes. Students were also shown to frequently endorse attributions that emphasized math perceptions attributions and adaptive inferences that emphasized classroom-related behaviors. The results of this study further revealed that the theme students are most commonly engaging in during reflective thinking results in the view that limited efforts are the core determinant of academic achievement. Moreover, it appears that students whose reflections contain the theme of limited effort are also more likely to have additional attributions and adaptive inferences. Consequently, future interventions that are keen on improving students strategic thinking should be developed with ways to combat students' maladaptive thoughts by integrating techniques that can offset overly general reflection and increase the prevalence of exposure to regulatory strategies.

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Appendix A

Literature Review

In our daily lives, we all engage in reflection. Engaging in reflection on a daily basis is important because it helps us gain insight into our thoughts, perceptions, and understanding of ourselves and the world in which we live. Yet, reflection also has the capacity to improve academic performance and learning (Brookfield, 1995). The distinguishing characteristic between reflection that expands our understanding of how we perceive ourselves and our environment and reflection that enables us to enhance our learning is the capacity to actively assess and alter our thoughts and behaviors. Within academic literature and research, there are different types of reflection that have been discussed. Specifically, the following three types of reflection have been identified: (1) daily reflections, (2) critical reflection, and (3) SRL self-reflection. Daily reflection has been conceptualized in academic literature as the thoughts one has that are absent of references to adaptation or change. The systematic process of reflection is captured through critical reflection and the reflection phase within self-regulated learning (SRL). Within critical reflection, reflection is defined as a process whereby one uses his/her beliefs to interpret, analyze, perform, discuss, or judge a situation or circumstance (Boud, Keogh, & Walker, 1985; Mezirow, 1990). The self-reflection phase found in SRL consists of actively thinking of how he/she performed in a given context and the underlying reasons why (Zimmerman, 2000). Similarly, critical reflection refers to the deliberate act of challenging one's assumptions to adapt (Mezirow, 1990, 2006). When comparing the self-reflection phase of SRL and critical reflection both are shown to empathize the capacity to evaluate ourselves and our environment as well as describe the ability to change. With further evaluation the reflective

process within SRL's self-reflection phase can be viewed as a framework through which critical reflection can be understood.

With an understanding that critical reflection, or reflection that allows one to reassess his/her beliefs and acquire and act on new insight, occurs during the self-reflection phase of SRL it is clear that SRL's self-reflection surpasses the daily reflections that we are most familiar with. The self-reflection phase exceeds daily reflections in its known ability to heighten decision making and increase prosocial behaviors (Brookfield, 1995). Further, educational research has revealed reflection as a process that enhances student's abilities to meet academic objectives (Bennett, Power, Thomson, Mason, Bartlett, 2016; Billett, 2000; Mason, 2014; Mezirow, 1991, 2006, Zimmerman, 2000). To date, the research that has explored reflection phase processes has utilized numerous assessment tools and allowed for insight pertaining to reflective strategies and planning to be gathered (Bennett et al., 2016). Yet, there remains a need to understand what students attribute to their academic success or failures and how they plan to improve their performance in the future. For academically at-risk students establishing a knowledge of their reflective patterns would enable teachers and others to better grasp the gaps in their students' strategy utilization as well as inform the development of interventions tailored to their unique needs. In this section, the literature is reviewed that supports the areas of inquiry in this paper. A detailed conceptualization of reflection is provided, SRL theory and research are discussed, and the importance of microanalytic assessment of attributions and adaptive inferences are accentuated.

Overview of Reflection

The focus on reflection processes has been of increasing interest within educational research over the past few decades (Fook, White & Gardner, 2006). Originally, reflection was a

term that originated in the work of Dewey (1933) and was defined as the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the ground that support it and the further conclusion to which it tends (p.9)." However, the popularity of reflection has resulted in its conceptualization changing based on the context it is addressing. Specifically, three over-arching types of reflection have emerged: daily reflection, critical reflection, and SRL self-reflection. Daily reflections are those which occur as people engage in their regular routine and activities, such as shopping, cleaning, and driving. Consequently, daily reflections are the simplest form of reflection as they simply refer to the thoughts one has about something he/she is currently engaging in or have engaged in. Thus, daily reflections can be viewed in a similar vein to the basic consciousness with one crucial distinction. Unlike basic consciousness, which is the state or quality of being aware of an external object or internal self, daily reflections can be used to describe awareness with intent or purpose. An example of a daily reflection could be when a student thinks back to their class lecture to assist them in completing their homework. In this moment the student is only trying to recall the information his/her teacher had provided them in class and apply it to the current assignment. While this form of reflection assisted the student, as he or she thought about the strategies and procedures outlined by their teacher, its benefits end there. That is to say that, daily reflections, while helpful, have not been linked to increased academic outcomes (Fook et al., 2006; Fook & Gardner, 2007).

Other types of reflection have been linked to increased academic performance and improved learning, such as critical reflection and self-reflection phase processes embedded within theoretical models of SRL. Specifically, the ability to influence achievement through reflection has been established in contexts in which one is actively engaging in a process whereby he/she thinks about their action(s) in relation to their desired outcome(s) and

contemplates advantageous alternative(s) (Mezirow, 1990). According to Mezirow (1990) reflection leads to gains only when one purposefully challenges his/her prior assumptions. This process is achieved when one thinks of their former thoughts and behaviors and compares the outcomes of these actions to his/her desired outcomes (Mezirow, 2006). Once this is accomplished one establishes if he/she should continue to act in the same manner or if he/she should shift them in an attempt to better meet his/her desired goal. It is through this process that one is able to increase his/her achievement and improve his/her learning for it is continuous.

Self-reflection has also been defined and conceptualized as a set of processes embedded within a more comprehensive model of SRL. Self-reflection as outlined in SRL is described as a part of a continuous cycle whereby the reflections one makes are assumed to impact future thinking and performance (Zimmerman, 2000). It is within the self-reflection phase of SRL that one is asked to think of his/her performance and identify reasons why he/she had a certain outcome (Zimmerman, 2000).

Self-Regulated Learning

Self-regulated learning, also referred to as SRL, when applied in academic or learning contexts is conceptualized as a process where an individual control, monitors and regulates his/her thoughts, beliefs, and actions (Pintrich & Schunk, 2002; Ross, 2008; Zimmerman, 2000). SRL processes are accomplished as a result of individuals enacting a variety of sub-processes that operate within a cyclical loop (Ames & Archer, 1988; Pintrich, 2000; Zimmerman & Schunk, 2011). Most contemporary SRL theorists espouse the premise that SRL is a type of feedback loop process wherein an individual engages a set of interconnected processes. Although there are a wide range of SRL theoretical frameworks reported in the literature this researcher

focuses on a social-cognitive theoretical (SCT) perspective (Panadero, 2017; Schunk & Zimmerman, 2012).

Grounded in the work of Albert Bandura, SCT emerged as a byproduct of the behavioral and information processing views of learning at the time. Operating under the premise that learning is based on how an individual interprets and responds to his/her environment, SCT rejected the idea that human behavior was merely the result of an environmental event in isolation (Bandura, 1986). Rather, SCT posits that learning can occur from observing or performing a behavior (Bandura, 1986). Further, SCT operates under the assumption that one's environment, cognitions, and behaviors interact in reciprocal ways to influence learning (Bandura, 1986). Known as triadic reciprocal determinism, this principle indicates that human behavior can be both the cause and effect of cognitive and environmental factors (Bandura, 1986). From this perspective, the causal influence of a given factor will vary across contexts and situations (Bandura, 1986).

Consistent with the model of reciprocal determinism, SCT emphasizes the role of environment and context on people's thoughts and behavior (Bandura, 1986). Thus, social-cognitive theorists are particularly interested in the notion of context-specificity or the belief that students' thoughts, affects, and behaviors are relative to particular context (Bandura, 1986). The significance of acknowledging context specificity in learning is evident in that it supports the notion that environmental and personal factors impact the proficiency with which a student can learn (Bandura, 1986).

When reviewing the literature, evidence has been found supporting claims that task demands and a student's skill level may impact the extent to which one employs strategic thinking and problem solving (Cleary & Chen, 2009). Further, the specific types of strategies

utilized by a student has been shown to vary across task and time (Pintrich, 2000; Zimmerman, 2000). Consequently, SRL is best represented as an ever-changing application of competencies that are acquired overtime that impact individuals behaviors (Bandura, 1986). According to Bandura (1986) the ability to enact certain behaviors is related to key capabilities. The key capabilities are those that allow one to alter his/her environment and include symbolizing, use of forethought, self-reflection, vicarious learning, and self-regulation. The symbolizing capacity refers to one's ability to communicate using symbols and the forethought capacity refers to one's ability to anticipate consequences and engage in future actions that allow for goal attainment (Bandura, 1986; Luszyczynska & Schwarzer, 2005). The ability to reflect on one's experiences and determine where changes are required is another important human capability, as was the ability to learn through observing others, also known as vicarious learning (Bandura, 1986; Luszyczynska & Schwarzer, 2005). The ability to self-regulate is regarded as one's ability to integrate all of the former capabilities (Bandura, 1986). Practically speaking, a student whose current performance does not align with their desired goal can regulate their behaviors through utilizing strategies that align with self-regulation skills (Bandura, 1986). Bandura devised a framework of self-regulation that involved three regulatory mechanism: self-observation, self-judgement, and self-reactions (Bandura, 1986). It is from this initial model that Zimmerman (2000) developed and expanded a social-cognitive perspective of SRL.

