

USE OF GUIDED NOTES
IN REMEDIAL ALGEBRA

Approved by Richard Rogers

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Abstract

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This action research project evaluates the use of guided notes and a master notebook in remedial algebra courses. The project began with a search for a universal instructional design approach to address note taking issues in remedial algebra courses. Guided notes and a master notebook were chosen to provide all students note taking support without stigmatizing those with disabilities or with weaker academic skills. In general using guided notes resulted in assisting students with keeping a good set of notes and in engaging them more during class time. Because of the feedback, this researcher will continue to use and improve the guided notes already produced.

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Chapter One: Introduction

Remedial algebra students are presented with a variety of challenges to success. Many have struggled with the subject in the past. Now they must perform well in a postsecondary environment or face falling further behind. Anxiety, discouragement, and poor study skills are a few of the issues that students must overcome.

Teaching remedial algebra classes at a mid-sized Midwestern university, this researcher wanted to enable her students to be more successful in the context of the current course structure, lecture three hours a week, and to have the skills to succeed in their following math courses. Poor note taking and inadequate notes were observed regularly in class and when providing individual assistance. While some students may have chosen to not take notes, it should be pointed out that good note-taking strategies in mathematics can be different than those in other lecture courses (Eades & Moore, 2007).

An issue for instructors can be making accommodations for students with disabilities in the remedial algebra courses. One of the frequent accommodations requested is a note-taker. The instructor is requested to ask the class or specific students if they would be willing to make their notes available to another student. In a remedial course, very few students feel confident enough in their own abilities to volunteer. Therefore a search was begun for a universal approach to both address the needs of students with disabilities needing accommodations and benefit other students as well.

Statement of the Problem

What assistance or what strategies do students need to improve their notes and note taking in remedial algebra courses? How can an instructor model good note taking skills? Specifically what would the effect of guided notes in these courses?

Definition of Terms

Guided notes: guided notes are a variation of the instructor's notes that requires students to complete the missing components during the lecture or discussion (Austin, Lee, & Carr, 2004).

Master notebook: A master notebook is a complete set of notes made available to students as a resource (Eades & Moore).

Delimitations of Research

Guided notes were incorporated into remedial algebra courses over three semesters.

Guided notes were used in two sections of Elementary Algebra during the Fall 2009 semester, three sections of Intermediate Algebra during the Spring 2010 semester, and two sections of Elementary Algebra and one section of Intermediate Algebra during the Fall 2010 semester as part of this action research project.

Method of Approach

This action research project evaluates the use of guided notes in remedial algebra courses. In the lower level Elementary Algebra course, students were given the guided notes and required to turn them in for a grade over the whole semester. The quality of the individual student's notes was then compared to the student's final grade. In the Intermediate Algebra classes, students were given the guided notes and had to turn them in just for the first unit. The guided notes for the rest of the semester were available online for the students to print out for themselves if they wanted. Accessing the online notes was then compared to the student's final grade. Students also gave feedback on the guided notes.

A review of literature on recent research of guided notes was conducted and the results are summarized. Recommendations based on the action research project and on the review of literature are made.

Chapter Two: Review of Related Literature

Background

The university at which this researcher teaches places over 40% of incoming students into one of two remedial algebra courses. The reasons for their placement and their failure or success in these courses are varied. However, the result for many students in remedial algebra courses is stress and lack of motivation to succeed.

Some students are placed into remedial algebra because they did not take the math classes in high school to adequately prepare them for college. Also because four years of math are not required for high school graduation, many do not take a math class their final year of high school. This gap results in needed skills being greatly diminished or lost by the time they enter college.

A number of students in remedial algebra have a large amount of math anxiety or general dislike for the subject. People can develop math anxiety because of previous struggles and unpleasant experiences with the subject (Bass, 2007). Students who have “always” struggled with math many times believe that they always will.

One of the more observable deficiencies among students in remedial algebra is their poor note-taking skills. Notes are incomplete, illegible, and poorly organized. They may not have been previously instructed in ways to take notes in a mathematics course.

