Using Knowledge Surveys as Study Guides: Prompting Student Reflection

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CHAPTER 1 – PURPOSE

As the Common Core State Standards in Mathematics have been adopted in forty-five of the fifty states, many states are moving toward end of course testing in the required high school mathematics courses through Algebra II. Similar to final exams, these end of course tests are cumulative and require students to synthesize all of the standards addressed throughout the class. Test results will count as 20% of the students’ final grade in the course. Unlike final exams however, the teachers and administrators cannot alter student scores on these assessments. It would seem that end of course tests may start to impact the teacher evaluation processes within districts. Ultimately, these tests are another wave of high stakes testing for students. For many of these students, any type of testing is associated with high levels of testing anxiety. It is left to the teacher to prepare his or her students to be both academically and emotionally ready for the end of course exams.

The new Common Core State Standards for Mathematics boast fewer benchmarks and indicators that delve more deeply into the content. This means the lens of the instructional standards is focusing the students on a clearer image of a smaller amount of material. Teachers are using many methods to encourage students to be active and engaged in their own learning so that they will have a firm understanding on this required material. Education professionals are being increasingly encouraged by their administrators to display objectives in their classroom as a way of pulling the students into the lesson. Sometimes these take on the form of Can I… questions posted within the classroom or distributed to students. These statements (when answered with yes) should
indicate that a student has accomplished the desired learning goals, and is proficient at the indicated activity. These objectives and statements vary in cognitive demand.

It would seem that many high school do not take advantage of these Can I… statements as an instrument for self-monitoring and as a method of reflection (Lawanto et al., 2013). They do not take the time to evaluate whether or not they have accomplished the objectives or if they can honestly answer yes to the Can I… statements. As a result, formal assessments are often the only form of self-monitoring present in the high school classroom. However, by the time students display their knowledge on a formal assessment, the self-monitoring is happening alongside the (potentially high stakes) assessment. At this point, it is too late for self-initiated improvement.

As a way to prepare students both academically and emotionally for end of course exams, teachers may begin to make changes to their assessment procedures throughout the year (Amador et al., 2013). In some classrooms this looks like more frequent assessment of student work. In other classrooms teachers are providing targeted high stakes testing practice questions. Still other teachers are simply making all assessments cumulative. Regardless of what these changes look like, some form of review has traditionally been incorporated into preparation for assessments and this portion has not been eliminated during this transitional flux.

Review, as a teaching tool, has taken on many forms within the academic sphere. Review manifests itself in the form of practice problems, practice tests, study guides, or even disguises itself as a game. Sometimes review is mandatory and graded while other times it is optional. Regardless of form, most educational professionals would agree that
the purpose of review is to help students solidify their understanding and ultimately prepare for assessment. Just as every student learns differently, every student studies differently. However, it is possible that students may further benefit from self-reflection on learning (Ramdass et al., 2008). Unfortunately, developing a structure or framework for personal reflection is a skill that may be lacking in high school students. In order to promote self-reflection among students at the high school level, students must be provided with some form of scaffolding to lead them through the process until they can reflect on their learning independently. In this vein, a review guide that would simultaneously promote student review of content and reflection on personal ability would likely be a useful tool for many students. The challenge to the teacher is to provide or support a review that will offer each student the tools such as reading guides, guided notes, or review guides necessary to study effectively.

**Key Terms**

The research presented in this paper focuses on review guides. **Review guides** are often given to student to help them prepare for a formal assessment. Several examples of review guides are discussed in the literary review in Chapter 3.

The primary focus of this research is the value of a **Knowledge Survey** as a form of a review guide. A Knowledge Survey is a type of review guide, which spirals three types of support into one guide. A Knowledge Survey combines a study guide with both practice problems and personal reflection. The study guide portion indicates each standard from the Common Core State Standards, which are being evaluated on the assessment.
Under each of these standards, example problems are available for students to practice their skills. Each standard is phrased as a Can I… statement. A Can I… statement prompts the student to ask herself how confident she is in her ability to complete the task. Next to each standard, there is a place for students to reflect on this Can I… statement and determine if they can do each type of task on their own, with help, or if they really do not understand the concept at all. By spiraling all three tools together students can evaluate themselves and determine in what areas they need more.

**Research Question**

The purpose of this study is to explore the benefits of using a Knowledge Survey as a review tool. Prior research presented in Chapter 3 suggests that the main goals of review are to promote an understanding of what is being assessed, provide sample tasks, provide assistance, and encourage self-assessment. Because of the unique nature of a Knowledge Survey, this is an excellent new type of review guide.

The Knowledge Survey spirals awareness of the content standards addressed with the assessment, example practice problems, and self-reflection, which explicitly prompts the student to do personal reflection on their ability with the content and provides them with an arena with which to test their ability. This reflection coupled with practice problems allows the students to evaluate their skills more accurately. A student’s ability to evaluate his or her abilities accurately is extremely important because it will directly inform his study habits in preparation for the assessment. Many students may be more likely to utilize a review guide to study if there are practice problems immediately available. This format also will familiarize students with the expectations and potential question types. Because of this familiarity, some students with test anxiety may find...
themselves more at ease because they have a better idea of the structure and types of problems that will be typical of the assessment.

The self-assessment prompted by the Knowledge Survey may aid students in developing effective and efficient study habits. The Knowledge Survey is designed to aid students in the identification of specific areas of deficiency. By identifying these topics, students may improve their studying by narrowing the scope. This development of skills could result in an increased performance. Although students may perform better with this type of targeted review, the goal of assessment is to monitor student understanding rather than assess temporary knowledge.

Knowledge Surveys are a unique type of review guide that are characterized by the spiraling of content standards, practice problems, and self-reflection. Are Knowledge Surveys an effective method of promoting better review for high school students?

The research presented in this paper examines how students incorporate Knowledge Surveys into their preparation for assessments. The impact of this particular type of review on both confidence and performance during summative assessments will also be presented.
CHAPTER 2 – LITERATURE REVIEW

Introduction

Plenty of research has been conducted on the value of review guides as preparation for assessment. There are many different types of review that are used across content areas to prepare for assessment. When creating a review guide, there are certain key aspects recommended for incorporation. The incorporation of these key aspects may positively impact student performance (Duchastel, 1983). Because self-assessment is a part of reviewing, self-assessment has a direct impact on student performance.

The current education and psychology of education research has been explored and reviewed to highlight the relationships and impact of the current study. Current research presented in this chapter covers the following topics: types of review, creating effective review guides, the impact of review on student performance, and the impact of self-reflection on self-efficacy.

Types of Review

The main purpose of review is to aid in student study. Review may come in many different forms based on the content area, the tests, the instructor, and most importantly the students (Gurung et al., 2010). Previous research has explored different review methods. Several studies have focused on the impact of study habits on student performance and test anxiety among other potential impact areas. Review techniques are differentiated into two categories: collaborative review and individual review.
**Collaborative review**

Collaborative review is a study habit in which multiple students work together in the same space to study for an upcoming assessment. According to Bhathia (2010) students who attended small group review sessions scored significantly higher than similarly abled peers who chose not to attend review sessions. Students who attended the review sessions in this study commented that the review sessions were helpful because the material was presented in another format that allowed for an additional perspective than that offered during the typical class. The researcher noted that the students who participated worked together to organize and interpret information in multiple ways which allowed multiple learners additional access to the material.