Cyclical feedback loops within SRL. Zimmerman (2000) conceptualizes SRL as a three-phase cycle consisting of forethought, performance, and reflection phase processes. Typically occurring prior to learning, the forethought phase processes includes two classes of sub-processes: task analysis and self-motivation. The performance phase includes regulatory processes that typically occur during learning and includes the broad categories of self-control

and self-observation. Following learning or performance, is the self-reflection phase. It is within this phase that individuals make various types of self-judgments and exhibit self-reactions. The three phases are described as a cyclical in nature in that they are sequentially related. Thus, forethought phase processes are hypothesized to impact those of the performance phase, which, in turn, will influence the self-reflection phase. One iteration of the cyclical loop is considered completed when self-reflection phase processes influence forethought processes prior to the next learning attempt. Ideally, this cyclical process of thinking and action continues until a learner attains a desired level of performance or their personal goal.

Forethought. The forethought phase of the SRL process consists of a combination of sub-processes that are based in regulation and motivation. Those based in regulation are subsumed under the broad category of task analysis, which is further comprised of *goal setting* and *strategic planning*. Self-motivation beliefs are comprised of self-efficacy, goal orientation, intrinsic interests, and outcome expectations (Bandura, 1997; Zimmerman, 2000). During task analysis, one breaks down a task to determine the necessary actions that are needed to reach their desired goal. Consequently, it is the process of *goal setting* where one consciously decides on the goal he/she would like to achieve and *strategic planning* is the individualized plan that is generated to achieve that goal (Bandura, 1991; Zimmerman, 2000). When reviewing self-motivation, there are several motivational beliefs that play a vital role in the amount of effort one puts forth and one's degree of engagement (Zimmerman & Clearly, 2009). The role of self-efficacy, or the beliefs one holds about his/her own capabilities, lies in its relationship to whether one learns to persist and overcome, both of which are associated with promoting academic outcomes (Cleary, Callan, Malatesta, & Adams, 2015; Schunk & Pajares, 2005). Similarly, one's predisposition to set performance goals or outcome goals (goal-orientation) and one's

preferences (intrinsic interests) also have various links to performance (Bandura, 1986). Lastly one's anticipated consequences for a given action (outcome expectations) influence the behaviors one engages in or plans for (Bandura, 1986). Thus, one's task analysis is impacted by one's self-motivation and vice versa.

Performance. The performance phase of SRL consists of self-control and self-observation (Zimmerman, 2000). Common sub-processes of self-control include self-instruction, imagery, attention focusing, and task strategies and common sub-processes of self-observation include self-recording and self-experimentation (Zimmerman, 2000). Within this context, self-control refers to strategies that are used to manage affect, attention, and motivation to increase the likelihood of achieving a goal. One's utilization of self-control is readily observable to others yet is likely to vary as strategies are often employed in response to task demands and individual capabilities. Common examples of SRL strategies identified throughout the literature are help seeking, environmental structuring, seeking information, organizing, and transforming information (Zimmerman & Martinez-Pons, 1986).

In addition to use of self-control strategies, self-observation is a critical aspect of a regulated learner. One's monitoring of themselves through systematically raising awareness of his/her behaviors and corresponding performance, is described as self-observation within SRL and is comprised of self-recording and self-experimentation (Panadero, 2017; Zimmerman, 2013). Through self-observation one gains insight into the actions, beliefs, and feelings that may impact his/her learning and is provided with information as to how to maintain preferred behavior or alter inappropriate behavior (DiBenedetto & Zimmerman, 2010; Zimmerman, 2000). This ability to modify performance arises through one's tracking of his/her performance (self-recording) and modification of strategies (self-experimentation). Thus, it is during this phase that

one fosters self-awareness and the capacity to channel internal feedback to optimize future learning and goal attainment (Bandura, 1991; Cleary & Zimmerman, 2004).

Self-reflection. The final phase, self-reflection is comprised of self-judgements and self-reactions (Zimmerman, 2000). Self judgements include the sub-processes of *self-evaluation* and *casual attributions,* whereas self-reactions include the sub-processes of *self-satisfaction/affect* and *adaptive/defensive inferences* (Zimmerman, 2000). Self-evaluation refers to the comparisons individuals make about their performance in relation to their own standards, established benchmarks, or the expectations of others. Casual attributions, on the other hand, are the reasons an outcome is thought to have occurred, regardless of whether it is thought of as desirable or not. This reasoning is than directly linked to how pleased one is with his/her performance (self-satisfaction) and the determined need to modify strategies in the future (adaptive inferences). Given that the key purpose of this dissertation is to specifically examine self-reflection phase processes, a more in depth look at these processes are needed.

Attributions. Originating from the work of Heider (1958) and refined through the research conducted by Kelley (1967) and Weiner (1985), the conceptualization of attributions has undergone changes over the years. The first mentioning of attributions occurred in Fritz Heider 1920's dissertation where he determined that people attribute what they directly sense to stimuli they perceive as casual to that sensation (Heider, 1958; Malle, 2004, 2011). This line of understanding then resulted in an extension of attributions as the motives, behaviors, and thoughts manifested in behavior and the identification of two categories of attributions: internal and external (Heider, 1958; Malle, 2004, 2011). Through the combined work of Harold Kelley and Bernard Weiner the internal/ external dichotomy of attributions was enhanced. According to Kelley's (1967) covariation model, attributions are made based on how others would behave

(consensus information), respond to varied stimuli (distinctive information), and display a stimulus behavior across contexts (consistency information). Weiner (1985) continued to expand the conceptualization of attributions through identifying three dimensions by which attributions could be defined. These dimensions included stability (stable vs unstable), locus (internal vs external), and controllability (controllable vs uncontrollable) (McClure, et al., 2011; Weiner, 2010). Thus, Weiner's (1985) three-dimensional model moves beyond Kelley's assumption, that behaviors occur because of a logical and rational thought process, to the belief that behaviors are the result of affective responses associated with the intrinsic and extrinsic motives.

Weiner continued to research attributions and eventually identified four general types of attributions each exhibiting a different combination of the dimensions: effort (internal, controllable, and unstable), ability (internal, uncontrollable, and stable), task difficulty (external, uncontrollable, stable), and luck (external, uncontrollable, and unstable; McClure et al., 2011; Weiner, 2010). Across research it has been found that controllable outcome attributions increase motivation and perseverance whereas uncontrollable outcome attributions decrease motivation (McClure et al., 2011). When applied in educational contexts, outcome attributions have been further explored through determining the extent to which they reflect a mastery orientation (focus on learning new skills) or a performance orientation (focus on how performance appears to others).

In a study conducted by Elliott & Dweck (1989) the impact of feedback on student attributions and performance was assessed as it related to orientation. Following the completion of a pattern recognition task, students were randomly assigned to a low-performance or high-performance group. All students had their ability to learn reinforced by the experimenter to minimize the effect of low confidence. Students were than presented with two boxes, one with a

performance task ("In this box we have problems of different levels. Some are hard, some are easier. If you pick this box, although you won't learn new things, it will really show me what kids can do.") and one with a learning task ("If you pick the task in this box, you'll probably learn a lot of new things. But you'll probably make a bunch of mistakes, get a little confused, maybe feel a little dumb at times – but eventually you'll learn some useful things"). Students in the group that emphasized performance were told that they were being filmed and that their performance would be reviewed by experts whereas no filming was mentioned to students in the group that emphasized learning. Further, students in the learning group were informed that the learning task might improve their school performance. Students were than given the opportunity to choose which box and then had their performance and spontaneous verbalization recorded. For students given low ability feedback it was found that they were likely to attribute their performance outcomes as failures when compared to their peers who received high ability feedback. Examples of statements for students in the low ability feedback group included, "I'm not very good at this" or "I'm confused" and demonstrated the student's perceived loss of ability (Elliott & Dweck, 1989). Conversely, students given high ability feedback persisted in attempts to find solutions and did not make failure attributions. Yet, this difference was not found when students learning was emphasized. Therefore, when performance was emphasized students who perceived themselves to have low ability made negative attributions to their performance compared to their peers who perceived themselves to have high ability. It is through this research that attributions were found to be influenced by students' perception of ability and their goals.