Incorporating principles of universal design can help encourage the above mentioned types of students, traditionally underrepresented students and students with disabilities. Universal design gives options that in the end benefit all students. Rather than making exceptions or making low performers stand out, universal design of instruction presents

strategies to help all students learn the material. So a search was begun for methods to improve note taking that could benefit everyone.

Summary of Research on Guided Notes

In a variety of settings the use of guided notes has shown to be an effective way to improve student learning, increase student engagement, and benefit students with disabilities that impact note-taking. While different note taking methods are available and promoted, a good set of notes, regardless of method, is beneficial for later study. Having accurate notes increases the ability of students to prepare for quizzes and exams (Tincani, 2004).

So why not just have instructors give students the notes? Giving partial notes to students compared to giving them a full set of notes led to better performance and facilitated active note taking during class (Cornelius & Owen-DeSchryver, 2008). When students are given a full set of notes, they tend to decrease doing the activities that enable them to master the material, i.e., adding additional notes, attending class, etc. (Cornelius & Owen-DeSchryver).

Guided notes provide a nice balance of demonstrating a framework for a good set of notes and encouraging engagement during the lecture without providing so much as to be detriment to learning. Students must pay attention and make active responses to complete the notes (Tincani). If designed well, guided notes can make class time more interactive and provide an outline to make connections between topics (Mantis, 2007). Supplemental activities can be incorporated into the guided notes (Konrad, Joseph, & Eveleigh, 2009).

Guided notes have been shown useful in increasing note-taking accuracy (Konrad, et al). Students are more likely to take notes when provided with guided notes because they view it as being less effort (Konrad, et al). When given a visual prompt, students are encouraged to write down important examples (Austin, Lee, & Carr, 2004).

Students indicate they like guided notes, claiming the guided notes helped them stay interested in the material (Lazarus, 1993). Student satisfaction with the course is higher when guided notes are provided (Montis). Students prefer using guided notes to traditional lecture (Must-Rao, Kroeger & Schumacher-Dyke, 2008).

Once tried, instructors also prefer guided notes (Konrad, et al). The guided notes can help instructors organize lecture and course material, provide consistency between lectures, and convert important points into test questions (Tincani). Other benefits for instructors incorporating guided notes into their courses are having more focused lectures, help staying on topic, having a “bad-day safety net”, and improving course evaluations (Heward, 2004).

Guided notes can also help promote note-taking skills among students with disabilities (Lazarus). For any student with note-taking difficulties, guided notes solve issues of what to write and how to organize their notes (Tincani). Therefore, guided notes reduce the frustration concerning note-taking for students with disabilities (Konrad, et al). Since all students are provided with the guided notes, those with disabilities are not made to stand out or feel stigmatized. As a result, principles of universal design are then being incorporated into a course (Higbee, 2008).

Other note taking aids

A master notebook, a completed set of notes, can be developed by students or in conjunction with the instructor (Eades & Moore). It should be available for student reference at a help center or in the instructor’s office. A master notebook is helpful not only for students who need to miss a class but also for those students with disabilities who require accommodations for note taking. Having a resource like a master notebook falls into the category of instructional universal design in that students with disabilities have access, they are not being singled out, and

all students benefit from it. Students also find it reassuring that they have access to a reliable set of notes (Eades & Moore).

Students may not improve their note taking skills unless they practice and are given a good model (Eades & Moore). Another approach to providing both practice and modeling is discussed by Rose, et al (2008). In a large lecture class several students are assigned on a rotating basis to hand in their notes after the lecture. The notes are then posted on the course website and are included in their participation grade. Other students benefit from the variety of notes by different types of learners and the note takers are given routine practice with feedback.

As a result of the review of literature, this researcher decided to develop and incorporate guided notes into the current course structure for the remedial algebra courses that she teaches. To model note taking and provide a course notebook or binder, a master notebook with the instructor's notes and with answer keys to worksheets, quizzes, and tests was also developed for students in the student help center. Using guided notes and a master notebook gives all students note taking support without stigmatizing those with disabilities or with weaker academic backgrounds.

Chapter Three: Action Research Project

Overview of the Project

Action research is a series of small investigations. It involves systematically changing some aspect of classroom practice, collecting relevant data pertaining to the new practice, and interpreting and analyzing that data. As the results are reported, adjustments are made and then the process starts over.