Other research conducted by Gurung et al. (2010) correlating different studying techniques to student performance cautions that if collaborative review is to be encouraged within the classroom, the instructor should model how to ensure a productive study session. Gurung et al. (2010) found a negative correlation between students who reported studying with a friend and test performance. The researchers suggested that this is because students are likely to get off task and focus on other topics. As a remedy for this particular short-coming, the researchers suggest providing a scaffold for partner or group review to encourage students to maximize the usefulness of their study time.

**Independent Review**

Independent review is a study habit in which individual students work independently to study for an upcoming assessment. Independent review methods include, but are not limited to the following: the creation of a ‘cheat sheet,’ the
completion of a set of practice problems or questions, the independent creation of study guides, and the completion of an instructor created study guide. Former teacher Brigette Erbe (2007) utilized cheat sheets in her classroom. She found that the students’ test anxiety was primarily focused around the memorization of facts and formulas that are addressed by questions that only target the lowest levels of Bloom’s Hierarchy of learning. She found that students rarely utilized their ‘cheat sheets’ on assessments (although she allowed for their use) because by preparing the ‘cheat sheets’ students had been able to accomplish the appropriate learning and growth for the assessment.

Other research done by Wilhem et al. (2007) suggests that students benefit from completing sets of practice questions, which mimic those appearing on the formal assessment. This particular research study indicated that students who worked on the practice questions scored significantly higher on the assessment than students who chose not to use it at all. Interestingly enough, students tended to select only 60% of questions on average to answer as review. Even this percentage was positively linked to an increase in performance. The researcher found that students tended to select questions on the review to complete based on the perceived likelihood of a similar question appearing on the test. The researchers found that an even higher performance was likely when students collaborated to complete the practice questions. This indicates that this method is useful both on the individual and collaborative level. Students indicated that the study questions were extremely valuable during the process of planning and preparing for assessment.

Additionally, multiple research studies have examined the difference between student and teacher generated study guides. These studies suggest that overall students
perform at about the same level regardless of using an instructor generated study guide or creating their own study guides (Cannella-Malone et al., 2009). However, this research does indicate that students who prepare their own study guides preform higher on tasks with higher cognitive demand. The researchers suggest that this may be caused by the instructor generated study guides limiting students’ opportunities to think critically about and synthesize the topics not included on the guides.

Based on the previous research, it is clear that materials generated for the purpose of individual review also serve as good scaffolds for collaborative review. Students when provided with this scaffolding can utilize one another to reframe prior learning and organize this content in a manner that makes the most sense.

**Creating Excellent Review Guides**

Not all review guides are created equal. When the instructor is the generator of the study guide, he or she should follow research-based techniques. Although the instructor may not always be the creator of the study guide, it is important to provide students with advice and expectations for the type of study guide to be created. These recommendations should also be derived from the same guiding principles the instructor would use and follow.

*Guidelines*

When creating a review guide, the entire purpose is to structure the students’ study efforts in a manner that promotes maximal learning. Duchastel (1983) suggest that the ideal study guide serves four main functions: orient the learner, provide directed tasks, provide the learner with assistance, and allow the student an opportunity
for self-assessment. Although Duchastel goes on to comment that the ideal guide for mathematics will look quite different from the study guides he describes, the four main tenants are still visible and useful in the mathematics classroom.

A more recent research paper adds on to the tenants elicited by Duchastel and suggests several additional practices to create effective review guides (Conderman et al., 2010). The researchers suggest that a study guide must be related to the objectives and standards, but more importantly, it must be organized to demonstrate these connections. Content specific vocabulary should be included and integrated with the material. Students should be prompted to engage in higher order thinking and reflect on what they have learned. When an instructor is creating the review, he or she should consider the main emphasis of the assessment. This includes a specific connection to the objectives and standards for the content. When students are creating their own guides, they should also consider the big ideas of the content. The instructor should determine how students will be assessed and provide examples of how content may be assessed. Students, when creating their own study guides, should look at example problems from homework or the book to see how the big ideas are assessed. Ultimately, Conderman et al. (2010) suggest that students should be given access to the study materials several days before the assessment, and must be held accountable for utilizing the study guides.

Another researcher who agreed with the sentiments laid out by both Duchastel and Conderman et al. remarks on the value of study guides when created with these guidelines. The students who utilize well constructed study guides are provided with a better sequencing of thought and more opportunities to assess his or her own individual understanding and competence in the content area (Laidlaw, 1990). These study guides
provide an opportunity for independent learning and self-selection of areas that require additional assistance. By using such study guides, students can determine how to utilize their study time most effectively.

*Types of Review Guides*

Review guides can come in many different forms:

- Independent guides
- Prompted guides
- Directed study guides
- Interactive study guides
- Learning from text guides
- Textbook activity guides
- Reading road map study guides
- Two-column notes
- Flip-flops
- Compare and contrast study guides

The bulleted list shown above is just a small sampling of the types of review guides recommended by Conderman et al. (2010). These study guides range from student generated to instructor generated.

Many instructors leave the responsibility of studying and creating review guides to the students. This type of review guide is called a student constructed review guide. Although this type of review guide is most often utilized at the post-secondary level, there is certainly merit in this technique at the high school level. Katayama et al. (2006) focused their research on student constructed study guides. The instructor in this research held students accountable for completing the study guides by grading them based on completeness, organization, and elaboration. The instructor had students use three different models for study guides: outlines, matrix organizers, and concepts maps. Outlines, when used as study guides were found to have the most positive impact on
student performance on test items with low cognitive demand. Both the concept maps and the matrix organizers were found to have the most positive impact on student performance on test items with high cognitive demand. The researchers recommendation: “regardless of study guide type students should seek out a variety of study strategies that allow them to become more self-regulated in their learning,” (Katayama et al., 2006).

**Impact of Review on Performance**

Although days in every classroom are spent reviewing for assessments, some teachers question the usefulness of both review days and review guides as a method of increasing student performance. Many research studies have been conducted to determine whether or not review guides are useful tools that lead to higher student performance.

Some research suggests that only students that are required to use study guides actually demonstrate a statistically significant difference in summative assessment performance (Dickson et al., 2005). Not only was completing a minimum of 75% of the study guide found to improve student test scores, it was also found to be directly related to a reduction of test related anxiety in students. The researchers posit that this reduction in testing anxiety was due to the repeated exposure to similar questions that would appear on the assessment.

The researchers also noted that the additional neurological practice of retrieving information was enhanced by the using the same information retrieval during the studying time devoted to utilizing the study guide (Dickson et al., 2005). Within the research structure, there were students who were given the opportunity to use a study
guide to structure their thinking but were not required to use this resource. The researchers found that unless required, the majority of students will not complete or utilize review guides. However, the students who did choose to use the guides self-selected the portions of the review guide that they thought would provide the most assistance in their test preparation (Dickson et al., 2005). The student participants in the study also recognized the positive impact of utilizing the review guides on their performance on formal assessment.