Additional research conducted by Elliot, Dweck, and their colleagues has revealed that students who attribute their outcomes to effort are more open to learning then students who attribute their outcomes to ability (McClure et al., 2011). Yet, additional research has explored

the impact of other factors on attributions. In a study conducted by Kitsantas, Zimmerman, and Cleary (2000), the influence of modelling and social feedback on students' acquisition of dart-throwing was studied amongst 60 high school girls. The girls were divided into three groups: (1) no modeling no social feedback, (2) modeling with no social feedback, (3) modelling with social feedback. Following the 15 minute practice period the girls' attributions were assessed using the microanalytic prompt, "Why do you think you missed the bullseye on the last attempt?" The girls that received a demonstration from a model as well as feedback attributed their errors to strategy shortcomings while the girls in the other two groups attributed their errors to a lack of ability, effort, and practice (Kitsantas et al., 2000). Further, attributions to strategy shortcomings were found to be positively correlated with self-efficacy and intrinsic interest whereas attributions to ability and effort were found to be negatively correlated with intrinsic interest. As self-efficacy and motivation have been shown to impact academic outcomes and learning there is an underlying implication for the correlation between these processes and attributions. Specifically, students' attributions, or what they identify as the reasons for their performance, also have a critical role in student learning.

In a similar study conducted by Zimmerman and Kitsantas (2005), students' attributions were assessed while following a dart throwing task. In this instance the same microanalytic attribution question ("Why do you think you missed the bullseye on the last attempt?") was asked however student participants were from a pool of undergraduate psychology students and were divided into one of the five following group: (1) no-treatment control (told the purpose was solely to hit the center target), (2) absolute standards without graphing (told that the bulls eye was worth 7 points but other circles worth 0), (3) absolute standards with graphing (told that the bulls eye was worth 7 pts, other circles worth 0, told to graph scores after trials), (4) graduate

standards without graphing (told that the bulls eye was worth 7 pts with diminishing value to the concentric circle), and (5) graduate standards with graphing (told that the bulls eye was worth 7 pts with diminishing value to the concentric circle, and told to graph scores after trials). The authors found that graphing increased student's performance as well as improved reflection phase attributions which were shown to reliably predict students' self-satisfaction. Further, the groups that had access to graphing or evaluation information were more likely to attribute their outcomes to controllable factors, such as strategy use (Zimmerman & Kitsantas, 2005). Groups which did not receive graphing or evaluation information were shown to attribute their performance to a lack of ability or effort, which have been shown to negatively impact motivation and performance (Kitsantas & Zimmerman, 1998). Thus, it is apparent that whether students attribute their success and failure to ability/ effort or strategy utilization has an impact on motivation, self-efficacy, and learning.

While attribution research continues to grow and evolve, inconsistencies remain regarding what attributions are made by students and the extent to which attributing an outcome to an external factor influences academic achievement (McClure et al., 2011). In a study conducted by Cleary, Velardi, and Schnaidman (2017) students' attributions were assessed through asking students to reflect on their recent performance on exams. In this study students were found to attribute their performance to various factors that ranged from reflecting SRL to maladaptive. It was found that students who were a part of interventions that increased familiarity with strategies had improved their academic performance more than their peers who had received additional math instruction. Yet, while this research presented information that allowed for between group comparisons of student attributions the extent to which student attributions compare was not presented. Consequently, while we currently know that controllable

attributions enhance motivational beliefs (affect, persistence, self-efficacy; Schunk, 1990), task performance (Zimmerman & Kitsantas, 2005), and SRL (goal setting, monitoring, strategy use) there is a limited understanding of the range of attributions made by students while in academic settings and more specifically how students respond when asked they can improve their performance.

Adaptive Inferences. Much of the research into adaptive inferences stems from the exploration of various subprocesses subsumed within the self-reflection phase of the three-phase SRL model. Defined as the behavioral and strategic changes one perceives are necessary following completion of a task (Zimmerman, 2000), adaptive inferences are considered a type of self-reaction to performance. According to Zimmerman (2000), the process of altering one's approach to learning is essential for continued growth and learning. In the three-phase, adaptive inferences are particularly important because they are hypothesized to influence subsequent learning phases, particularly the forethought phase (Marsh, Craven & McInerney, 2008). It is through adaptive inferences that one not only acknowledges that his/her actions impact performance, but one also reflects on how his/her actions can be altered to achieve goals through implementing more appropriate and desirable strategies (Zimmerman & Martinez-Pons, 1992).

Similar to attributions, adaptive inferences have been found to influence students' performance and achievement (McClure et al., 2011). Of particular importance is that the types of adaptive inferences students make have consistently been shown to be related to the quality of one's attributions (Cleary, Callan, Zimmerman, 2012). Specifically, DiBenedetto and Zimmerman (2010) showed that a student is more likely to draw conclusions about the need to adapt their strategy use in the future if they attributed their performance outcomes to difficulties in using effective strategies. Cleary and Zimmerman (2001) also examined the link between

causal attributions and adaptive inferences in a study by targeting experts, non-experts, and novices during an athletic task. In this study, participants were asked to perform a free-throwing task for ten minutes and asked to reflect on their performance upon missing or completing two consecutive shots (Cleary & Zimmerman, 2001). Analyses revealed that experts attributed their failures to their utilization and execution of specific techniques whereas novices attributed their failures to a lack or practice (Cleary & Zimmerman, 2001). As attributions impact the ways in which a student thinks they can improve their future performance (i.e., adaptive inferences), technique attributions have implications for performance. This was displayed in this study as a participant that attributed their failure to not keeping their elbow in was more likely to than identify a strategic way of adapting (e.g., "I need to keep my elbow in").

Cleary, Zimmerman, and Keating (2006) conducted an experiment with novice basketball players to examine the additive effects of goal setting, self-recording, and strategic self-reflection. In this study participants were also asked to complete a free throwing exercise and reflect on their performance. The findings of this study revealed that adaptive inferences were significantly correlated with shooting performance and shooting adaption. Thus, individuals who made strategic adaptive inferences displayed greater skill at shooting free throws and, more importantly, displayed a greater tendency to adapt more quickly during practice than those who attributed their missed shots to factors other than strategy utilization. Adaptive inferences were further revealed to be related to a leaner's perception of their ability to improve future performance (Cleary et al., 2006). The connection between adaptive inferences and controllability has been supported in other research whereby one's perception of his/her performance as controllable was connected to the belief that future success is not determined by the past (Cleary & Zimmerman, 2000).

Within educational contexts, adaptive inferences have also been shown to correspond to higher academic performance. Research has suggested that students who generate adaptive inferences following a performance situation tend to achieve higher and regulate more effectively than peers who neglect to or generate defensive inferences (Cleary et al., 2012; Zimmerman, 2000). In a study conducted by Gandomkar et al., (2010) students' regulatory processes were assessed while they were asked to complete a learning task. When analyzing students' reflective processes and performance it was found that higher performing students utilized adaptive inferences that were task-specific. It was also found that attributions and adaptive inferences were associated with learning task performance (Gandomkar et al., 2010) It is here that the connection between attributions and adaptive inferences is highlighted once again.

However, while a review of prior research demonstrates that adaptive inferences and attributions have been assessed together, it also depicts both of these processes as contextual and reveals a current lack of in-depth exploration into the reflective thoughts of students. As there are known benefits within education context and a need for a thorough understanding of the nuances of both attribution and adaptive inferences within reflection phase processes, SRL researchers have turned to contextual, event measures to assesses these regulatory processes. Of greatest interest to this dissertation is how the specific event measure of microanalysis impacts reflection phase processes.

Assessment of SRL

Over the past few decades, there have been significant changes to the breadth and types of assessment tools used to assess SRL. Given that most contemporary theories conceptualize SRL as a complex, multi-dimensional process, a variety of assessment types have been

emphasized (Cascallar, Boekaerts, & Costigan, 2006). The most common SRL measures include self-report questionnaires, structured interviews, teachers rating scales, behavioral traces, direct observations, diaries, think-alouds, and SRL microanalysis (Winne, 2000; Butler, 2011).

During the initial development of SRL assessment (in the 1970s and 1980s), researchers' attention was on the strategic skills and individual knowledge of each student. With attention turned towards strategic skills, two broad categories of investigation emerged: cognitive strategies and metacognitive strategies (Boekaerts & Corno, 2005). Cognitive strategies were defined as those which assist a student in remembering and understanding class material whereas metacognitive strategies were defined as those which are utilized in planning, monitoring, and modifying cognition (Boekaerts & Corno, 2005; Schunk & Zimmerman, 1994; Zimmerman & Schunk, 1989). Thus, metacognition moved beyond strategies that increase retention and information acquisition and for this reason became the dominating area of focus and measurement (Boekaerts & Corno, 2005).

As metacognition became increasing popular, so did the idea that regulation was an individual and relatively stable trait. Consequently, researchers believed that the expression of regulation would be expressed similarly regardless of context (Boekaerts & Corno, 2005). With self-report questionnaires also becoming popular at that time, most initial SRL measures were developed using a questionnaire format; thus, in using this type of measure, researchers were invariably conceptualizing SRL as a stable trait particularly in terms of use of strategies and metacognitive skills (e.g., self-awareness). Yet, as time passed researchers began to reevaluate their former framing of SRL and in the 90's began to regard regulation as a contextualized construct that was not universal (Boekaerts & Corno, 2005). This resulted in the development of more contextualized types of measures of interview (e.g., Self-Regulated Learning Interview

Scale, SRLIS; Zimmerman & Martinez-Pons, 1988) and questionnaires (Cleary, 2006; Winne & Perry, 2000).

