The Effects of Two Homework Assessment Schemes on At-Risk Student Performance in College Algebra

Twyla Harris
Western Kentucky University

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THE EFFECTS OF TWO HOMEWORK ASSESSMENT SCHEMES
ON AT-RISK STUDENT PERFORMANCE IN COLLEGE ALGEBRA

A Specialist Project
Presented to
The Faculty of the Department of Curriculum and Instruction
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Specialist in Secondary Education

By
Twyla D. Harris

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THE EFFECTS OF TWO HOMEWORK ASSESSMENT SCHEMES ON AT-RISK STUDENT PERFORMANCE IN COLLEGE ALGEBRA

Date Recommended April 16, 2008

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Director of Thesis

Wanda Heidemann

Dean, Graduate Studies and Research 4/24/2008

Date
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This project is the result of a yearlong study documenting the comparative effectiveness of two homework assessment schemes. While both schemes assess completeness and accuracy, one scheme was more traditional and one was more non-traditional in nature. The more traditional method required students to complete homework assignments that were constructed from problems found in the textbook that accompanied the course. These assignments were monitored and were checked weekly for accuracy. The non-traditional method utilized the on-line assessment tool called MathXL®. The effectiveness of these two methods was compared through analysis of differences in student persistence on homework, student performance on tests, and final course grades. After analyzing the material, this study suggested that using MathXL® as a tool versus the traditional book and paper/pencil method does not lead to significant increases in persistence or success. Thus, it seems that using Math XL® should be a personal choice of the instructor for the purpose of convenience. The study concludes with a discussion of findings and study limitations, as well as suggestions for future research.
Introduction

Mathematics educators continually explore new methods for effectively assessing learning skills in mathematics. This daunting task is even more important for teaching and assessing at-risk students. Many studies around the world have focused on effective mathematics instruction through the lens of demographic differences in race, economics, or learning disabilities. This study will concentrate on those students who have a limited capacity to perform skills successfully at the college algebra level.

Homework has been long been regarded as the staple for measuring learning progress. However, the subject of homework itself has been debated throughout educational history. Given that most educators deem homework a necessary evil, this study reviews research on the amount of time being spent doing homework by students in the United States, the effects of doing homework on a consistent basis, and the effects of homework that is enhanced through the use of technology.

In regards to homework, Bouknight (1983) states, “attempts to find one best method or approach have been disappointing, and no one method appears to be more effective generally than the others” (p. 1). Today however supporters of the computer assisted learning program, MathXL®, purport that overwhelming success in learning objectives can be obtained using their program in the classroom as a supplement to lecture (Speckler, 2007). In view of this position, the purpose of this study was to attempt to find if the claims of Math XL® are merited, that this computer assisted learning program is more effective that traditional homework methods, particularly on the population of at-risk students.
Review of Literature

While educators have deemed homework important, debates have raged through the decades concerning the amount of time spent on homework and its effectiveness. The debate became so heated that at one point in the history of U.S. public education, homework was almost banned from the education process. Gill and Schlossman (1996, 2003, 2004) conducted several extensive studies on the sentiments of the American public regarding the effects of homework during the first half of the 20th century. Wilde (2007) summarized their findings on attitudes towards homework in her article for GreatSchools,

Around the turn of the 20th century, the Ladies' Home Journal carried on a crusade against homework. They thought that kids were better off spending their time outside playing and looking at clouds. The most spectacular success this movement had was in the state of California, where in 1901 the legislature passed a law abolishing homework in grades K-8. That lasted about 15 years and then was quietly repealed.

Today, although most teachers and parents agree that homework is important at every educational level, some concerns about its negative effects persist. For example, an article appeared in Time magazine highlighting the homework abuse of a sixth-grade student (Ratnesar, 1999). Likewise, LeTendre and Baker found that increases in homework loads "worsen distinctions in student learning" (cited in Blaum, 2005). However, most critics acknowledge that homework is a necessary evil.
Some organizations, such as the National Commission on Excellence in Education (1983) have strongly advocated more homework, and others (Gosche, 2005) have lamented that U.S. students receive less homework compared to students in other developed countries like Japan and Taiwan. Some researchers, such as Betts (1997), have asserted that a larger quantity of homework increases success in that area of study.