Vandsburger et al. conducted a similar study in 2011. Their results found that the students who used the study guide had measurably higher performance on following assessments and also had a higher academic self-efficacy. However, many students responded negatively to the mandatory completion of the study guide because they felt that it was a waste of time and simply busy work. The researchers noted that this was a common theme among the higher performing students while the lower performing students thought that the study guide helped by showing the what to expect on the assessment and helping them focus on the important ideas (Vandsburger et al., 2011). On average, in both of these studies, there was a marked increase in student performance after completing the study guides.

The prior studies mentioned above utilized instructor created traditional review guides. One is left to wonder how the results may vary based on the type of review guide provided; how does a computerized review compare to pencil and paper review and how does student performance change with student generated study guides? Macedo-Rouet et al. (2009) compared student performance with traditional and computerized review guides. The researchers expected to find that the students who completed the
computerized review performed better than the students who did the traditional review guide. They were surprised to find that the students who completed the traditional review performed significantly better than the students who did not complete a review and the students who had completed the computerized review (Macedo-Rouet et al., 2009). The researchers attribute this difference in performance to the length of the review and the eyestrain causing decreased motivation, but the computerized review did seem to boost the student performance above those who did not complete any review guides (Macedo-Rouet et al., 2009).

So what is the difference between teacher and student generated study guides? Horner et al. (2007) explored the impact of providing students with study guides. The researchers noted that many teachers and instructors find that students invariably request study guides for formal assessments, and believe that teacher generated study guides will improve their test performance. After analyzing the data collected, the researchers found that students benefited from both student generated and teacher generated study guides. The students benefitted slightly more from teacher generated study guides. The researchers reference Vygotsky’s (1978) learning theories in their explanation of this result. Based on his theories, one would expect that students who have not yet mastered effective study skills and study habits not be able to create an effective study guide. Thus lower level students will benefit more from teacher generated study guides until they can understand the scaffolds which create the most effective format for creating their own study guides (Horner et al., 2007).
Regardless of form or source, prior research shows that review guides are beneficial study tools for students. Review guides structure student thinking and as a result, students perform better on formal assessments.

**Impact of Self-Assessment and Self-Efficacy on Performance**

As noted by Vandsburger et al. (2011), students who completed review guides were found to have increased self-efficacy within the academic content area. This implies that completing a review guide, improving study skills, and self-assessment have an impact on self-efficacy. This self-efficacy also has a direct impact on student performance. This suggests that with improved self-assessment (prompted by study skill enhancement) comes an increased academic self-efficacy, which leads directly to an increase in academic performance. Therefore, there is a positive correlation between improved self-assessment and increased performance.

*Study Skills and Self-Assessment: Impact on Self-Efficacy*

Many high school students who struggle with standardized tests or with basic course work are being tracked into study skills courses. Research has shown that increases in study skill instruction leads to an increase in academic self-efficacy (Boysen et al., 2005). The researchers also note that self-efficacy can be influenced by practicing good study skills by using tools such as review guides effectively. Additionally, self-efficacy has been found to account for 33% of the variance in academic performance (Boysen et al., 2005). Self-assessment has already been demonstrated to be one of the key components in review guides. Prior research demonstrates that students who practice self-assessment tend to increase their learning of mathematics (Adeyemi, 2012). Students who practice self-assessment have improved awareness of how to accomplish
their learning goals, assume further responsibility for their learning, and have a markedly higher academic self-efficacy. However, the researcher indicated that the self-assessment is best treated as a formative assessment rather than as a summative assessment (Adeyemi, 2012). A review guide is a perfect example of self-assessment used by the student and teacher as formative assessment.

*Self-Assessment and Self-Efficacy: Impact on Performance*

Prior research demonstrates that especially in mathematics courses, self-assessment is directly correlated to course performance (Dupeyrat et al., 2011). The researchers found based on the data collected that students who tended to overestimate their mathematics competence had significantly higher performance approach goals than their peers who underestimated their math competence, but did not differ significantly from those who were able to accurately measure their math competence. Students who tended to overestimate their ability on self-assessment tended to have surprisingly low performance on assessments (Dupeyrat et al., 2011).

Another researcher studied the effects of self-assessment on both intrinsic motivation and achievement (Freiberg et al., 2012). The results of this study indicated that unlikely that students’ reflected ability appraisals influence intrinsic motivation or math achievement. The results also indicate that there is a strong link between perceived ability evaluations and competence beliefs (Freiberg et al., 2012). Finally, the results of this study indicate that students with higher competence beliefs have better grades irrespective of their reflected ability appraisals. This means that students who have
higher (accurate) perceived abilities are more likely to have higher grades (Freiberg et al., 2012).

Data collected by Jacobse et al. (2012) indicates that student’s self-assessment and metacognition can be measure in multiple ways. This research indicated that the think-alouds provided a large indication about metacognitive processing, which affected word problem solving. The visualization and accuracy measure was found to be a more practical instrument for measuring the same metacognition in mathematics. The visualization and accuracy measure has high predictive ability for math word problem solving ability (Jacobse et al., 2012). This research is highly valuable because it indicates that visual representations, such as graphic organizers, when used as a part of a review guide also are effective at prompting and measuring student self-assessment.

The use of Knowledge Surveys, as self-assessment tools, has been researched and found to be highly effective (Clauss et al., 2010). A Knowledge Survey is designed to give students a preview of what will be assessed on an examination. The defining characteristic of a Knowledge Survey is explicit self-reflection on academic content standards. The purpose is to encourage students to recognize areas of academic strength and weakness so that they may better prepare themselves for formal assessment.

The prior research indicates that there is a strong relationship between Bloom level of questioning and being able to accurately self-assess. Students were able to better self-assess at low (knowledge) and high (analysis, synthesis, evaluation) Bloom’s levels, yet struggled to self-assess at the intermediate levels (comprehension, application). This research also found that students with good self-assessment skills who do poorly on the survey may in fact perform better on the exam because the survey served as a wake-up
call and prompted further study (Clauss et al., 2010). Because students typically struggle to correctly assess their skills with tasks at the intermediate levels of Bloom’s, teachers should focus more feedback and assistance in the self-analysis of these types of tasks. The knowledge survey as utilized by these researchers is an excellent method to assess how students perceive their knowledge.

Improved study skills and the formation of good study habits associated with review guides leads to an improvement in student academic self-efficacy. Students with increased academic self-efficacy are also more likely to perform better on formal assessments. Additionally, student self-assessment is a strong indicator for how the student will perform on formal assessments. Between self-assessment prompted by review guides and the positive effects of study on self-efficacy, formal review guides are directly linked by prior research to improvement of student performance on formal assessment.

Conclusion

There are many research based approaches for providing review guides for students. Both individual and collaborative review have been found to be effective, although collaborative review is most effective when there is some instructor scaffolding or modeling occurring. The most effective individual review method is the review guide. There are four main parts that make a review guide effective: learner orientation toward standards and objectives, effective directed tasks, incorporate appropriate assistance, and give many opportunities for honest self-assessment. The use of review guides has been found to be positively correlated with student score improvement on formal assessment regardless of who generated the review guide (Conderman et al., 2010). However,
students need to have some sort of scaffolding before they can begin to create their own effective review guides. Self-assessment and high self-efficacy have been found to be positive indicators for high achievement in students.