With the rise in measurement options there arose an interest in gathering an understanding of the strengths and weaknesses of each assessment approach. To facilitate this, Winne & Perry (2000) developed a coding scheme that differentiated two categories of measurement: aptitude and event measures. Each of these measurement categories were found to produce different types of data and thus impact the conclusions that can be drawn.

Aptitude measures. Depicting SRL as global trait, aptitude measures typically measure regulation through aggregating multiple instances of regulation across tasks to develop a composite. With this conceptualization, aptitude measures enable one to explore regulation in a broader way that is often used to predict future behavior (Winne & Perry, 2000; Zimmerman & Cleary, 2009). Further, aptitude measure will often require individuals to retrospectively report on their regulatory processes. Common aptitude measures include self-report questionnaires, structured interviews, and rating scales.

Self-report questionnaires. Relaying on Likert scale or forced choice formats, self-report questionnaires require individuals to read several statements and to rate them using a Likert scale. For instance, a student could be asked what strategies they use to assist them in mathematics and then be prompted to select the strategies they use (forced choice) or rate how often they use a particular strategy to learn utilize those in a given list (likert items). These responses are averaged generating a composite strategy score which would then be used for interpretation. While these scores are useful in interpreting SRL as a general aptitude, they do not shed much light into specific regulatory processes in authentic settings. Thus, researchers remain uncertain about the extent to which self-report questionnaires maintain utility in

informing a specific SRL instances. This hesitation is the result of the manner in which the data is collected. Due to its reliance on aggregated data, self-report questionnaires are not designed to produce detailed information pertaining to a specific instance of SRL behavior or a process. Specifically, one cannot review self-report questionnaire data and gain an understanding of how SRL unfolds in real time or to assess specific SRL processes in a given moment. Rather, by relaying on a composite score that combines response data across contexts, self-report questionnaires inaccurately present SRL as a construct that operates uniformly across contexts (Winne & Perry, 2000; Zimmerman, 2008).

Nevertheless, self-report questionnaires remain one of the most frequently used measures of SRL (Cleary et al., 2012; Dinsmore, Alexander, & Loughlin, 2008). Reasons for its popularity have been connected to its ease of administration, cost efficiency, and strong psychometrics (Pintrich, Wolters, & Baxter, 2000). Specifically, self-report questionnaires have been found to have high internal consistency, construct validity, and predicative validity. Further, self-report questionnaires allow for the examination of aspects of SRL that may not be readily observable. However, its reliance on aggregated scores and accuracy of the respondents' long-term memory undermines the validity of self-report questionnaires for interpreting SRL as a contextualized, task-specific process (Winne & Jamieson-Noel, 2002). Operating in the mindset that all SRL is the same, the items used in questionnaires are often vague. While this allows for the same questionnaire to be used across tasks or events, it limits researchers' ability to discern the context in which one is responding from and overall differentiation. Further, as memory has been found to be highly susceptible to distortion and bias, assessments like self-report measures that relay on recall are at an increased risk for response biases or errors. These errors can be the product of

failures related to one's ability to encode his/her memory fully, accurately retrieve a memory, or natural alterations that occur within regular encoding or retrieval processes.

Rating scales. Similar to self-report questionnaires, rating scales utilize Likert ratings to measure SRL. However, what sets rating scales apart from self-report questionnaires is that rating scales gather information about students SRL through alternative sources, such as parents or teachers. The use of rating scales as a form of SRL measurement is important because it can provide a more objective account of SRL behavior and can enhance the likelihood, when used with questionnaires, of drawing conclusions based on multiple data sources. In actuality, best practice guidelines have bolstered the idea through obtaining multiple and varied sources of information, a more comprehensive and detail picture of SRL can arise (Achenbach, 2006). The reasoning here is that each source can provide information that will enrich understanding. What rating scales add is a way to move beyond understanding SRL through the narrow lens of how one perceives himself/herself towards an integrative understanding of how one is perceived. Research has also found that rating scales tend to be more objective and accurate in measuring student behavior, when compared to self-reports. The most common forms of rating scales utilized in SRL assessment are teacher rating scales and parent rating scales.

Although receiving less attention in SRL literature, compared to self-report measures, teacher rating scales enable researchers to gain insight into student's engagement (Winne, 2005). Further researcher has utilized teacher rating scales in both educational and clinical settings to acquire a more exhaustive knowledge of externalized behaviors of students (Reynolds & Richmond, 2005). Currently there are several teacher rating scales. Two popular are the *Rating Student Self-Regulated Learning Outcomes: A Teacher Scale* and the *Self-Regulated Learning Interview Schedule* (SRLIS) (Zimmerman & Martinez-Pons, 1986, 1988). More recently, Cleary

and Callan (2013) modified the preexisting *Self-Regulation Strategy Inventory* (SRSI) for teachers. A 13-item measure, the *Self-Regulation Strategy Inventory – Teacher Rating Scale* (SRSI-TRS), assesses teacher's perceptions of motivation and SRL strategy utilization among students in their classroom context (Cleary & Callan, 2013). This measure was found to be highly predictive of future achievement, have high internal consistency, and exhibited moderate correlations with different self-report measures of student SRL (Cleary & Callan, 2013).

Similar to teacher rating scales, parent rating scales have been shown to account for unique variance in achievement (Lubin, 2015). A common rating scale for parents was also modified from the *Self-Regulation Strategy Inventory* (SRSI). The development of a parent rating scale that targeted student's academic SRL processes was spearheaded by Chen and colleagues (2014). Through their research the *Self-Regulation Strategy Inventory – Parent Rating Scale* (SRSI-PRS) was found to be predicative of student achievement and correlate moderately with corresponding self-report (SRSI-SR). Regardless of the source of information or the use of questionnaires or rating scales, caution is recommended when interpreting these scales. Evidence in favor of this has appeared across research where difference emerged between parents and teachers (Achenbach, 2011). Therefore, while there is a known benefit from collecting information from multiple sources as it allows for the triangulation of evidence, the sole utilization of rating scales to draw conclusions of SRL is not recommended.

Event measures. In contrast to aptitude measures, event measures depict SRL as contextualized, specific event. By depicting SRL as more of a context-specific process, event measures are designed to measure regulation as it occurs in real time during well-defined tasks. Consequently, event measures, which enable one to examine SRL in real time, are different from aptitude measures which utilize aggregated scores to draw conclusions about a feature of

regulation that have occurred (Winne & Perry, 2000; Zimmerman & Cleary, 2009). Consequently, event measures are typically administered while a task of interest is occurring and produce highly contextualized data. Aiming to isolate regulation during a particular task, researchers utilizing events measures also have the ability to assess contextualized factors and to control the level specificity desired to be explored within data. As such, it is very important that the task of interest have a defined beginning and end, for this allows one to discern whether a response is related to the desired task. While all event measures seek to gather real-time data, they all seek to obtain that information in different ways. The most popular event measures include behavior traces, diaries, direct observations, SRL Microanalysis, and think-alouds. For the purpose of understanding the variability across event measures, this researcher will provide an overview of these types of measures, with an emphasis on SRL microanalysis as it is the measure most pertinent to this dissertation.

Behavior traces, diaries, direct observation, and think-alouds. Recognized as the gathering of information through collecting the observable "traces" of SRL processes left behind, behavioral traces rely on the analysis of marking (e.g., annotations, and underlined and highlight texts) (Winne & Perry, 2000). Through reviewing the markings of students, one can hypothetically ascertain an individuals' thinking during learning or areas of focus, emphasis, or perceived value. Similarly, diaries are utilized to measure SRL as they involve the careful and systematic record keepings of one's daily life processes (Schmitz, Klug, & Schmidt, 2011). Not only have diaries been found to facilitate SRL, but they have been shown to foster self-monitoring (Zimmerman & Paulsen, 1995). Diaries are able to facilitate SRL through their ability to go beyond spontaneous reflection towards consistent and thoughtful reflection. Direct observations on the other hand rely on one to direct monitor the actions of another for a denoted

period of time (Winne & Perry, 2000). This type of event measures has the added benefit of not having to rely on the target individual as the source of data, while still affording researchers the ability to collect data in as it is occurring. Lastly, there are think-alouds, which involve continuous verbalizations of student's thoughts while performing a task (Greene, Robertson, & Costa, 2011). Taking on unstructured or structured forms, think-alouds can allow researchers to openly prompt students to state their thoughts at any time or when predetermined contingencies have been met. Consequently, think-alouds are similar to direct observations in that they are recorded by one other than the student but are also similar to behavior traces and diaries in that the information is generated by the student. Further, each of the former event measures have been shown to illuminate the understanding and conceptualization of SRL processes. Yet, behavioral traces, diaries, direct observations, and think-alouds are not grounded theoretically and typically are not equipped to measure a particular SRL process.