Regardless of one’s position on its merits or disadvantages, homework seems firmly entrenched in the U.S education system at both K-12 and post-secondary levels. In this review of the literature, studies of homework are described based on the following categories: 1) Time students spend on homework, 2) General effects of homework, and 3) Effects of technology-enhanced homework. The review will conclude with the purpose of the proposed current study and research questions and hypotheses that will guide the study.

Time Students Spend on Homework

K-12 studies. Gill and Schlossman (2004) implemented several types of surveys to explore the amount of time spent on homework over a century. They noted the only increase in the time spent on homework occurred in the decade after Sputnik’s launch date. In fact, they found that the amount of homework given to elementary students has decreased in recent years.

The Brown Center Report (2003) compiled several studies, including the National Assessment of Educational Process (NAEP). This report investigated the amount of time 9-, 13-, and 17-year olds spent on homework between the years 1980-1999, and concurred with Gill and Schlossman’s findings that the average amount of homework given to K-12 grade students has not increased since the 1930’s. The report also noted
that the typical student in this investigation averaged less than one hour nightly. In particular, in 1999, 65% of 17-year olds were among those that spent less than one hour on nightly homework.

Post-secondary studies. When students enter the arena of higher education, it is not uncommon for college instructors to strongly advised students to spend two hours outside class preparing for each hour spent in the classroom setting. Unfortunately, results from the 2001 National Survey of Student Engagement found that only 12 percent of the freshmen attending a four-year residential college reported spending 26 or more hours per week preparing for classes. The majority (63%) said that they spend 15 or fewer hours on class preparation. Class preparation was defined as “studying, reading, writing, rehearsing, and other activities related to your academic program” (Young, 2002, p. A35). The 2005 Administration of Your First College Year (YFCY) National Aggregates at UCLA polled over 400,000 first-year freshmen from over 700 higher educational institutions. Over 38,000 students responded. The findings indicated that, although the majority had a normal 12-hour class load, nearly 70% of the students spent less than 10 hours a week studying (Hurtado et al., 2007). This indicates a large deficit from the recommended time allotment.

General Effects of Homework

K-12 studies. While experts agree little correlation exists between homework and success at the elementary level (Brown Center Report 2003; Sharp, Keys, & Benefield, 2001), most acknowledge that the purpose of homework at this age is the development of discipline in completing a task. This discipline is viewed as important because later
academic material becomes more advanced and homework is regarded as a necessary tool for success.

Betts (1997) discovered that the amount of mathematics homework assigned positively affects mathematical achievement for virtually all students. Additional homework is potentially cost-effective, since it is the homework assigned, rather than the amount graded, which has the larger influence on achievement. Sousa and Skandera (2003) noted that of 50 studies they reviewed, 86% found that students who did homework on a regular basis were more successful in the classroom and on tests. Cooper (1989) also compiled a listing of several studies that suggested a correlation between homework and success in the classroom.

Post-secondary studies. As was previously established by Betts (1997), homework plays an integral part in mathematical success, yet little research has been conducted on the effectiveness of homework at the post-secondary level. When focus on homework is directed toward undergraduate freshman mathematics classes, the field of study becomes even sparser.

In 1981, Godia conducted a comparison study of freshman remedial classes. His study employed two approaches to teaching: (1) small group instruction with access to a calculator during study sessions and an on-line grading capability (called ISS), and (2) large group instruction that only used error analysis techniques. The first group consisted of 227 students that were enrolled in eight classes containing from 25 to 35 students. The second group was formed after pre-testing was used to identify in which areas students needed remediation. This approach allowed the teacher to focus only on these needs instead of covering the entire contents of the course. There were 94 students in this
section. The study compared the two groups in three areas: achievement, attitude change towards mathematics, and attrition rate of knowledge of material. Godia found that the achievement rate on daily assignments within the small group was significantly higher ($r = 2.16, p \leq .05$) than those in the large group instruction. However, those same students engaged in the small group instruction did not have a significantly lower attrition rate (final passing score) than those in the large group instruction. This difference could be interpreted to indicate a strong case towards the use of calculators on homework and computer assisted grading techniques, but the study did not explore the use of calculators on quizzes and tests. Neither did the study allow students to use the computer to do daily assignments. The ISS was used strictly for retrieval of grades and multiple-choice questions on tests. Finally, this program was only based on remedial students and not students that were receiving credit towards graduation.