The Knowledge Survey model introduced by Clauss et al. (2010) is being used in the current research to evaluate how students’ perceptions of their abilities may change between the administration of the knowledge survey and the summative assessment. Using the type of Knowledge as a study guide or preparation for the test is used as in the current research as a review guide or a pre-evaluation before an assessment. A similar survey based on the model presented by Claus et al. (2010) is used in the current research as students are actually taking the summative assessment to measure any changes.
CHAPTER 3 – METHODS

Introduction

This study was conducted with students ranging from Sophomores through Seniors enrolled in math courses in an Appalachian high school. The instruments utilized in this study were sets of surveys that were conducted prior to and during each formal assessment from the second semester of these classes. Additionally, students were selected to participate in interviews focused on the impact of the review guides on their personal study habits. Datum was collected throughout the second semester of the school year, and encompassed data collected from seven associated formal assessments. The data were analyzed to identify possible connections between the Knowledge Survey and performance on the formal assessment.

Setting

This study was conducted in an Appalachian high school in a district, which serves approximately 1634 students with approximately 486 students enrolled in the high school. The district covers 169 square miles which support a large number of local farms. The district has 130 teachers with an average of 14.6 years of teaching experience. Approximately 63.7% of the teaching staff in the high school has training above a bachelor’s degree.

The district is comprised of 95.6% White, Non-Hispanic students, and 3.3% Multi-racial students. Of the students enrolled, 48.3% of the students come from economically disadvantaged homes. Approximately 23.3% of students have been identified as having a disability.
Participants

This study was conducted on 3 classes of students with a total of 88 participants. The students were selected based on their enrollment in one of the following three courses: Honors Algebra II, Pre-Calculus, and Honors Chemistry. There were 27 participating students in the Honors Algebra II class, 32 participating students between two Honors Chemistry courses, and 29 participating students between two Pre-Calculus classes. There were 42 male students and 57 female student participants. Of these students, there were 33 sophomores, 46 juniors, and 30 seniors.

Instruments

Pre-Test Knowledge Survey – The day before each summative assessment (test) students were given a Knowledge Survey as a review guide. This had Can I… statements with the topics that would be covered on the test and example problems for practice with three ability columns: one column each for I can do this by myself, I can do this with help, and I can’t do this. An example Knowledge Survey is included in Appendix A.

On-Test Confidence Survey – On each corresponding summative assessment (test), a Confidence Survey was included. This means that after every question on the test, the students were directed to place a check mark in the box corresponding to how they felt they had done on the item. There were three choices: I knew how to do this problem (I know I got it right), I was able to start this problem, but I wasn’t really sure how to do this problem (I may have gotten it right), and I had no idea what to do for this problem (I guessed). An example Confidence Survey is included in Appendix A.
**Evaluation Survey** – At the end of each quarter students were given a survey asking how they used the Knowledge Survey and the Confidence Survey throughout the previous quarter, and if the students thought the surveys were helpful. The questions used the Likert Scale as a response method.

**Data Collection**

**Pre-Test Knowledge Survey** – The students were directed to use the knowledge survey to review as they saw fit, but that it was required to place a check mark indicating how well they believe they can do the task for each Can I… statement. The Knowledge Surveys were collected on the day of assessment.

**On-Test Confidence Survey** – The students were directed to place a check mark in the box that most accurately described how they felt they did on each test item or items. The assessments were graded.

The Knowledge Surveys were returned with the graded tests. Students used student response devices to enter their responses to the Knowledge Survey, Confidence Survey, and their scores for individual questions. Data was then exported to an excel file.

**Evaluation Survey** – The evaluation surveys were administered using student response devices available within the classroom allowing students to complete the survey at their own pace, and the data to be collected and analyzed more easily. Evaluations surveys were conducted during the last 10-15 minutes of class on the last day of each quarter. Data was stored in Excel files.

**Data Analysis**

**Pre-Test Knowledge Survey** – Each category on the pre-test Knowledge Survey was given a point value ranging from 1 to 3. The response “I can do this by myself,”
earned 3 points, “I can do this with help,” earned 2 points, and “I can’t do this,” earned 1 point.

On-Test Confidence Survey – Each category on the On-Test Confidence Survey was given a point value ranging from 1 to 3. The response “I got it right,” earned 3 points, “I may have gotten it right,” earned 2 points, and “I guessed,” earned 1 point.

Question Score – Each questions set was assigned a point value ranging from 1 to 3. This value was assigned by finding the percentage of points earned. A percent between 80% and 100% earned 3 points, between 60% and 79.9% earned 2 points, and a percent below 60% earned 1 point.

Comparing the Knowledge Survey Data, Confidence Survey Data, and the Question Scores – The questions on the test were broken down into groups that addressed each of the Can I…? statements included on the Knowledge Survey. The differences between the following sets of data:

- On-Test Confidence Survey and Pre-Test Knowledge Survey
- Question Score and Pre-Test Knowledge Survey
- Question Score and On-Test Confidence Survey

Evaluation Survey – The evaluation surveys were qualitatively compared to both student performance, and the Confidence Survey points.

Summary

This study involved 88 participants in select sophomore through senior math courses in an Appalachian school district. Data were collected targeting the evaluation of the Knowledge Survey as a more productive study guide for formal assessment. This data was collected in the form of Knowledge Surveys, Confidence Surveys, and
Evaluation Surveys. Data collected from the Knowledge and Confidence Surveys were compared to the student performance on the formal assessment. Qualitative evaluation was done to compare the data collected from the Evaluation.
CHAPTER 4 – RESULTS

Introduction

All of the surveys administered were full and complete and have been utilized in the analysis of the data. The Pre-Test Knowledge Survey, the On-Test Confidence Survey, and the Question Scores were broken into groups, which addressed the same topic. These groups were then compared by computing the differences between the On-Test Confidence Survey and Pre-Test Knowledge Survey, the Question Score and Pre-Test Knowledge Survey, and the Question Score and On-Test Confidence Survey. The findings are displayed in tables, histograms, and box and whisker plots.

Results

On-Test Confidence Survey and Pre-Test Knowledge Survey – The difference between these two surveys is a measure of the difference between the students’ self-perceived abilities during the assessment and before the assessment. A positive value indicates an increase in perceived ability from the Pre-Test Knowledge Survey to the On-Test Confidence Survey. A negative value indicates a decrease in perceived ability from the Pre-Test Knowledge Survey to the On-Test Confidence Survey. The table below gives the mean and standard deviation, mode, and median values for the difference between the assigned values for the On-Test Confidence Survey and Pre-Test Knowledge Survey. These data are shown for the three classes individually as well as the overall scores for all of the participants.

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<thead>
<tr>
<th></th>
<th>Honors Algebra II</th>
<th>Pre-Calculus</th>
<th>Honors Chemistry</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean/SD</td>
<td>-0.1337</td>
<td>-0.1458</td>
<td>-0.1872</td>
<td>-0.1518</td>
</tr>
<tr>
<td></td>
<td>0.3642</td>
<td>0.2639</td>
<td>0.3033</td>
<td>0.3185</td>
</tr>
<tr>
<td>mode</td>
<td>0</td>
<td>-0.2222</td>
<td>-0.1429</td>
<td>0</td>
</tr>
<tr>
<td>median</td>
<td>0</td>
<td>-0.1111</td>
<td>-0.1429</td>
<td>-0.1111</td>
</tr>
</tbody>
</table>
The figures shown below are representations of the individual students’ score difference between the On-Test Confidence Survey and the Pre-Test Knowledge Survey. The box and whisker plot shown in Figure 2 identifies six data points that are statistically considered outliers. These outliers are the six values less than –0.75. The data shown in Figure 1 (when removing the outliers) appears to be roughly normal.