This action research project is designed to investigate the results of using guided notes and a master notebook in remedial algebra courses. The goals of the project involve incorporating universal design into the courses to better serve all students and improving student success.

Universal design in instruction helps teachers design all products for a set of diverse individuals. Instead of creating curriculum for the average learner, it is created for the most number of learners possible so that special accommodations are not often required. Specifically one of the goals of the combination of guided notes and a master notebook is eliminating the need for a note taker for certain students with disabilities. At the same time all students, especially those with undocumented disabilities and those who are nontraditional students, benefit from these tools.

In order to help students improve their performance several other goals with regards to note taking are included. Students first off should be helped to see the benefit of keeping a good set of notes. Then they are given assistance in keeping that set of notes accurate. The process of using guided notes attempts to engage students more during the class period. The master notebook serves as a model as to what should be included and how their binder should look.

During the fall 2009 and fall 2010 semesters, Elementary Algebra students were given guided notes for each chapter. They were expected to fill out the notes during class. If they missed a class or even just a few blanks, the students could come to the help center to fill in what they missed from the master notebook. Each set of guided notes was handed in for a grade on quiz or test days. Some feedback was given on improving their notes.

During the spring and fall 2010 semesters, Intermediate Algebra students were given guided notes for the first unit. The notes for that first unit were assessed and the students were given some feedback. The remainder of the semester the guided notes were posted online, so that students could use the guided notes if they chose.

A master notebook was available as a resource in the help center. It was to be a model as to how a student's binder should look. Besides the notes from class, the syllabus and answer keys to worksheets, quizzes and tests were included.

Development of the Guided Notes

The guided notes for both courses were developed from previously written lecture notes, examples, and classroom activities. In this case the process was relatively easy since most of that material was already stored in electronic documents.

As suggested by Heward, key facts and concepts were left blank to be filled in by students. Also example problems were given, but then students were given space to write out the steps for themselves. When developing the guided notes, Montis suggests that the goal should be to keep the students engaged, but not for them to be spending their whole time copying. She also suggested that students should be given time and room for the examples and that the guided notes should assist students in making connections between different concepts.

Addition Property of Equality

For any real numbers a , b , and c , if $a = b$, then _____

Example 2: Solve.

a) $x - 6 = 3$

b) $x + 6 = 3$

Multiplication Property of Equality

For any real numbers a , b , and c , with $c \neq 0$, if $a = b$, then _____.

Example 3: Solve.

a) $\frac{x}{3} = 2$

b) $3x = -27$

Our goal is to _____

You try # 12, 18, 36, 48, 50 on page 84.

Applying both properties

Example 4: Solve $2a + 5 = 1$

Figure 1: Sample of guided notes developed.

Results

Assessment of the effectiveness of the guided notes was done by student evaluation of the guided notes, student comments, comparison of the student's final grade to his or her guided notes grade for Elementary Algebra, and for Intermediate Algebra the comparison of the student's final grade to his or her use of the guide notes (see Appendix A).

In the Elementary Algebra course, while not strong, there is some correlation (Fall 2009, $r = 0.67$; Fall 2010, $r = 0.73$) between how well the students completed the guided notes and their final grade.

In the Intermediate Algebra course, there was not a correlation (Spring 2010, $r = 0.23$; Fall 2010, $r = 0.18$) between using the guided notes and the final grade. This result is not that surprising because the use of the guided notes was optional. Therefore, some students who needed assistance did not use them, but obviously some who did not use the guided notes did not need the extra tool.

Question	never true				always true
	1	2	3	4	5
1. The study guides helped me stay organized in this course	5.5%	0.0%	13.7%	31.5%	49.3%
2. The study guides have helped me have a good set of class notes	4.1%	2.7%	9.6%	27.4%	56.2%
3. Using the study guides have helped me pay attention and participate in class	4.1%	2.7%	11.0%	21.9%	60.3%
4. I referred to my study guide as I did my homework	5.5%	5.5%	21.9%	19.2%	47.9%
5. I review the study guides before tests.	5.5%	12.3%	8.2%	21.9%	52.1%
6. The study guides have helped me prepare for the test and the final exam	4.1%	8.2%	17.8%	24.7%	45.2%
7. I now have a better idea of what notes in a math course should ideally look like.	2.7%	2.7%	15.1%	35.6%	43.8%
8. I will now be better prepared for my future math classes even if a study guide is not provided	1.4%	5.5%	26.0%	24.7%	42.5%
9. I will attempt to put together similar notes on my own in future math classes.	1.4%	4.1%	13.7%	39.7%	41.1%