SRL microanalysis. SRL microanalysis is unique, relative to other event measures, in that it relies on student responses to structured interview questions (self-report feature) that address their actions, feelings, and thoughts in relation to a specific task in real time (event measure feature) (Cleary, 2011). What further separates SRL microanalysis from other event measures is that is grounded in Zimmerman's (2000) three-phase model of SRL. The key components that enable SRL microanalysis to be aligned with the theoretically underpinnings of the three-phase model include the following: (1) selecting a well-defined task, (2) identifying a target SRL process, (3) developing SRL microanalytic question(s), (4) linking cyclical phase processes to task dimensions, and (5) coding of recorded responses (Cleary, Callan, & Zimmerman, 2012).

The selection of a well-defined task is crucial when using microanalytic protocols because of the close link between microanalytic questions and the nature of the target task. SRL microanalytic questions are also typically administered in an individualized fashion to reduce potential biases that may result from the influence of peers or other social factors (Cleary, 2011). In addition, establishing a well-defined task enables researchers to investigate SRL in relation to tasks, such as writing an essay, studying for an exam, or reflecting on a specific exam. This is important as SRL microanalysis is grounded in SCT, which holds that SRL is contextualized and thus acknowledges that there may be differences in SRL when assessing it in varied circumstances.

Practically speaking this enables data pertaining to a specific task to be gathered in greater detail, for prior to investigating SRL the specific context must be outlined. For example, SRL microanalysis wouldn't be conducted on students' global math performance but rather would assess students' performance on quarterly mathematics exams. Yet, one must be cautious when selecting a task, for defining a task inappropriately can result in difficulties differentiating whether the recorded SRL corresponds to the task of interest of something that occurred before or after. One feature of SRL microanalysis that assists in ensuring that tasks are well defined and contextualized is that single-items are utilized to measure a construct. Not only does this minimize the need to aggregate or compile numerous data points, it increases the extent to which the data is truly contextualized.

However, knowing that mathematics performance is the task of interest is not enough to generate a microanalytic question. What is also needed is an understanding of which SRL process is going to be targeted. For the purpose of this dissertation, attention focuses primarily on two self-reflection phase processes within the SRL loop: casual attributions and adaptive

inferences. As such, the development of an appropriate microanalytic question would require a researcher to consider both the task of interest (i.e., student's quarterly mathematics exam performance) and targeted SRL process (i.e., attributions/ adaptive inferences). The manner by which this is accomplished is by first referring back to the definitions of attributions and adaptive inferences and then using such definition to guide the wording of questions. For example, given that attributions refer to one's perceived reasoning for an outcome, a typical microanalytic question would be, *what is the main reason why you received X grade on your mathematics quarterly exam*? As for adaptive inference one would need to recall that adaptive inference refers to one's thoughts of how he/she could improve future outcomes. An example of a typical microanalytic question that is adaptive inference focused would be, *what do you think you can do next time to improve your grade on your mathematics quarterly exam*?

One of the core features of microanalysis is that the question(s) must be connected to both the cyclical phase and task of interest. SRL microanalysis accomplishes connecting the cyclical phase of interest and the task of interest through the structure of the question as well as the timing of question administration. In this way, there is a link between microanalytic question(s) and the task that enables researchers to tap into the cognitions and behaviors specific to the area of inquiry. For example, by asking students why they received a specific grade on their mathematics exam they are being prompted to engage in reflection, as they are asked to think back to their performance and attribute a cause to their outcome. Similarly, by asking students to infer how their exam performance could be improved in the future they are being asked to reflect and make an adaptive inference. Thus, one can also see that the wording of these microanalytic questions directly corresponds to the constructs of interests (attributions and adaptive inferences) and their individual definitions. Further, the connection to the task of

interest, reflection on mathematics performance, is shown in both questions directly drawing students' attention to reflect on their performance on a specific mathematics exam. Thus, the connection between the cyclical model of SRL and microanalytic questions is also apparent. As SRL is grounded in the cyclical model of SRL (Zimmerman, 2000) which breaks an event into three-time periods (before, during, and after) the ability of SRL microanalysis to administer questions at the time in which one is thought to be engaging in the SRL process of interest is highly beneficial. This not only allows for a reduction in retrospective reporting but also allows for data to be collected in real-time and in authentic contexts.

Yet, SRL microanalysis is only completed when the responses of the students are recorded and coded into distinct categories. This step is important because it moves beyond merely assessing individual responses and assign meaning to establishing categories based on unprompted responses made in real time and within a predetermined context. The nature of SRL microanalysis as an assessment tool that utilizes unprompted and contextualized responses is what distinguished microanalysis from other forms of measurement. While some microanalytic measures utilize a close-ended format or responding, a majority of microanalytic questions use open-ended questions that ask students to write out or verbally report their responses. Given the free response format of questions, there is a reduction in response bias that can occur when a student can identify the more socially desirable response. However, as students are not utilizing a predetermined format to generate their answers, microanalytic questions rely on researchers identifying and defining categories by which the individual student responses can be coded. Thus, in using microanalytic questions, researchers typically need to develop a coding manual that guides interpretation. This dissertation utilized the coding manual generated by Cleary at al. (2017).

Review of microanalytic research. To provide a better understanding of how this dissertation hoped to expand microanalytic research, a review of microanalytic is provided.

Upon reviewing the literature, it is found that the first studies that explored reflective phase processes concentrated solely on attributions. One of the first studies was conducted by Zimmerman and Kitsantas (1997) and involved recruiting a group of 90 high school girls to engage in dart throwing exercises. Within this study the students were attributions were measured by asking them "Why do you think you missed the bull's-eye on the last trial?" and "What can you do to improve your performance?" Once the students had provided an answer to this question their written answers were grouped into one of six categories according to the believed cause of insufficiency: type of strategy, amount of effort, level of ability, amount of practice, "I don't know," or "other" (Zimmerman & Kitsantas, 1997). From this research it appeared that attributions to self-regulated learning strategies were not only related to one's interest in mastering a task but also increased one's belief in their learning potential (Zimmerman & Kitsantas, 1997). To assist in further expanding this line of inquiry Kitsantas and Zimmerman (1998) conducted another study in which high school girls were asked to participate in a dart throwing exercise. The same microanalytic questions were asked to gain insight into the students' attributions and their responses were coded in one of the same six categories. This time the study revealed that strategy attribution was enhanced when students were asked to self-evaluate during learning (Kitsantas & Zimmerman, 1998). Yet, while these studies provided insight into the attributions of students, they remained limited as they focused on one task and continued to employ a coding scheme that was limited in scope.

Zimmerman and Kitsantas (1999) expanded their exploration of reflective phase processes using a different learning activity. High school girls were asked to complete a writing

task during which their attributions were assessed. Following the completion of the task the students' attributions were coded into one of the same six categories. The authors reported that students who attributed their deficient performance to the utilization of a strategy rather than their ability or effort were more positively correlated with self-reaction, self-efficacy, and intrinsic interests (Zimmerman & Kitsantas, 1999).

Kitsantas, Zimmerman and Cleary (2000) expanded on the earlier dart-throwing studies by exploring the extent to which modelling influenced the development of self-regulation. The results of this study revealed that students' attributions were not impacted by modelling and supported former findings that strategy attributions following unfavorable performance are associated with more positive self-reactions, higher self-efficacy, and greater intrinsic interests (Kitsantas et al., 2000). It is important to also note that this study did not rely on factorial analysis of variance (i.e. ANOVAs) as the former studies did but rather conducted chi-square analyses.

The utilization of chi-square analysis to explore attributions continued with Cleary and Zimmerman (2001). In this study high school boys were asked to engage in a free throw exercise during which their attributions were assessed. Following two consecutive missed free-throws the students were asked, "Why do you think you missed those last two shots?" and following two consecutive successful throws the students were asked, "Why do you think that you made those last two shots?" The students' responses were than coded into one of eleven categories: specific and general technique, specific and general focus, distractions, rhythm, don't know, other, confidence, effort, and practice. The results of this study revealed that a student's choice of strategy is dependent on his/her level of prior known in the area of interest and that future performances can be improved through the use of more appropriate strategies (Cleary &

Zimmerman, 2001). Furthermore, this study demonstrated that students taught to attribute their failure to specific processes are more likely to focus on specific processes in future performances which can in turn lead to more adaptive self-efficacy and satisfaction (Cleary & Zimmerman, 2001).

It wasn't until 2002 when Kitsantas and Zimmerman decided to expand their exploration of reflective phase processes to include adaptive inferences in addition to attributions. In this study, college women were asked to engage in a volleyball exercise during which their attributions and adaptive inferences would be assessed. In order to assess the students' attributions, they were asked, "Why do you think you missed the highest designed target area with your serve?" The students' responses were then coded into one of six categories: form/technique, ability, power, practice, concentration, and do not know (Kitsantas & Zimmerman, 2002). Similarly, after a student missed two serves they were asked three additional questions: (1)"After making an error overhand, do you think about why you made the error?", (2) "When you make an error serving overhand, do you change anything during your net overhand serving attempt?" and (3) "If you repeatedly make an error serving overhand, do you ask your coach or teammates to give you feedback to eliminate the error?" The students' responses were than coded as either yes or no (Kitsantas & Zimmerman, 2002). The findings of this study supported prior research. Specifically, this study found that experts attributed their deficiencies to form/technique whereas non-experts attributed their deficiencies to form/technique less than half of the time and novices never attributed their deficiencies to form/technique (Kitsantas & Zimmerman, 2002). Experts were also shown to have higher levels of self-satisfaction. When exploring adaptive inferences, experts were found to think about their

errors and be more likely to change their behavior when compared to non-experts and novices (Kitsantas & Zimmerman, 2002).