**Figure 1**

*Question Score and Pre-Test Knowledge Survey* – The difference between these two surveys is a measure of the difference between the students’ actual abilities and self-perceived abilities before the assessment. A positive value would indicate an increase in actual ability from the Pre-Test Knowledge Survey to the actual assessment. A negative value may indicate a decrease in actual ability from the Pre-Test Knowledge Survey to the assessment or an over estimate of ability on the Pre-Test Knowledge Survey. The table below gives the mean and standard deviation, mode, and median values for the difference between the assigned values for the Question Score and Pre-Test Knowledge.
Survey. These data are shown for the three classes individually as well as the overall scores for all of the participants.

### Question Score and Pre-Test Knowledge Survey (Table 2)

<table>
<thead>
<tr>
<th></th>
<th>Honors Algebra II</th>
<th>Pre-Calculus</th>
<th>Honors Chemistry</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean/SD</td>
<td>0.0277</td>
<td>0.4831</td>
<td>-0.0590</td>
<td>0.0542</td>
</tr>
<tr>
<td>mode</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>median</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The figures shown below are representations of the individual students’ score difference between the Question Score and the Pre-Test Knowledge Survey. The box and whisker plot shown in Figure 4 identifies three data points that are statistically considered outliers and one datum point that is statistically considered an extreme outlier. These outliers are the three values greater than 1.0 and the single value of –1.50. When removing these four outliers and considering the histogram shown in Figure 3, the data appears to follow a roughly normal curve with the average skewed slightly to the right.
*Question Score and On-Test Confidence Survey* – The difference between these two surveys is a measure of the difference between the students’ actual abilities and self-perceived abilities on the assessment. A positive value would indicate an underestimate of ability on the assessment. A negative value would indicate an overestimate of ability on the assessment. The table below gives the mean and standard deviation, mode, and median values for the difference between the assigned values for the Question Score and On-Test Confidence Survey. These data are shown for the three classes individually as well as the overall scores for all of the participants.

<table>
<thead>
<tr>
<th>Question Score and On-Test Confidence Survey (Table 3)</th>
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</thead>
<tbody>
<tr>
<td>Honors Algebra II</td>
</tr>
<tr>
<td>mean/SD</td>
</tr>
<tr>
<td>0.1614 / 0.5152</td>
</tr>
<tr>
<td>mode</td>
</tr>
<tr>
<td>median</td>
</tr>
</tbody>
</table>

The figures shown below are representations of the individual students’ score difference between the Question Score and the On-Test Confidence Survey. The box and whisker plot shown in Figure 6 identifies four data points that are statistically considered outliers and one datum point that is statistically considered an extreme outlier. These outliers are the three values greater than 1.0, the single value of –.60, and the extreme outlier with a value of –1.50. When removing these five outliers and considering the histogram shown in Figure 5, the data appears to follow a roughly normal curve with the average skewed to the right.
**Evaluation Surveys** – All 88 participants completed the evaluation surveys. The evaluation survey asked students to provide information about their study habits before the introduction of the Knowledge Surveys and after the use of Knowledge Surveys was incorporated into the classroom. The data in Figure 7 shows the students’ preparation techniques prior to the incorporation of the Knowledge Surveys, and the data in Figure 8 shows the students’ preparation techniques after the incorporation of the Knowledge Surveys. The students were able to select multiple methods of review prior to the implementation of the Knowledge Surveys. After the implementation of the Knowledge Surveys, students selected only one of three options for their review techniques: I only use the Knowledge Surveys to review, I use the Knowledge Surveys and other methods, and I do not use the Knowledge Surveys because I do not study. Students were also able to select one response indicating how much of the Knowledge Surveys they completed: all questions, half of the questions, one from each section, and just placing check marks.
Figure 7

Preparation Before Knowledge Surveys

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Past Celebrations</td>
<td>14</td>
</tr>
<tr>
<td>Use Online Resources</td>
<td>6</td>
</tr>
<tr>
<td>Practice Book Problems</td>
<td>23</td>
</tr>
<tr>
<td>Study Group</td>
<td>12</td>
</tr>
<tr>
<td>Review Homework</td>
<td>26</td>
</tr>
<tr>
<td>Review Calculator Commands</td>
<td>7</td>
</tr>
<tr>
<td>Review Notes</td>
<td>33</td>
</tr>
<tr>
<td>Read Textbook</td>
<td>17</td>
</tr>
<tr>
<td>Ask Teacher Questions</td>
<td>20</td>
</tr>
<tr>
<td>I do not Prepare</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 8

Preparation With Knowledge Surveys

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>I only use the Knowledge Survey</td>
<td>52</td>
</tr>
<tr>
<td>I use the Knowledge Survey and other methods</td>
<td>18</td>
</tr>
<tr>
<td>I do not use the Knowledge Survey, because I do not study</td>
<td>5</td>
</tr>
<tr>
<td>I complete all of the questions on the Knowledge Survey</td>
<td>11</td>
</tr>
<tr>
<td>I complete about half of the questions on the Knowledge Survey</td>
<td>8</td>
</tr>
<tr>
<td>I complete one question from each section of the Knowledge Survey</td>
<td>34</td>
</tr>
<tr>
<td>I look at the questions on the Knowledge survey, and just put a check mark in appropriate box</td>
<td>17</td>
</tr>
</tbody>
</table>
CHAPTER 5 – DISCUSSION

Interpretation of the Data

The data collected during the research has been grouped in order to determine if the students demonstrated changes in perceived ability, changes in actual ability, and accurate estimations of true ability. These trends have been displayed in tables, histograms, and box and whisker plots throughout Chapter 4.

On-Test Confidence Survey and Pre-Test Knowledge Survey – The data shown in Table 1, Figure 1, and Figure 2 would seem to indicate that the participants had an overall average decrease in confidence between the Pre-Test Knowledge Survey and the On-Test Confidence Survey. This negative trend may have several explanations. First, the students were able to use any notes, books, or other resources when completing the Pre-Test Knowledge survey. If students did not try the practice problems without the assistance of such resources, this may have led to a false increase in the students’ sense of ability. Second, some of the students may have experience test related anxiety. Test anxiety may have caused students to feel less confident in their abilities.

Question Score and Pre-Test Knowledge Survey – The data shown in Table 2, Figure 3, and Figure 4 would seem to indicate that the participants had an overall average slight increase in ability between the Pre-Test Knowledge Survey and the Question Score earned on the assessment. However, these data are more indicative of an accurate self-assessment on the Pre-Test Knowledge Survey rather than an overall increase in ability.

Question Score and On-Test Confidence Survey – The data shown in Table 3, Figure 5, and Figure 6 seem to indicate that the participants had an overall average underestimation of ability between the On-Test Confidence Survey and the actual
Question Score. One explanation for this trend may be test related anxieties experienced by the students. Another possible explanation may be that the assessment questions were not clear, and the student was not sure if he or she was providing the response the instructor was looking for.