Revak (1997) observed that the majority of “students placed into precalculus and algebra courses have not yet mastered the fundamentals of algebra. Many of these students have learned algebra as a set of rules. As such, homework problems in algebra courses usually consist of a set of problems related to the most recent problem type” (Introduction, ¶ 1). Calling this type of homework, “massed practice,” she considered it problematic because students do not learn to differentiate between problem types. Her subjects consisted of 351 US Air Force Academy cadets in their first year of college divided into two groups. Both groups had identical course topics, textbook, handouts, reading assignments, and tests, only differing in their assignment arrangement. The control group was assigned daily homework related to the material covered that day in class or massed practice assignments. The treatment group was assigned homework that
combined practice on current material and reinforcement of previously covered material. This was called "distributed practice homework" in the study. Revak's results showed that the distributed practice homework bolstered the success rate of lower achieving pre-calculus mathematics students. Revak asserts a strong correlation existed between doing distributed practice homework and success at upper-level classes like calculus (Revak, 1997). Revak did acknowledge that the study does not represent the general population of precalculus students, particularly at-risk students. Also, there was no mention of use of calculators and or computers to aid in the instruction of the student.

In the Department of Mathematics at Western Kentucky University, some intervention has been initiated to promote success of freshman classes. In the fall of 1997, the College Algebra course was modified to include an extended version, which meets twice as often as a regular Tuesday/Thursday College Algebra class. The first semester consisted of three such classes taught by members of the Mathematics department (Linda Pulsinelli, personal communication, November 2, 2006). These classes were populated by students who were deemed "at risk" based on their ACT/SAT math scores, high school mathematics preparation, and scores made on an internal Mathematics Placement Exam (MPE) taken before registering for a class. In an honors thesis documenting the success of these three initial classes, Baker (1997) found that the extended version of College Algebra allowed "at risk" students to perform with a similar success rate to the typical College Algebra student in spite of initially having lower basic algebra competency. She found no significant difference in the performance levels between these classes. Recommendations of this thesis indicated that future studies should include topics such as methods of homework procedures.
In the spring of 2004, Harris (2004) conducted a semester long action research project that compared two more traditional methods of homework assessment and their effect on a student’s success in the classroom. Both methods required students to use pencil and paper methods to complete daily assignments. Graphing calculators were used to enhance lecture and were allowed on all graded materials. The more rigid method required a teaching assistant to monitor daily attempts to complete the homework assignment. Furthermore, each week all the assignments would be collected and random questions throughout the collection would be checked for accuracy. In the second, less rigid method, each week only one assignment was selected randomly and checked for accuracy. The evaluation of the effectiveness of these two methods was measured through in-class surveys and final grades. The results of this study revealed that while the daily monitoring did show success in promoting students to continue doing homework throughout the semester, there was no significant difference between the two classes in the overall averages. The class with the less rigid approach tended to have a slightly higher test average. Limitations of this study included the small number of subjects and the absence of any form of computer-assisted learning. From this study, a new form of assessment was developed that allowed for more attention to daily attempts towards completion of daily assignments. To promote continued participation, the recording of students’ attempts was incorporated into the grading of a single random selection from the weekly assignments. This addition was to enhance diligence while trying to maintain the higher test average that was previously reported.

Effects of Technology-Enhanced Homework

The previous studies showed the effectiveness of doing homework when aided by various motivational techniques. Emphasis was placed on various teaching methods.
These studies involved very little use of computer assisted learning tools. However, the world has been radically changed by the accessibility of the personal computer. For example, Gilder (2002) reported that in 1990 that there were over 50 million personal computers in the United States and Battles (1997) reported that 23% of American households owned a personal computer in 1993. Furthermore, businesses of every kind have made substantial investments in computers and software (Precis, 2006). Yet, in 1994, UCLA Higher Education Institute found that roughly only 16% of the undergraduate classes in four-year public institutions contained any form of computer-assisted learning (Burke, 1994).