Figure 2: Student feedback on guided notes (study guides) in Elementary Algebra

The student feedback on the use of the guided notes in the Elementary Algebra courses was for the most part positive (see Appendix B). The statements receiving the highest percentage of positive responses (over 80% of responses were a four or a five) were that the guided notes helped the students stay organized, helped in having a good set of notes, and helped them pay attention and participate in class. The statement with the lowest positive response (67%) was that the students used their guided notes as they did their homework. Along with that the highest negative response (17.3% of responses were a one or a two) was that they reviewed their guided notes before a test.

For Intermediate Algebra, the student feedback on the use of the guided notes was more mixed (see Appendix C). Over 70% of the students indicated that they had printed out some or all of the optional guided notes. Therefore, majority of the students saw enough value in the guided notes to take the time and effort to access them and print them out. When students were asked why they did not use the guided notes or use them all the time, the majority of the comments were along the lines of “forgetting” or being “too busy”.

Question	None		Some		All	
1. Did you use the study guides posted on D2L?	27.9%		50.8%		21.3%	
	never true			Always true		
	1	2	3	4	5	Blank
2. The study guides helped me stay organized in this course.	3.3%	18.0%	24.6%	21.3%	29.5%	3.3%
3. The study guides have helped me have a good set of class notes.	4.9%	11.5%	29.5%	14.8%	36.1%	3.3%
4. Using the study guides have helped me pay attention and participate in class.	4.9%	13.1%	19.7%	29.5%	29.5%	3.3%
5. I referred to my study guide as I did my homework.	9.8%	16.4%	19.7%	21.3%	29.5%	3.3%
6. I review the study guides before tests.	11.5%	18.0%	32.8%	18.0%	16.4%	3.3%
7. The study guides have helped me prepare for the tests and the final exam.	14.8%	14.8%	21.3%	32.8%	13.1%	3.3%
8. I now have a better idea of what notes in a math course should ideally look like.	9.8%	14.8%	31.1%	21.3%	19.7%	3.3%
9. I will now be better prepared for my future math classes even if a study guide is not provided.	4.9%	13.1%	31.1%	27.9%	19.7%	3.3%
10. I will attempt to put together similar notes on my own in my future math classes.	3.3%	14.8%	26.2%	32.8%	19.7%	3.3%

Figure 3: Student feedback on guided notes (study guides) in Intermediate Algebra

The statements with the highest positive responses in Intermediate Algebra were that the guided notes helped them pay attention and participate in class (59%) and that they will attempt to put together similar notes in future math classes (52.5%). The lowest positive response (34.4%) was that the students reviewed the guided notes before tests. This corresponds to the highest negative response (29.6%) that the guided notes helped prepare them for tests and the final. The statement receiving the lowest negative response (16.4% of responses were a one or a two) was that the guided notes helped them have a good set of notes.

Overall the Elementary Algebra students viewed the guided notes favorably. There was some correlation between how well the guided notes were completed and the student's overall performance in the course. Some sample student comments on the guided notes:

"The study guides helped me out very much. Thank you!"

"Overall I thought they were a good resource and they helped me keep my notes organized."

"I think the study guide helped the class move quickly. It allowed us to learn a lot without waiting to copy notes."

"They were easy to follow and were helpful when doing assignments."

In general determining how Intermediate Algebra students benefited from the guided notes was more mixed. However, the majority of them saw enough benefit to use at least some of the guided notes beyond what was required. In both courses, the goals for the guided notes of assisting students with keeping a good set of notes and of engaging them more during class time were definitely met.

Chapter Four: Conclusions and Recommendations

In summary, guided notes can be a helpful universal design tool to facilitate better student organization and note taking. Guided notes provide a framework for a good, complete set of notes without providing so much as to be a detriment to learning the material. The guided notes, along with the master notebook, provide a model for note taking and organizing class materials.