Evaluation Surveys – The data displayed in Figure 7 and Figure 8 show a change in the study habits of the students as the Knowledge Surveys were incorporated into the classroom. It is most notable that before the incorporation of the Knowledge Surveys, 12 students were not preparing in any way for the assessments; but after the incorporation of the Knowledge Surveys, only five students were not preparing for the assessments.

Synthesis – The results from the On-Test Confidence Survey and Pre-Test Knowledge Survey data set indicated an overall decrease in perceived abilities. The results from the Question Scores and the Pre-Test Knowledge survey indicated a minimal improvement in the actual abilities of the participants. The results from the Question Scores and On-Test Confidence Survey indicate that the participants tended to underestimate their true abilities on the assessment. These three pieces of evidence appear to indicate that the decrease in perceived abilities is unrelated to the participants’ actual abilities. The decrease is more likely due to test related anxieties because the students’ actual abilities remained approximately the same.

Based on the students’ responses on the Evaluation Survey, students appear to be more likely to study if they are provided with a Knowledge Survey as a method of review. One explanation for this decrease in students who choose not to study may be due to the requirement of collecting the Knowledge Survey. Another possible explanation for this decrease could be the convenience of the Knowledge Survey as a
method for review. One of the students commented on the bottom of the Evaluation Survey “they were the sole reason I got an A in chemistry. Without them, I probably would’ve gotten a C. They were really neat and made reviewing much easier.”
Throughout the course, many students expressed similar sentiments. The students seemed to appreciate the examples provided because the examples illustrated and clarified the topics that would be covered on the assessments. One student also suggested that one way to improve the Knowledge Surveys would be to include page numbers where the topics on the Knowledge Survey could be found in the textbook.

**Recommendations for Further Research**

Although the participants responded positively to the implementation of the Knowledge Surveys, it is difficult to determine advantages and disadvantages of a Knowledge Survey as a review method as opposed to alternative review methods. Further research is necessary to determine the differences between Knowledge Surveys as a type of review, other methods of review, and no review. Some insight may be gained when considering the changes between students’ actual abilities if the practice questions on the Knowledge Surveys were actually graded.

Additionally, Knowledge Surveys may also provide a format to compare teacher generated review and student generated review. It would be valuable to explore how student generated knowledge surveys may would compare to teacher generated Knowledge Surveys. If the teacher provided the Can I… statements, would it still be a valuable method of review if the students had to generate their own practice questions? Finally, it would be important to determine how the students specifically utilize the Knowledge Surveys, and how they perceive the benefits of this particular type of review.
REFERENCES


**Pre-Test Knowledge Survey**

<table>
<thead>
<tr>
<th>Can I...</th>
<th>By myself?</th>
<th>With help?</th>
<th>I have no idea.</th>
</tr>
</thead>
</table>

**Write the equation for a geometric sequence and find sequential terms?**

1. Write the equation for a geometric sequence and find sequential terms?

   1. $7, 21, 63, \underline{189}, \underline{567}, \underline{1681}$

   2. $243, -81, 27, \underline{-9}, \underline{3}, \underline{1}$

   3. $\frac{2}{3}, \frac{4}{3}, \frac{8}{3}, \underline{1}, \underline{4}, \underline{16}$

   4. $9, -6, 4, \underline{-12}, \underline{36}, \underline{-108}$
Can I...

<table>
<thead>
<tr>
<th>By myself?</th>
<th>With help?</th>
<th>I have no idea.</th>
</tr>
</thead>
</table>

Write the equation for an arithmetic sequence and find sequential terms?

1. $5, -1, -7, \underline{\hspace{2cm}}, \underline{\hspace{2cm}}, \underline{\hspace{2cm}}$

2. $-7, -3, 1, 5 \underline{\hspace{2cm}}, \underline{\hspace{2cm}}, \underline{\hspace{2cm}}$

3. $4, \frac{29}{6}, \frac{34}{6} \underline{\hspace{2cm}}, \underline{\hspace{2cm}}, \underline{\hspace{2cm}}$

4. $12, \frac{28}{3}, \frac{20}{3} \underline{\hspace{2cm}}, \underline{\hspace{2cm}}, \underline{\hspace{2cm}}$
<table>
<thead>
<tr>
<th>Can I...</th>
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<th>With help?</th>
<th>I have no idea.</th>
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<tr>
<td><strong>Find the geometric mean?</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. 3, ______, ______, 24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 8, ______, ______, ______, ______, ______, $\frac{1}{4}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. 625, ______, ______, ______, $\frac{2}{5}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. 256, ______, ______, ______, 81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can I...</td>
<td>By myself?</td>
<td>With help?</td>
<td>I have no idea.</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Find the arithmetic mean?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. $-7, \underline{\quad}, \underline{\quad}, \underline{\quad}, 9$</td>
<td></td>
<td></td>
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<tr>
<td>10. $12 \underline{\quad}, \underline{\quad}, 4$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. $9, \underline{\quad}, \underline{\quad}, \underline{\quad}, \underline{\quad}, -6$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. $56, \underline{\quad}, \underline{\quad}, \underline{\quad}, 28$</td>
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<td>Can I...</td>
<td>By myself?</td>
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<td>-------------------------------------------------------</td>
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<td>-----------------</td>
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<tr>
<td><strong>Find a specific term in a geometric series?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \sum_{n=1}^{25} (2 + (-3)(n - 1)) = ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \sum_{n=1}^{17} (-240 + 15(n - 1)) = ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \sum_{n=1}^{20} (2 + 9(n - 1)) = ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \sum_{n=1}^{11} (15 + (-4)(n - 1)) = ]</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Can I...</td>
<td>By myself?</td>
<td>With help?</td>
<td>I have no idea.</td>
</tr>
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<td>----------</td>
<td>------------</td>
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<tr>
<td>Find a specific term in a geometric series?</td>
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<tr>
<td>$\sum_{n=1}^{25} \left( \frac{1}{2} (4^{n-1}) \right) = $</td>
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</tr>
<tr>
<td>$\sum_{n=1}^{17} (4(1^{n-1})) = $</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>$\sum_{n=1}^{20} (2(3^{n-1})) = $</td>
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<td>$\sum_{n=1}^{11} \left( \frac{1}{5} (10^{n-1}) \right) = $</td>
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## Can I...