Cleary, Zimmerman, and Keating (2006) returned to the 2001 study conducted by Cleary and Zimmerman and expanded the exploration of student's reflective phase processes while performing a free-throwing exercise. In this study, students' attributions and adaptive inferences were explored. Following two missed free throw shots, student responses were classified into one of the original ten categories (i.e., specific technique, general technique, confidence/ability, focus/concentration, effort, practice, rhythm, distraction don't know, and other; Cleary et al., 2006). These ten categories were then collapsed into three categories: (1) specific technique, (2) general motoric (i.e., general technique, effort, practice, and rhythm), and (3) general cognitive (i.e., distraction, confidence/ability, and focus; Cleary, et al, 2006). Adaptive inferences were classified into nine similar categories (i.e., specific technique, general technique, effort, focus/concentration, practice, rhythm, distraction, don't know and other; Cleary et al., 2006). This studies results supported prior research in demonstrating that students who make technique attributions and adaptive inferences were likely to perform at a higher level than those who did not identify a specific technique as their reason for their deficiencies (Cleary et al., 2006). The larger implication from this research is that "focusing on process rather than outcomes is important, because it helps athletes be more mindful of how they do something rather than simply their attained success Cleary et al., 2006, p 260).

Based on the prior research, it is clear that there are connections between attributions and adaptive inferences; however up till this point there has been a limited degree of investigation into how these reflective phase processes occur during academic learning tasks. To address this gap in microanalytic research, DiBenedetto and Zimmerman (2010) conducted a study in which

high school students were asked to reflect on their learning while having their knowledge or tornados assessed. Students' attributions were asked through one of two questions: (1) "Why do you think you didn't do better on this particular test question on tornado development? Please explain" or for students who answered this question 100% correctly, (2) "Why do you think you did so well on this particular test question on tornado development? Please explain." (DiBendetto & Zimmerman, 2010). All student responses were than coded as ability, effort, or strategy. To assess adaptive inferences students were asked, "Is there anything you would do differently on this particular test question on tornado development if you were given another chance to study the material on tornados? Please explain" (DiBendetto & Zimmerman, 2010). The students' responses were than coded into either ability, effort, or strategy (DiBendetto & Zimmerman, 2010). As demonstrated in prior research high achieving students attributed their performance more to self-regulatory strategies, were more satisfied, and were more adaptive when compared to their lower achieving peers (DiBendetto & Zimmerman, 2010).

Gandomkar et al. (2016) continued to explore attributions and adaptive inferences through engaging medical students in a biomedical science learning task. Following the completion of the task the students were asked questions which were then coded as descriptive of task specific or general processes or other (Gandomkar et al., 2016). Results of this study revealed attributions and casual inferences to be associated with learning task performance such that task specific processes were found to be associated with higher performance on learning tasks (Gandomkar et al., 2016).

Till now, the microanalytic research for reflective phase processes has steadily grown to include attributions and adaptive inferences, has adopted various coding schemes to assess different aspects of these processes, and has utilized different types of statistics to interpret the

microanalytic data. However, the coding schemes continued to be limited in the depth at which they allowed researchers to explore attributions and adaptive inferences as many have reduced reflective codes to broad categories (i.e., ability or effort or strategy and task specific or general process). While the utilization of broad categories has allowed for attributions and adaptive inferences to be linked to other processes (i.e., self-efficacy, motivation) it has limited the extent to which research has been able to decipher the ways in which reflective processes maybe unique or the specific reflections one tends to generate. In Cleary et al. (2017) conducted a study in which middle school students reflective phase processes were explored. Students attributions and adaptive inferences were explored by asking students two questions following the retrieval of a mathematic exam: (1)" What are some of the reasons why you may have gotten a(n) (insert grade) on this test?" and (2) "What do you need to do to improve or to perform well on your next test?"(Cleary, et al., 2017). Upon review of the students written response each was placed into one of eight coded categories: (1) SRL strategy, (2) general studying, (3) test-taking skills, (4) classroom-related behaviors, (5) math perception, (6) teacher skills, (7) don't know, and (8) other. Yet, although this study obtained this data, it's focus was on determining the effectiveness of a strategic intervention (SREP) compared to a remedial math intervention (WIN) (Cleary et al., 2017). Consequently, while this study revealed a statistically significant trend in which strategic interventions are more positively related to achievement when compared to remedial math interventions, there was little exploration into the microanalytic responses of students' reflective phase processes (Cleary, et al., 2017).

SRL microanalytic coding. The coding manual utilized in this dissertation was adapted from prior research conducted by Cleary and colleagues (2015) which also targeted student's reflective thoughts on how they can improve their future exam performance. The coding scheme

utilized outlined several categories that a student's response could be classified in and included the following: self-regulation learning strategies, general study, classroom-related behaviors, test-taking skills, math ability, specific mathematics task skills, teacher skill, don't know, and other (Cleary et al., 2017).

Self-regulated learning strategies was further broken down into four sub-categories. The first sub-category was study tactics, or statements that indicate students' use of tactics related to learning course material during study and included *transformational learning tactics* (i.e., "I summarized the things I read from the textbook"), *rehearsing and memorizing* (i.e., "I need to use index cards to remember things better"), and *seeking information* (i.e., "I will look up things on the internet when I get confused"). The second sub-category was self-management of study session and references statements that reflect one's plans, goal or behaviors and included *time management/planning* (i.e., "I should make a plan to start studying a few days before the test), *environmental structuring* (i.e., "I need to study in a quiet place"), and *material organization* (i.e., "I can use a binder to organize things"). The third sub-category *was help-seeking/seeking information* and included statements that indicated that students attempted to solicit help from others regarding their test performance, answers, or other learning content (i.e., "I ask my teacher about some of the things I did not get correct"). The fourth and final sub-category was volition/performance control process and referred to statements reflecting students initiated attempted to manage their own behavior or learning and included *self-reinforcement* (i.e., "I tell myself I can watch TV is I study for an hour), *self-instruction/ self-talk*, (i.e., "I gave myself pep talks when I was bored"), *self-monitoring* (i.e., "I did not test myself when studying to see what I don't know), and *emotional and mental self-control* (i.e., "I was not relaxed when I studied"). It is these strategies that are regarded in the literature to be indicative of performance gains as well

as improvement in academic outcomes. However, as many students do not innately know how to engage in reflection and also often need models to engage in reflection that is regulatory additional categories were outlined.

General studying was also subdivided into two categories that referenced very broad and non-specific statement: general quality of studying and general study effort. *General quality of studying* reflected statement where a student indicated that the quality of their studying impacted their performance but provided minimal additional detail (i.e., "I did not study well"). *General study effort* on the other hand reflected statement of the act of studying, the amount of time spent studying, or the amount of effort expended (i.e., "I need to look over my notes more"). Test-taking skills referred to the statements student make regarding their behaviors or tactics used during a test or approaches to taking a test (i.e., I could not think straight during the test; I just froze"). *Classroom-related behaviors* referred to students' class attendance and behaviors during class lectures or activities (i.e., I have trouble paying attention during class lectures.). *Math perceptions*, like general studying was divided into two subcategories: general math difficulty and math specific problems. *General math difficulty* was utilized to reflect statements that identified the difficulty level of the test or math in general and statements regarding the student's perception of their ability to learn, remember, master course content, or prepare for tests (i.e., "I am pretty smart with this stuff"). *Math specific problems* on the other hand reflected specific type of problems or skills that the student perceived they have to get better at (i.e., "I have trouble with word problems"). Teacher skill referred to statements pertaining to perceptions about teachers' instructional skills or behaviors (i.e., The teacher really knows how to teach"). Lastly, *don't know* was utilized to refer to statements that indicated that students were uncertain

about what to do or how to handle the situation and *Other* was utilized for responses that did not fit into other categories.

The process by which student responses were coded into one of these categories follows those typically reported by microanalytic researchers (Cleary et al., 2006; DiBenedetto, 2010; Gandomkar et al., 2016). Specifically, two coders trained to use the coding scheme individually rated all student responses and a percent agreement of was obtained. This percent agreement was obtained by each response of the two separate coders being compared for likeness. In instances in which the two coders were not in agreement a third coder was asked to review the individual statement and a final code was determined. Overall, attributions were found to have a percent agreement of 87% and adaptive inferences were found to have a percent agreement of 90.5%.