This deficit changed as the needs of higher education changed. As the new millennium has progressed, more and more students have begun seeking higher education degrees. Suddenly, universities have begun dealing with issues of increased costs; exponential growth, and low pass rates. Unfortunately, State or Federal funding has not adequately covered this increase in enrollment. In fact, Guskin (1994) states, “Higher education is becoming the fourth or fifth funding priority behind K-12, health care, welfare, and prisons” (p. 1). To hold down costs, more and more universities have invested in technological measures to aid instruction and improve course management (Lang, 2004). With increased use of Computer Assisted Instruction (CAI) and/or Course Management Systems (CMS) came claims of advances in increased retention of educational knowledge. However there is little empirical research that supports these significant changes in retention (Morgan, 2003; Dutton, Dutton, & Perry, 2002; Klass and Crothers, 2000).
Morgan (2003) surveyed over 700 faculty members in the University of Wisconsin system. Over 80% of the participants stated that they used computer management systems to enhance the classroom setting. While instructors had mixed impressions on the use of computers in the classroom, several stated that students discourage the use of computers. When asked to respond, the students cited lack of technology skills as the main reason for their reluctance to use the technology. Morgan concluded that CMS were unable to document accurately the amount and degree of campus technology usage and that information gathered about such systems represented more of a collection of thoughts and comments than empirical data.

Another investigation conducted by Dutton, Dutton, and Perry (2002) allowed individual students in computer programming to choose whether they would take an on-line course or attend a traditional class setting. Upon completion of the course, the grades for students that opted for on-line learning were slightly, but not significantly, higher than the grades of those students who attended the traditional course. At the beginning of the study, a concern was noted about the advanced maturity level and computer skills of the on-line student and some guards were included to monitor this flaw. These included surveys asking the extent of computer skills and the workload of each group. Also noted was the amount of contact with instructors outside of class. The results remained inconclusive. However, there was one significant difference: students who were diligent in completing homework did significantly better on final course grades no matter which type of class they took.

A third study, conducted by Crothers and Klass (2000), involved 120 students of an American Government and Politics class. Students were given either written multiple-
choice quizzes or on-line quizzes of the same format. The results showed no significant
difference in the final grades between the two groups with most recording scores in lower
“80’s.” When polled, however, 70% of the students that used the on-line quizzes felt that
they were helpful.

While these studies show no considerable effects of technology on learning, some
reviewed 59 independent evaluations of classes that employed “computer based college
teaching.” The results of this study showed that using computers showed significant
improvement in college students’ attitudes, motivation, and performance. In addition,
Agarwal and Day (1998) conducted a study of the impact of classes that had CAI. Four
classes, comprised of two undergraduate and two graduate classes of microeconomics,
were observed for two semesters. The results showed that using web-based
communication, such as e-mail, strengthened communicational ties between students,
their classmates, and the instructors. More importantly, there was significant increase in
learning with those students using the computer.

Over the years, few empirically based studies that document the benefits of CAI
courses have been conducted. However, the College Algebra classes of Western
Kentucky University, some of which are part of the present study, have adopted a text
that can be enhanced by MathXL®, a CAI/CBM system. Since no published studies
could be found exclusively about MathXL®, this report includes three studies that used
MyMathLab (MML), a CAI/CBM program that is powered by MathXL®. Two of these
studies focused on the portion of MML that operates homework and quizzes (Trigsted,
2004; Evans, 2005), while one study looked at a new delivery system called R2R (Rouse,
2005). In these studies, students were deemed successful if they completed the course with a final grade of A, B, or C.

Trigsted (2004) placed traditional College Algebra students into a modified classroom setting. First, students were required to attend one focus group each week that provided guidance for success on upcoming material. This session did not teach material, but rather gave suggestions on how to interpret material presented on the MyMathLab site. Secondly, students were to spend a minimum of 150 minutes in the Polya Center (Math Lab) each week working on homework. Students were then given the choice to complete weekly homework assignments based on problems from the textbook or from a MyMathLab assignment. All materials were available on-line. The overall success rate of those who finished the course was 77%. Students who opted to work from a text were 64.7% successful and those opting to do homework on MML were 78% successful. The author did not report whether this difference in success rates was significant.