### Find the inverse of a function?

<table>
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<th>With help?</th>
<th>I have no idea.</th>
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<tbody>
<tr>
<td>1. $f(x) = 5x - 20$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. $f(x) = x^2 - 3$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. $f(x) = \sqrt[3]{2x} + 60$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. $f(x) = \frac{1}{10}x + 5$</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Can I…

<table>
<thead>
<tr>
<th>Determine if two functions are inverse pairs</th>
<th>By myself?</th>
<th>With help?</th>
<th>I have no idea.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. $f(x) = \frac{1}{3}x + 4 \quad and \quad g(x) = 3x - 12$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. $f(x) = 6x + 2 \quad and \quad g(x) = x - \frac{1}{3}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. $f(x) = 5x^3 - \frac{1}{2} \quad and \quad g(x) = \sqrt[3]{\frac{1}{5}x + \frac{1}{2}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. $f(x) = \frac{1}{2}x^2 + 3 \quad and \quad g(x) = \pm\sqrt{2x - 6}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Find the inverses of the following functions: (3 points each)

   a. \( f(x) = 12x - 8 \)

   b. \( f(x) = 2x^5 + 3 \)
2. Determine if the following functions are inverse pairs (3 points)
   
   a. \( f(x) = 5x + 135 \) and \( g(x) = \frac{x-27}{5} \)
   
   b. \( f(x) = \sqrt[3]{x^2 - 4} \) and \( g(x) = 2x^3 + 8 \)

3. Fill in the missing terms for the sequences below. (2 points each)

   a. 1, 4, 9, 16, __________, __________, __________, __________

   b. A, D, G, J, __________, __________, __________, __________

<table>
<thead>
<tr>
<th>I knew how to do these problems. (I know I got it right.)</th>
<th>I was able to start these problems, but I wasn’t really sure how to do them. (I may have gotten it right.)</th>
<th>I had no idea what to do for these problems. (I guessed.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I knew how to do these problems. (I know I got it right.)
4. Identify the sequences below as arithmetic or geometric (0.5 points), write an equation for the sequence (2 points), and fill in the blank terms (0.5 points each).

a. \(3, \frac{19}{6}, \frac{10}{3}, \frac{7}{2}, \) __________, __________, __________

b. 15625, 6250, 2500, __________, __________, __________

c. 14, 11, 8 __________, __________, __________

<table>
<thead>
<tr>
<th>I knew how to do this problem. (I know I got it right.)</th>
<th>I was able to start this problem, but I wasn’t really sure how to do this problem. (I may have gotten it right.)</th>
<th>I had no idea what to do for this problem. (I guessed.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. A roofer is nailing shingles to the roof of a house in overlapping rows. There are ten shingles in the top row. Because the roof widens from top to bottom, 2 additional shingles are required in each additional row.
   a. Write an equation for a sequence to model the number of shingles in each row. (2 points)

   b. If the roof requires 20 rows of shingles, how many shingles are there in the last row? (1 point)

   c. Write an equation for a series to model the total number of shingles after each row. (2 points)

   d. If the roof requires 20 rows of shingles, how many total shingles are there on that portion of roof? (1 point)
6. Some people say that smiles are contagious. Suppose that 25% of the people you smile at in an hour will smile back and smile at other people for an hour, 25% of which will continue to smile for an hour, and so on and so forth. Suppose that everyone smiles at 20 people per hour, and stops smiling after an hour.

a. Write the equation for a sequence to model the number of people smiling at any given hour if you started smiling at people at hour one. (2 points)

b. How many people are smiling at hour 7? (1 point)

c. Write an equation for a series to model the total number of people smiling at any given hour. (2 points)

d. How many total people would have smiled because of you on 12 hour day? (Count yourself.) (1 point)
EVALUATION SURVEY

Before the Pre-Test Knowledge Surveys were implemented, I reviewed by: (circle all that apply)

- Review Past Celebrations
- Review Homework
- Use Online Resources
- Review Calculator Commands
- Ask Teacher Questions
- Practice Book Problems
- Review Notes
- I Do Not Prepare
- Study Group
- Read Textbook

I review in other ways: (please indicate) __________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

After the implementation of the Pre-Test Knowledge Surveys, I reviewed by: (circle only one)

Only Using the Knowledge Survey

Using the Knowledge Survey and Other Methods

I Do Not prepare

Place a check mark by the statement which best represents the extent to which you utilize the Pre-Test Knowledge Surveys:

_____ I complete all of the questions on the Pre-Test Knowledge Survey.
_____ I complete about half of the questions on the Pre-Test Knowledge Survey.
_____ I complete one question from each section of the Pre-Test Knowledge Survey.
_____ I look at the questions on the Pre-Test Knowledge Survey, and just put a check mark in the appropriate column
_____ I do not use the Pre-Test Knowledge Survey
CHAPTER 1 – PURPOSE As the Common Core State Standards in Mathematics have been adopted in forty-five of the fifty states, many states are moving toward end (the end) of course testing in the required high school mathematics courses through Algebra II. Similar to final exams, these (this) end of course tests are cumulative and require students to synthesize all of the standards addressed throughout the class. Test results will count as 20% of the students’ final grade in the course. Unlike final exams however, the teachers and administrators cannot alter student scores on these assessments. It would seem that end of course tests may start to impact the teacher evaluation processes within districts. Ultimately, these tests are another wave of high stakes testing for students. For many of these students, any type of testing is associated with high levels of testing anxiety. It is left to the teacher to prepare his or her students to be both academically and emotionally ready for the end of course exams. The new Common Core State Standards for Mathematics boast fewer benchmarks and indicators that delve more deeply into the content. This means the lens of the instructional standards is focusing the students on a clearer image of a smaller amount of material. Teachers are using many methods to encourage students to be active and engaged in their own learning so that they will have a firm understanding on this required material. Education professionals are being increasingly encouraged by their administrators to display objectives in their classroom as a way of pulling the students into the lesson. Sometimes these take on the form of Can I… questions posted within the classroom or distributed to students. These statements (when answered with yes) should indicate that a student has accomplished the desired learning goals and is proficient at the indicated activity. These objectives and statements vary in cognitive demand. It would seem that many high school students citations do not take advantage of these Can I… statements as an instrument for self-monitoring and as a method of reflection. They do not take the time to evaluate whether or not they have accomplished the objectives or if they can honestly answer yes to the Can I… statements. As a result, formal assessments are often the only form of self-monitoring present in the high school classroom. However, by the time students display their knowledge on a formal assessment, the self-monitoring is happening alongside the (potentially high stakes) assessment. At this point, it is too late for self-initiated improvement. As a way to prepare students both academically
CHAPTER 2 – LITERATURE REVIEW

Introduction Plenty of research has been conducted on the value of review guides as preparation for assessment. There are many different types of review that are used across content areas to prepare for assessment. When creating a review guide, there are certain key aspects recommended for incorporation. The incorporation of these key aspects may positively impact student performance citations.

Because self-assessment is a part of reviewing, self-assessment has a direct impact on student performance. The current education and psychology of education research has been explored and reviewed to highlight the relationships and impact of the current study. Current research presented in this chapter covers the following topics: types of review, creating effective review guides, the impact of review on student performance, and the impact of self-reflection on self-efficacy. Types of Review The main purpose of review is to aid in student study. Review may come in many different forms based on the content area, the tests, the instructor, and most importantly the students citation. Previous research has explored different review methods. Several studies have focused on the impact of study habits on student performance and test anxiety among other potential impact areas. Review techniques are differentiated into two categories: collaborative review and individual review. Collaborative review is a study habit in which multiple students work together in the same space to study for an upcoming assessment. According to Bhathia (2010) students who attended small group review sessions scored significantly higher than similarly abled (able, cabled, tabled, bled, ambled) peers who