Importance of Reflection in Academic Contexts

Within educational literature, the importance of SRL is highly supported as it has been found to decrease adaptive behaviors and increase positive behaviors (Reid, Trout, & Schartz, 2005), improve learning and academic performance (Cleary & Zimmerman, 2004), and allow students to move towards greater independence (Asaro-Saddler & Saddler, 2010). As SRL is conceptualized as a three-phase model, whereby forethought leads to performance which leads to self-reflection which then leads back to forethought, reflection is assumed to play a particularly central role. It is this understanding that has increased the value of reflection within educational circles and has resulted in it being regarded as a "means of improving student's lifelong learning and professional practice" (Rogers, 2001). This notion arose from research that found that reflection not only enables students to think critically about their performance but to also alter their approaches (Bennett et al., 2016; Mason, 2014; Zimmerman, 2000). Further, in a study conducted by Colthorpe and colleagues (2015) it was found that not only did a majority of

students utilize adaptive strategies during the self-reflection phase of SRL but that the processes of reflection were more likely to have a positive impact of student learning than the implementation of a strategy alone. Therefore, reflection can be connected to the positive outcomes observed within SRL in addition to being noted as a process whereby one enhances their understanding of himself/herself which facilitate continued learning.

Yet, the true importance of reflection in academics becomes apparent when reviewing what happens to students who do not know how to engage in reflection. As the research has demonstrated, many students have not developed the skills necessary to engage in the type of reflection that leads to increased understanding of their own performance and knowledge of how they can alter their current behaviors/ thoughts to achieve a goal. Rather it has been shown that students need reflective models and opportunities to practice reflection with feedback in order to integrate reflection into their regular learning. However, for the students who do not have these opportunities to engage in reflection they often adopt rationalizing assumptions which justify their continued behavior or utilize maladaptive strategies to facilitate their performance. This occurs as reflection enables students to adapt and, in its absence, particularly in academic settings, the ability to improve their learning is hindered. Consequently, without reflection many students may face academic struggles as a result of ineffective and/or inappropriate coping strategies and assumptions.

Reflection in middle school context. Within the attribution literature and abased on theoretical accounts, ability and effort attributions are often described as predictive of increased academic outcomes. From a developmental perspective, the understanding of ability and effort has been shown to change drastically as a child progresses through development (Folmer et al., 2008). For example, a young child may say that a smart student works hard, and a not-so-smart

student does not work hard whereas, an older child is more likely to say that a smart child does not need to work hard and a student that needs to work hard must not be so smart (Folmer et al., 2008). It is through these examples that ability and effort are shown to be positively related concepts to younger children but inversely related to older children (Folmer et al., 2008). According to Nicholls (1978) the observed age-related differences are the result of cognitive levels of development. In a study conducted by Nicholls and Miller (1984) four distinct developmental levels were established for the differentiation of ability and effort: (1) 5-6 years old, effort, and ability not differentiated and relation to outcome is unclear, (2) 7-9 years old, outcomes attributed purely to effort, (3) 10-11 years old, beginning to distinguish effort and ability and inconsistently attributing outcomes to one or the other, and (4) 12+ years old, differentiate between effort and ability and ability recognized as a factor that limits the effects of effort (Nicholls & Miller, 1984).

When thinking of the research conducted by Folmer and colleagues as well as Nicholls and Miller, middle school students operate in a time of heightened change. It is during middle school that students are asked to take on new personal responsibilities, experience less school-based supports, and encounter greater academic expectations while simultaneously navigating their social, emotional and developmental changes (Barber & Olsen, 2004; Dembo & Eaton, 2000; Hill & Taylor, 2009; Rudolp, Lambert, Clark & Kurlakowsky, 2001). As a result of these heightened expectations, some children adopt a low-effort strategy to protect themselves in lieu of failure (Folmer et al., 2008; Jacobs, Lanza, Osgood, Eccles & Wigfield, 2002). For instance, a student who has not performed well on an exam may say, “I could have done better if I tried harder.” It is in this example that the motivation of a middle school student can be shown to be dependent on their perception of their ability and the associated degree of effort employed.

However, in middle school, as adolescents' need for autonomy and acceptance increase, they begin to move away from focusing on the opinions of their parents or adult figures to emphasizing those of their peers (Sentse, Lindenberg, Omvlee, Ormel, & Veenstra, 2010). Thus, adolescents' motivations may change from seeking to please teachers and parents to attempting to fit in more with their peers. Yet, research has demonstrated inconsistent findings surrounding the benefits and disadvantages of this shift (Sentse et al., 2010). It is for this reason that continued exploration of reflection in middle school students is important; for there is already evidence to support the importance of reflection in academics as it has been shown to led to increased outcomes. Yet, what remains to be known is the breadth and descriptive variability of middle school students' reflective statements.

Appendix B

Coding Scheme

1. Self-regulation learning strategies

a) Study tactics – statements indicating students' use of tactics related to learning course material during studying. These include:

1) Transformational learning tactics – statements indicating the rearrangement of course content to organize, summarize, or synthesize the information. Examples include outlines, graphic organizers, index cards, taking notes from textbook, test question predictions, or self-quizzing.*(Note that general mention of self-quizzing or testing one's self are transformational learning tactics, while self-quizzing for the purpose of monitoring learning is coded as 1d3 – self-monitoring.)* Also included in this category would be practice solving math problems or use of a specific app or program such as Quizlet, App your teacher, IXL, Virtual Nerd, Kahn Academy – all technology use outside of help seeking.

# 4	"I did not do anything to really learn and synthesize the material well" "I made summaries of my notes to learn the information better" "I summarize the things I read from the textbook" "I try to guess what questions the professor will ask"
# 5	"I need to seek connections of the study material" "I could look at DIGITS more frequently" (DIGITS is their e-textbook)

2) Rehearsing and memorizing – statements indicating student-initiated efforts to memorize material by overt or covert methods. These statements reflect reading multiple times (re-reading notes; reading things over and over) to learn the information, not simply reading notes. If a person says memorize then code this category.

# 4	"I should have re-read my homework assignments several times" "I had trouble memorizing definitions"

# 5	"I need to re-read my homework assignments several times" "I will memorize definitions until I can recite them without looking" "I need to use index cards to remember things better"

3) Seeking information – statements indicating student-initiated efforts to obtain further task information from non-social sources when studying, such as looking up information in notes, textbooks, apps, or on the internet *Note that the mentioning of app or other materials in reference to practice math problems would be coded as 1a1. If students mention the app or support materials it is also coded as 1a1. To be included for this category the response must involve searching for or looking up information.*

# 5	"I will look up things on the internet when I got confused" "I will find definitions from DIGITS" (or any type of app that they use as part of class)

b) Self-management of study session – statements reflecting one's plans, goals, or behaviors related to the amount of time spent studying, organization of study location, or organization of learning materials. These statements make no mention of a study tactic (#4) or of a specific learning or study strategy (#5).

1) Time management/planning - statements reflecting one's plans and behaviors related to the amount of time spent studying or learning course content.

# 4	"I did not need to think about when to start my assignments" "I did not make plan on how best to study" "I should start studying a few days before the test"
# 5	"I need to think about when to start my assignments" "I should make plan on how best to study" "I should start studying a few days before the test"

2) Environmental structuring – statements indicating student-initiated efforts to select or arrange the physical setting to make learning easier. This involves arranging environment and avoiding external distractions with the intention of being able to focus and concentrate more effectively

# 4	'There were too many distractions at home and I could not study"
# 5	"I need to study in a quiet place" "I will tell everyone to not disturb me" "I will turn off my cell phone"

3) Materials organization - statements indicating student-initiated overt arrangement of instructional materials to improve learning (can reflect organization or disorganization)

# 4	"I am so disorganized. My materials are everywhere and I couldn't find them when I needed them"
# 5	"I can use a binder to organize things"

c) Help seeking/seeking information - statements indicating student-initiated attempts to solicit help from teachers, peers, or other adults regarding their test performance, correct/incorrect answers, or any other issues related to learning course content.

# 4	"I should have asked my teacher about some of the things I did not get correct on homework" "I did not ask the teacher things that are confusing"
# 5	"I ask my teacher about some of the things I did not get correct" "I look at tests of my classmates and compare answers" "I get a tutor to help me learn"

d) Volition/performance control process – statements reflecting student-initiated attempts to manage their behaviors and learning during learning or studying at home

1) Self-reinforcement - statements indicating student arrangement or imagination of rewards or punishment for success or failure

# 4	"I took breaks…I tell myself I could watch TV if I study for an hour"
# 5	"I tell myself I could watch TV if I study for an hour"

2) Self–instruction or self-talk – statements indicating student-initiated overt or covert verbalizations to guide behavior and learning.