Evans (2005) looked at the effects of using the MyMathLab program on remedial Intermediate Algebra students in two different classes. Although the course itself followed the traditional lecture approach and both classes took quizzes on MML and attended mandatory one-on-one weekly lab sessions, one class used a text to do homework while the other did all homework using MML. The students were to work on homework assignments during these lab sessions using their assigned method. The final success rate of the textbook students was 52.3% and the MML students had a success rate of 92.3%. Again, the author did not report whether this difference in success rates was significant.
Both the above studies report that students using MML showed substantial improvement. However, in contrast to Trigsted’s students, who were traditional students fundamentally capable of handling the College Algebra material, Evans’ students were remedial students. Furthermore, Trigsted’s students were not taught in a traditional lecture setting, whereas Evans’ students were required to attend a weekly tutoring session. On the other hand, neither study included the option for students to use of MML/ MathXL® without a mandatory lab session. Nor do these studies focus on the success rate using MML/ MathXL® on the population of students that fall between these two levels who are learning the same material as the traditional College Algebra student.

Rouse (2005) researched the progress of 2506 students enrolled in College Algebra. These students could choose one of three learning options: 1) a traditional classroom setting; 2) a lecture delivery method in a large classroom setting with homework done on MyMathLab; or, 3) one hour a week in the traditional classroom setting with a minimum of 3 flexible hours a week to be spent in a learning lab using MyMathLab. This last method was called R2R. The last two options employed the use of homework, quizzes, and tests administered on the computer. Final success rates showed that the traditional setting yielded a 64% success rate, the large classroom setting had a 76% success rate, and the R2R class setting had a 73% success rate.

Although those classes that implemented the MML technology on graded material appeared to be more successful, key elements ensuring the comparability of the three groups were missing. There was no mention of whether the written and online versions of the tests were similar. Neither did the study mention how much formal instruction R2R
students received. An additional limitation of the study was that it focused on the traditional algebra student and did not concern itself with at risk students.

Purpose of Study

Since the fall of 1997, the Mathematics Department at Western Kentucky University has been dedicated to finding ways to promote success of at-risk students in the Extended College Algebra course. While this intervention has allowed the at-risk student to perform as well as the traditional student, informal studies have been conducted at Western Kentucky University to attempt to enhance the retention rate of the material presented in class by this population of student. One approach involved an action research project that focused on an alternative to traditional homework assessment methods. The other project recorded results of a modular approach that was performed at the Glasgow campus of Western Kentucky University. The modular approach, while successful, required the availability of a computer testing lab for re-testing that was accessible during evening hours and weekends.

In the spring semester of 2007, three instructors of Western Kentucky University at Glasgow conducted a modular approach to teaching all of their College Algebra classes. These students went to class twice a week and were assigned homework using Math XL®. Two of the three instructors also used Math XL® to administer quizzes. All exams were given using Math XL®. Students that were not successful on their first exam attempt were given the opportunity to re-take proctored on-line exams after remediation had taken place. No student was allowed to proceed with the next exam until the previous modules (exams) were successfully completed. Of the 81 students that continued taking the course, 95.9% successfully completed the course. (Britt, Fitzpatrick,
& Wells, 2007). This result showed remarkable success in the modular approach, using MathXL® as a supplement. However, several universities have the physical limitations of not having a testing center, including the main campus at Western Kentucky University. Thus, students at these universities are restricted to taking an exam only once.

The main campus of Western Kentucky University does not presently have access to a testing center in which to employ the modular approach previously discussed. However, many instructors are willing to embrace portions of the MathXL® program to enhance learning and increase retention. This program accompanies our adopted textbook for the College Algebra course. The Pearson Education Company has sent out two reports, 2005 and 2007, which boast the success rates of students using their program MyMathLab. These reports highlight the before mentioned studies on remedial and traditional college classes. Pearson also asserts that more than 1600 universities use some version of MathXL® (Speckler, 2007). The focus of this study centers on the “at-risk student” and whether the same success rates adhere to this homogeneous population.