The existing literature on guided notes supported their use, especially for students with disabilities. Frustration is reduced for students with note taking difficulties. The guided notes can improve engagement during class. Guided notes can also benefit instructors; the resulting lectures are more focused.

The majority of the feedback given indicated that guided notes did help students stay organized and have a good set of class notes. Therefore, one of the primary objectives of developing and using the guided notes was met. Especially for students that struggle with math or have math anxiety, the structure of the guided notes gave them a solid starting point for their homework and studying.

Many also indicated that that the guided notes assisted them in paying attention and participating in class. While not an original goal, this was even noted by classroom observers. In the future as updates are made to the current set of guided notes, it would be beneficial to incorporate more learning activities right into the notes.

Because of the generally favorable response to the guided notes and the correlation between the quality of the notes and the final grade for the lower level students, the guided notes were worth the investment of the initial time to develop. However, if other instructors do not

already have their materials in a digital format, more time would be needed. The development process could definitely be done in pieces, if preparation time is an issue.

Based on the results of the action research, this researcher will continue to use the guided notes in the remedial algebra courses. They will continue to be requirement for the lower level Elementary Algebra course to give those students the support they need. But for Intermediate Algebra, the students will just be exposed to the notes at the beginning of the course and then the guided notes will be provide online for those who wish to make use of them. This seems to be a good balance of providing structure and support, but preparing the students for future math courses where guided notes will most likely not be provided.

Based on the feedback, students did not make the connection between the notes and doing homework or preparing for tests as well. Instructors may need to assist students to make the connection between their notes and other parts of the course either during lecture or through modifications to the guided notes. Otherwise students are missing the point of having a good set of notes if the notes are not an aid in doing the homework or preparing for tests.

While not a cure all for students placed in and struggling with remedial algebra, guided notes are legitimate tool that instructors can use to assist and improve note taking in these courses. Guided notes do provide a universal solution to meet the needs of the some students with disabilities that benefits all students. In a remedial course, all students stand to benefit from the extra support provided with guided notes.