# 4	"I kept telling myself that I need to study more" "I gave myself pep talks when I was bored"
# 5	"I tell myself that I need to study more" "I give myself pep talks even if I am bored"

3) Self-monitoring – statements indicating student-initiated efforts to keep track of or to record learning, performance, or course material, during studying or learning at home (self-observation)

# 4	"I did not write down what was hard for me" "I did not test myself when studying to see what I don't know"
# 5	"I should write down all of the things I could not learn when studying" "I need to keep track of how well I am learning" "I can quiz myself to see which topics I don't know well"

4) Emotional and mental self-control - statements reflecting students' attempts to focus and concentrate during studying or to effectively manage emotions, fatigue, or mental states. Also includes statements indicating student-initiated tactics to manage, control, or reduce the impact of anxiety or other negative emotions on learning and studying. This could include deep breathing, imagery, and other strategies that increase motivation to learn. *Note that if the response includes reference to making a self-statement or self-talk then code as 1d2; General responses of "to focus" or "concentrate" should not be coded in this category because they do not sufficiently relate to the strategy.*

# 4	'I was not relaxed when I studied" 'I took study breaks to refresh myself" 'I flipped out and couldn't study" 'I didn't focus on my studying"
# 5	'I need to relax and concentrate when I study" 'I need to do a better job of concentrating" 'I will take breaks to refresh myself" 'I need to stay confident" 'I need to keep pushing myself" 'I have to motivate myself to study even if I am bored" 'I have to concentrate while I am studying."

2. General Studying (approaches to studying)

a) General quality of studying – statements reflecting the quality of studying, but minimal detail is provided - no strategy is mentioned. A response cannot be coded to this category and a SRL strategy. Please note that if part of the response is to "do more" of studying then code as effort (2b). This category involves the process of studying or how one studies.

# 4	"I did not study well" "I didn't read my notes well"
# 5	"I need to improve how I study" "I need to become a better studier" "I should know when to study" "I need to increase my study habits"

b) General Study Effort - statements reflecting the act of studying, the amount of time spent studying or learning course content, or the amount of effort expended. The statements do not involve references to specific SRL strategies but could include statements pertaining to looking at textbooks or notes, or statement referring to general motivation or attitude towards studying and learning.

# 4 *If an effort statement includes specific SRL strategies or other related behaviors then the response is coded as those strategies or behaviors (e.g., I did not seek out help when I should have).*	"I did not look over my notes **a lot**" "I didn't study hard enough" "I just don't care; I did not try very hard" "I didn't spend enough time looking over my notes" "I did not do any of the practice problems" "I was not prepared for the test "I did not care about math"
# 5 *Please note that if a person indicates that he or she has to put more effort into using a specific strategy then code the response relative to the particular strategy.*	"I need to look over my notes more" "I would do the readings" "I would make sure I know the readings" "I have to study more" "To study" "I need to take it more seriously."

3. Test-taking skills – statements referring to student behaviors or tactics used during test performance or approaches to taking the test. This also includes test anxiety as a debilitating factor in performance. If the person mentions regulatory tactics but it is in reference to test taking, then the response is coded as test-taking skills.

# 4	"I could not think straight during the test; I just froze" "I answered all of the easy questions first and then went back to the ones I did not know well"
# 5	"I need to breath and relax during a test" "I need to say positive things to myself during the test" "I need to answer all of the questions on the test"

4. Classroom-related behaviors – statements reflecting students' class attendance and behaviors during *class lectures or activities* such as paying attention, asking questions, and taking notes. (Please note that help seeking behaviors during class is coded for this category. If students indicate that they seek out help after class then code as Help Seeking. If the student does not specify under which context they seek out help from teachers, then code as Help Seeking.)

# 4	"I have trouble paying attention during class lectures" "I did not ask the teacher questions during class – I feel uncomfortable doing that"
# 5	"I need to try to pay attention during class" "I can take better notes" "I should ask the teacher questions during class"

5. Math Perceptions

a) General math difficulty – statements referring to the difficulty level of the test or math in general, and statements referring to student perceptions of their ability to learn, remember, or master course content, or to get prepared for tests. (Internal locus of control)

# 4	"The test was really difficult" "Math is really difficult for me" "I just could not remember the information" "I am pretty smart with this stuff"
# 5	"I need to do better in math" "I want to do better in math"

b) Math specific problems – statements that reflect specific types of problems or skills that the student perceives they have to get better at. If the response includes helping seeking from teachers, peers etc. then code as Help Seeking (e.g., "I want to ask my teacher how to interpret the graphs better").

# 4	"Graphs are really hard for me" "I have trouble with word problems"
# 5	"I need to be able to solve math word problems better"

6. Teacher skill – statements reflecting perceptions about teachers' instructional skills or behaviors.

# 4	"The teacher is very disorganized and does not teach well" "The teacher was not very clear about what would be on the test" "The teacher really knows how to teach" "The teacher explains things really well" "I don't get the way the teacher teachers it"
# 5 *CANNOT APPLY*	

7. Don't know – statements indicating students' uncertainty about what to do or how to handle the situation.

8. Other – any response or statement that does not fit into any of the other categories; does not seem applicable or appears to be un-codable.

Appendix C

IRB Approval

RUTGERS eIRB

Arts & Sciences IRB - New Brunswick
335 George Street
Suite 3100, 3rd Floor
New Brunswick, NJ 08901
Phone: 732-235-2866

Health Sciences IRB - New Brunswick/Piscataway
335 George Street
Suite 3100, 3rd Floor
New Brunswick, NJ 08901
Phone: 732-235-9806

Health Sciences IRB - Newark
65 Bergen Street
Suite 511, 5th Floor
Newark, NJ 07107
Phone: 973-972-3608

DHHS Federal Wide Assurance Identifier: FWA00003913
IRB Chair Person: Beverly Tepper
IRB Director: Michelle Watkinson
Effective Date: 2/12/2018
Approval Date: 1/24/2018
Expiration Date: None Exempt

eIRB Notice of Approval for Initial Submission # Pro2017000052

STUDY PROFILE

Study ID: Pro2017000052

Title: Exploring reflective trends in academically at-risk students through microanalysis: Implications for self-regulated learning and academic intervention

Principal Investigator:	Brittany Velardi	**Study Coordinator:**	Brittany Velardi
Co-Investigator(s):	Timothy Cleary	**Other Study Staff:**	There are no items to display
Sponsor:	There are no items to display	**Approval Cycle:**	Not Applicable
Risk Determination:	Minimal Risk	**Device Determination:**	Not Applicable

Review Type:	Exempt	**Expedited Category:**	None Exempt	**Exempt Category:**	4
Subjects:	N/A	**Specimens:**	N/A	**Records:**	42

CURRENT SUBMISSION STATUS

Submission Type:	Research Protocol/Study	**Submission Status:**	Approved
Approval Date:	1/24/2018	**Expiration Date:**	None Exempt

Pregnancy Code:	Not Applicable	**Pediatric Code:**	Not Applicable	**Prisoner Code:**	Not Applicable

Protocol:	Velardi_Clarification of Permission Letter and Subject Consent Velardi_Permissionletter.pdf IRB_Protocol.docx Research Protocol/ Summary	**Consent:**	There are no items to display	**Other Materials:**	There are no items to display

ALL APPROVED INVESTIGATOR(S) MUST COMPLY WITH THE FOLLOWING:

1. Conduct the research in accordance with the protocol, applicable laws and regulations, and the principles of research ethics as set forth in the Belmont Report.

2. **Continuing Review:** Approval is valid until the protocol expiration date shown above. To avoid lapses in approval, submit a continuation application at least eight weeks before the study expiration date.

3. **Expiration of IRB Approval:** If IRB approval expires, effective the date of expiration and until the continuing review approval is issued: **All research activities must stop unless the IRB finds that it is in the best interest of individual subjects to continue. (This determination shall be based on a separate written request from the PI to the IRB.) No new subjects may be enrolled and no samples/charts/surveys may be collected, reviewed, and/or analyzed.**

4. **Amendments/Modifications/Revisions**: If you wish to change any aspect of this study, including but not limited to, study procedures, consent form(s), investigators, advertisements, the protocol document, investigator drug brochure, or accrual goals, you are required to obtain IRB review and approval prior to implementation of these changes unless necessary to eliminate apparent immediate hazards to subjects.

5. **Unanticipated Problems**: Unanticipated problems involving risk to subjects or others must be reported to the IRB Office (45 CFR 46, 21 CFR 312, 812) as required, in the appropriate time as specified in the attachment online at: https://orra.rutgers.edu/hspp

6. **Protocol Deviations and Violations**: Deviations from/violations of the approved study protocol must be reported to the IRB Office (45 CFR 46, 21 CFR 312, 812) as required, in the appropriate time as specified in the attachment online at: https://orra.rutgers.edu/hspp

7. **Consent/Assent**: The IRB has reviewed and approved the consent and/or assent process, waiver and/or alteration described in this protocol as required by 45 CFR 46 and 21 CFR 50, 56, (if FDA regulated research). Only the versions of the documents included in the approved process may be used to document informed consent and/or assent of study subjects; each subject must receive a copy of the approved form(s); and a copy of each signed form must be filed in a secure place in the subject's medical/patient/research record.

8. **Completion of Study:** Notify the IRB when your study has been stopped for any reason. Neither study closure by the sponsor or the investigator removes the obligation for submission of timely continuing review application or final report.

9. The Investigator(s) did not participate in the review, discussion, or vote of this protocol.

10. Letter Comments: *There are no additional comments.*