<table>
<thead>
<tr>
<th>Contextual Spelling Check</th>
<th>32 issues</th>
<th>❌ Spelling (27)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>❌ Commonly confused words (5)</td>
</tr>
<tr>
<td>Grammar</td>
<td>84 issues</td>
<td>❌ Use of articles (3)</td>
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<tr>
<td></td>
<td></td>
<td>❌ Pronoun agreement (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Comparing two or more things (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Faulty parallelism (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Confusing modifiers (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Subject and verb agreement (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Verb form use (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❌ Sentence structure (5)</td>
</tr>
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<td></td>
<td>❌ Wordiness (16)</td>
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<td></td>
<td></td>
<td>❌ Passive voice use (40)</td>
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<td>❌ Punctuation within a sentence (8)</td>
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<td></td>
<td></td>
<td>❌ Capitalization (1)</td>
</tr>
<tr>
<td>Style and Word Choice</td>
<td>3 issues</td>
<td>❌ Vocabulary use (3)</td>
</tr>
</tbody>
</table>
CHAPTER 3 – METHODS

Introduction

This study was conducted with students ranging from Sophomores through Seniors enrolled in math courses in an Appalachian high school. The instruments utilized in this study were sets of surveys that were conducted prior to and during each formal assessment from the second semester of these classes. Additionally, students were selected to participate in interviews focused on the impact of the review guides on their personal study habits. Datum was collected throughout the second semester of the school year and encompassed data collected from seven associated formal assessments. The data were analyzed to identify possible connections between the Knowledge Survey and performance on the formal assessment. Setting This study was conducted in an Appalachian high school in a district, which serves approximately 1634 students with approximately 486 students enrolled in the high school. The district covers 169 square miles which support a large number of local farms. The district has 130 teachers with an average of 14.6 years of teaching experience. Approximately 63.7% of the teaching staff in the high school has training above a bachelor’s degree. The district is comprised of 95.6% White, Non-Hispanic students, and 3.3% Multi-racial students. Of the students enrolled, 48.3% of the students come from economically disadvantaged homes. Approximately 23.3% of students have been identified as having a disability. Participants This study was conducted on 3 classes of students with a total of 88 participants. The students were selected based on their enrollment in one of the following three courses: Honors Algebra II, Pre-Calculus, and Honors Chemistry. There were 27 participating students in the Honors Algebra II class, 32 participating students between two Honors Chemistry courses, and 29 participating students between two Pre-Calculus classes. There were 42 male students and 57 female student participants. Of these students, there were 33 sophomores, 46 juniors, and 30 seniors. Instruments Pre-Test Knowledge Survey – The day before each summative assessment (test) students were given a Knowledge Survey as a review guide. This had Can I… statements with the topics that would be covered on the test and example problems for practice with three ability columns: one column each for I can do this by myself, I can do this with help, and I can’t (can not) do this. An example Knowledge Survey is included in Appendix A. On-Test Confidence
CHAPTER 4 – RESULTS Introduction All of the surveys administered were full and complete and have been utilized in the analysis of the data. The Pre-Test Knowledge Survey, the On-Test Confidence Survey, and the Question Scores were broken into groups, which addressed the same topic. These groups were then compared by computing the differences between the On-Test Confidence Survey and Pre-Test Knowledge Survey, the Question Score and Pre-Test Knowledge Survey, and the Question Score and On-Test Confidence Survey. The findings are displayed in tables, histograms, and box and whisker plots. Results On-Test Confidence Survey and Pre-Test Knowledge Survey – The difference between these two surveys is a measure of the difference between the students’ self-perceived abilities during the assessment and before the assessment. A positive value indicates an increase in perceived ability from the Pre-Test Knowledge Survey to the On-Test Confidence Survey. A negative value indicates a decrease in perceived ability from the Pre-Test Knowledge Survey to the On-Test Confidence Survey. The table below gives the mean and standard deviation, mode, and median values for the difference between the assigned values for the On-Test Confidence Survey and Pre-Test Knowledge Survey. These data are shown for the three classes individually as well as the overall scores for all of the participants. On-Test Confidence Survey and Pre-Test Knowledge Survey (Table 1)

<table>
<thead>
<tr>
<th></th>
<th>Honors Algebra II</th>
<th>Pre-Calculus</th>
<th>Honors Chemistry</th>
<th>Overall</th>
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<td>-0.1337</td>
<td>0.2639</td>
<td>-0.1518</td>
<td>-0.1458</td>
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<tr>
<td>SD</td>
<td>0.3642</td>
<td>-0.1872</td>
<td>0.3033</td>
<td>0.3185</td>
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<tr>
<td>mode</td>
<td>0</td>
<td>-0.1111</td>
<td>-0.1429</td>
<td>-0.1111</td>
</tr>
<tr>
<td>median</td>
<td>0</td>
<td>-0.1429</td>
<td>-0.1111</td>
<td>0</td>
</tr>
</tbody>
</table>

The figures shown below are representations of the individual students’ score differences between the On-Test Confidence Survey and the Pre-Test Knowledge Survey. The box and whisker plot shown in Figure 2 identifies six data points that are statistically considered outliers. These outliers are the six values less than –0.75. The data shown in Figure 1 (when removing the outliers) appears to be roughly normal. Figure 1 Figure 2 Question Score and Pre-Test Knowledge Survey – The difference between these two surveys is a measure of the difference between the students’ actual abilities and self-perceived abilities before the assessment. A positive value would indicate an increase in actual ability from the Pre-Test Knowledge Survey to the actual assessment. A negative value may indicate a decrease in actual ability from the Pre-Test Knowledge Survey to the assessment or an over estimate of ability on the Pre-Test Knowledge Survey. The table below gives the mean and standard deviation, mode, and median values for the difference between the assigned values for the Question Score and Pre-Test Knowledge Survey. These data are shown for the three classes individually as well as the overall scores for all of the participants. Question Score and Pre-Test Knowledge Survey (Table 2)
CHAPTER 5 – DISCUSSION  Interpretation of the Data

The data collected during the research has been grouped in order to determine if the students demonstrated changes in perceived ability, changes in actual ability, and accurate estimations of true ability. These trends have been displayed in tables, histograms, and box and whisker plots throughout Chapter 4. On-Test Confidence Survey and Pre-Test Knowledge Survey – The data shown in Table 1, Figure 1, and Figure 2 would seem to indicate that the participants had an overall average decrease in confidence between the Pre-Test Knowledge Survey and the On-Test Confidence Survey. This negative trend may have several explanations. First, the students were able to use any notes, books, or other resources when completing the Pre-Test Knowledge survey. If students did not try the practice problems without the assistance of such resources, this may have led to a false increase in the students’ sense of ability. Second, some of the students may have experience test related anxiety. Test anxiety may have caused students to feel less confident in their abilities. Question Score and Pre-Test Knowledge Survey – The data shown in Table 2, Figure 3, and Figure 4 would seem to indicate that the participants had an overall average slight increase in ability\(^\text{1}\) (the ability) between the Pre-Test Knowledge Survey and the Question Score earned on the assessment. However, these data are more indicative of an accurate self-assessment on the Pre-Test Knowledge Survey rather than an overall increase in ability. Question Score and On-Test Confidence Survey – The data shown in Table 3, Figure 5, and Figure 6 seem to indicate that the participants had an overall average underestimation of ability between the On-Test Confidence Survey and the actual Question Score. One explanation for this trend may be test related anxieties experienced by the students. Another possible explanation may be that the assessment questions were not clear, and the student was not sure if he or she was providing the response the instructor was looking for. Evaluation Surveys – The data displayed in Figure 7 and Figure 8 show a change in the study habits of the students as the Knowledge Surveys were incorporated into the classroom. It is most notable...