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Appendix A

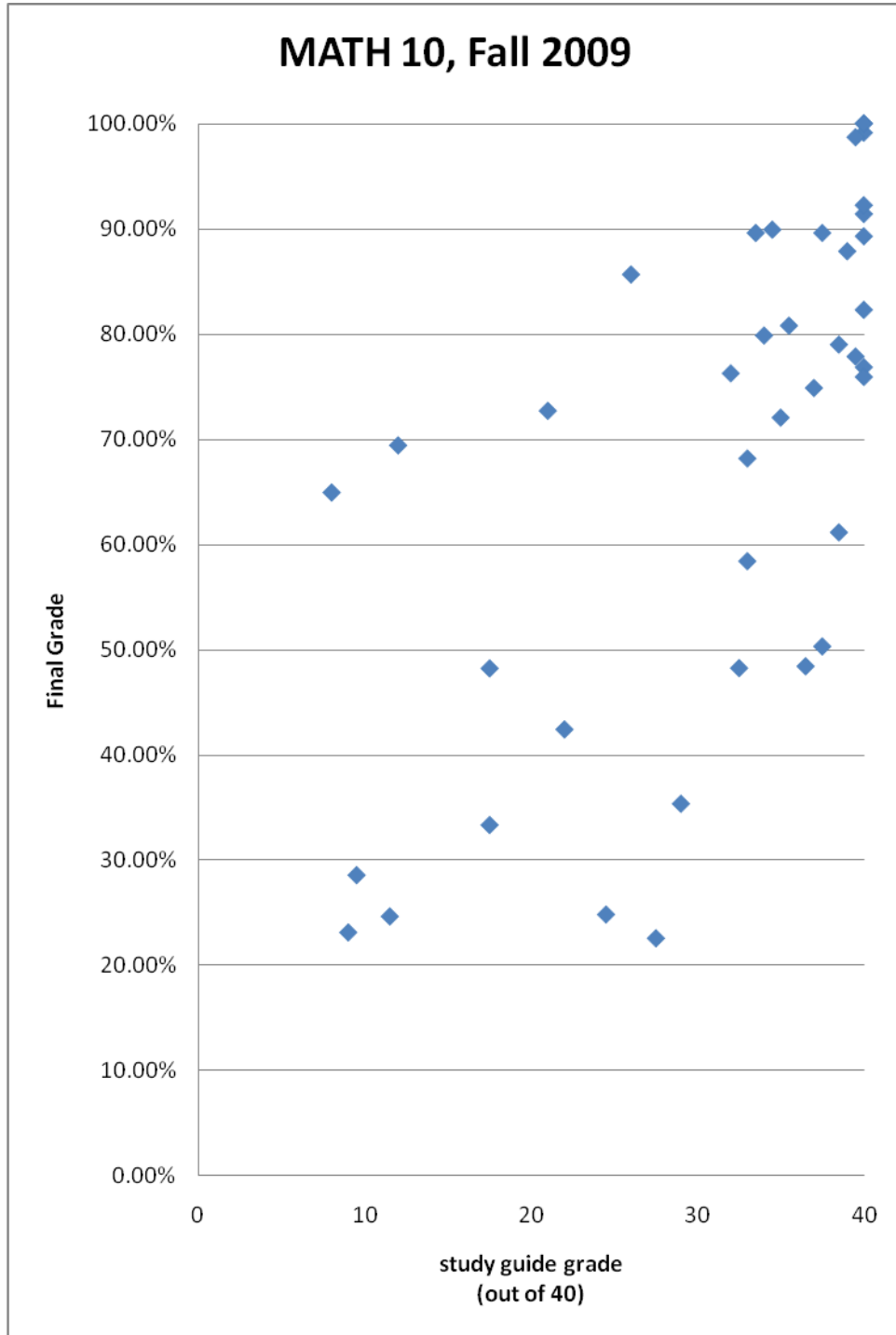


Table 1: Comparing study guide grade to final grade, Elementary Algebra, Fall 2009
r = 0.67

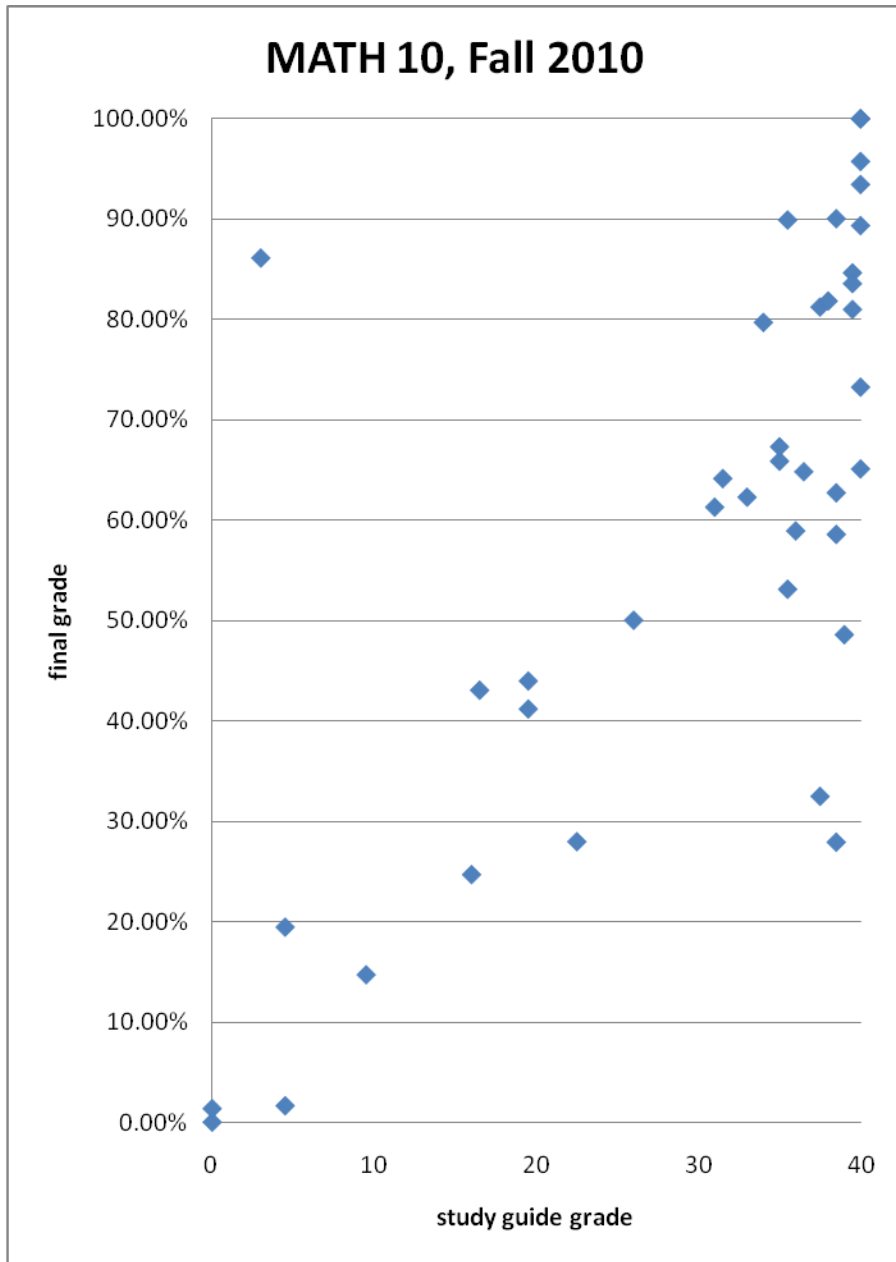


Table 2: Comparing study guide grade to final grade, Elementary Algebra, Fall 2010
 $r = 0.73$

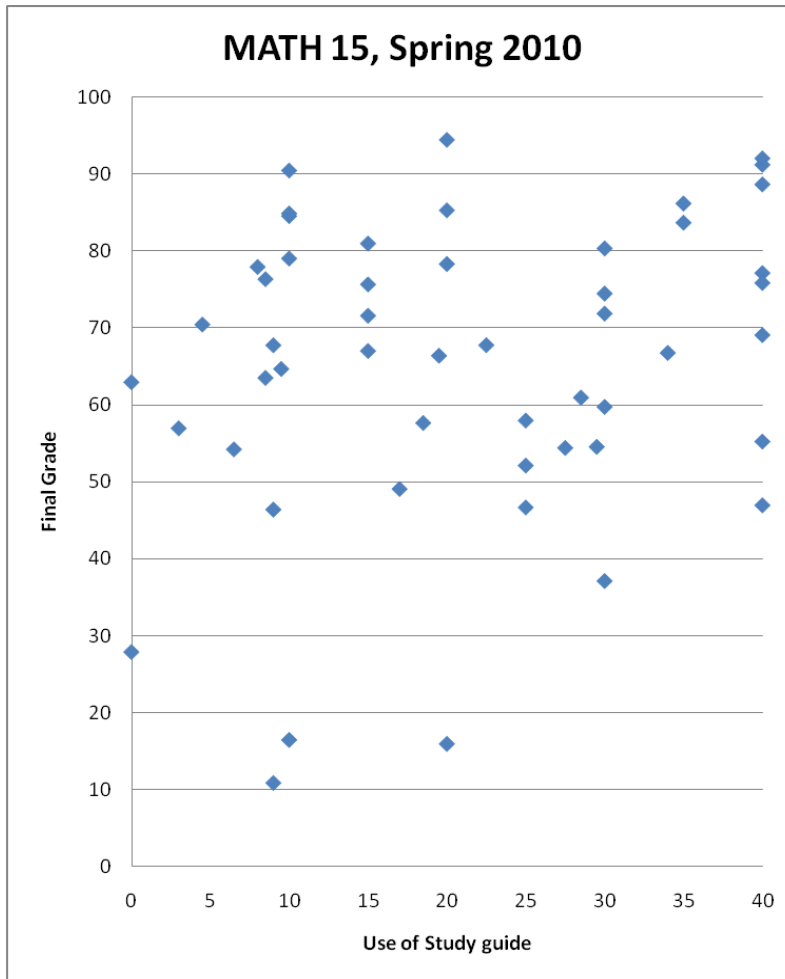


Table 3: Comparing study guide use to final grade, Intermediate Algebra, Spring 2010, $r = 0.23$

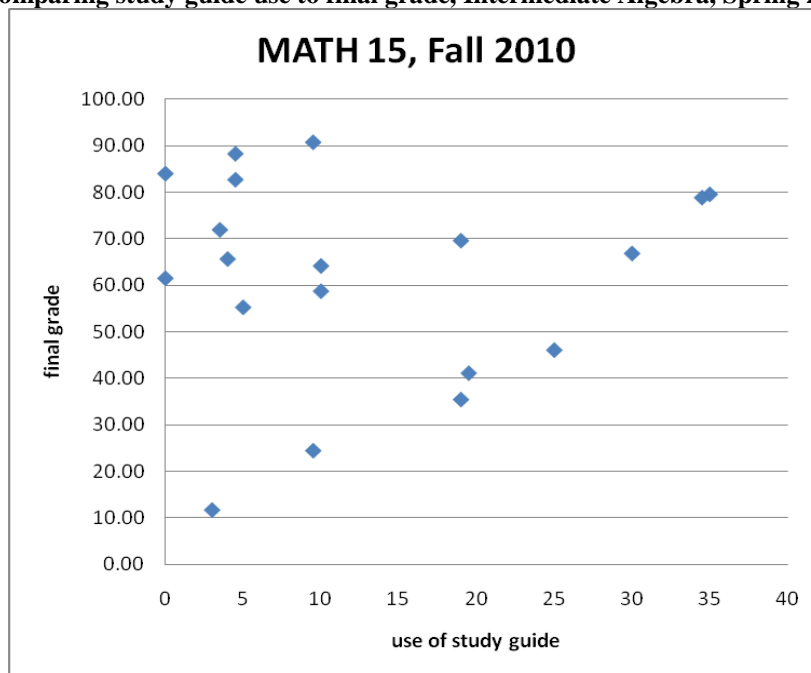


Table 4: Comparing study guide use to final grade, Intermediate Algebra, Fall 2010, $r = 0.18$

Appendix B

Study Guide Evaluation Elementary Algebra (Fall 2010)

	Never True				Always True
1. The study guides helped me stay organized in this course.	1	2	3	4	5
2. The study guides have helped me have a good set of class notes.	1	2	3	4	5
3. Using the study guides have helped me pay attention and participate in class.	1	2	3	4	5
4. I referred to my study guide as I did my homework.	1	2	3	4	5
5. I reviewed the study guides before tests.	1	2	3	4	5
6. The study guides have helped me prepare for the tests and the final exam.	1	2	3	4	5
7. I now have a better idea of what notes in a math course should ideally look like.	1	2	3	4	5
8. I will now be better prepared for my future math classes even if a study guide is not provided.	1	2	3	4	5
9. I will attempt to put together similar notes on my own in my future math classes.	1	2	3	4	5

Comments about the provided study guides for MATH 10:

Figure 4: Sample evaluation form for Elementary Algebra

Appendix C

Study Guide Evaluation MATH 15 – Fall 2010

A study guide was provided and graded for Unit 1. Study guides for the remaining chapters were posted on D2L and use was optional.

	None	Some	All		
1. Did you use the study guides posted on D2L?					
a. If you answered NONE, why didn't you use them?					
b. If you answered SOME, why didn't you use all of them?					
	Never True		Always True		
2. The study guides helped me stay organized in this course.	1	2	3	4	5
3. The study guides have helped me have a good set of class notes.	1	2	3	4	5
4. Using the study guides have helped me pay attention and participate in class.	1	2	3	4	5
5. I referred to my study guide as I did my homework.	1	2	3	4	5
6. I reviewed the study guides before tests.	1	2	3	4	5
7. The study guides have helped me prepare for the tests and the final exam.	1	2	3	4	5
8. I now have a better idea of what notes in a math course should ideally look like.	1	2	3	4	5
9. I will now be better prepared for my future math classes even if a study guide is not provided.	1	2	3	4	5
10. I will attempt to put together similar notes on my own in my future math classes.	1	2	3	4	5

Comments about the provided study guides for MATH 15:

Figure 5: Sample evaluation of guided notes for Intermediate Algebra