Research Questions and Hypotheses

This study sought to investigate the following questions regarding College Algebra:

1. Will “at-risk” students completing homework using Math XL® show greater persistence in doing homework over a semester than those students completing more traditional (i.e., paper and pencil, textbook) homework?

2. Will “at risk” students completing homework using Math XL® perform better on tests than those students completing more traditional homework?
3. Will “at-risk” students who persist in completing homework using Math XL® achieve higher final grades than those students who persist in completing more traditional homework?

The following hypotheses were entertained:

1. “At-risk” College Algebra students completing homework using Math XL® will show greater persistence in doing homework over a semester than those students completing more traditional homework.

2. “At-risk” College Algebra students completing homework using Math XL® will perform better on tests than those students completing more traditional homework.

3. “At-risk” College Algebra students who persist in completing homework using Math XL® will receive higher final grades than those students who persist in completing more traditional homework.

Significance of Study

Since the creation of this course in 1997, instructors involved with the Extended College Algebra course at Western Kentucky University have sought ways to improve retention and success rate of these at-risk students. By exploring different means of relaying information and assessing students’ understanding of this course, more adjustments can be made to refine the course. As Zeilik (2002) asserted in his primer on assessment, “Assessment is a mechanism for providing instructors with data for improving their teaching methods and for guiding and motivating students to be actively involved in their own learning. As such, assessment provides important feedback to both
instructors and students." By looking at two methods of assessing daily work, refinements may be made to improve instruction.

**Definition of Terms**

As with any specialized study, there exists terminology that is standard to the subject matter. For clarity and understanding, the following definitions will pertain to the terms found throughout the study:

For the purposes of this study, **at risk students** are students with at least one of the following characteristics:

- A Math ACT score below 18 & a Mathematics Placement Test above 13
- A Mathematics Placement Test below 14 & a Math ACT score above 21
- Successfully passing (grade of “C” or better) a remedial Algebra course
- Repeating a College Algebra to replace a non-successful grade or a withdrawal.
- Needing additional guidance in College Algebra

**Computer Aided Instruction** (CAI) is “Instruction delivered with the assistance of a computer. The student interacts with the computer and proceeds at his or her own speed. CAI software is commonly classified into these categories: drill-and-practice; tutorial; simulation; educational games; problem solving; applications” (Oregon Network for Education, 2008).

**MathXL®** “is a powerful online homework, tutorial, and assessment system that accompanies Addison-Wesley textbooks in mathematics and statistics” (Bittinger, Beecher, Ellenbogen, & Penna, 2006, p. xvii).

**MyMathLab** (MML) is “a series of text-specific, easily customizable online courses for Addison-Wesley textbooks in mathematics and statistics. MyMathLab is
powered by CourseCompass™—Pearson Education’s online teaching and learning environment—and by MathXL® (Bittinger, Beecher, Ellenbogen, & Penna, 2006, pg. xvii).
Method

This project focused on whether using MathXL® would increase Math 116E students’ persistence in working on homework assignments throughout the semester. The project also investigated their level of test performance and overall success in the course. To answer these questions, several forms of data were collected including a record of the number of assignments students completed over the semester, student test scores, and final course averages. To provide supplementary information about student persistence and performance over the semester, periodic post-test surveys measuring student perceptions regarding their performance in the course were administered and one-on-one interviews with randomly selected students were conducted. This study was approved by the Western Kentucky University’s Human Subjects Review Board on October 23, 2007. (Appendix C).

Participants

In order to enroll in the Math 116 College Algebra Extended class at Western Kentucky University, students must have met the criteria described on page 19. Once these prerequisites were met, students chose any Math 116E instructor by using an online registration program. The participants in this study consisted of a subset of the 96 students enrolled in four Math 116 College Algebra Extended classes during the 2007 fall term. The same instructor taught all of the classes that were part of this study. Eighty-seven (90.6%) of the students enrolled in these classes opted to participate in the study. However, any student that had previously taken this class, withdrawn, or stopped attending the course was not included in this study. This resulted in a final sample of 70 students. The final selection of students participating in the study ranged in ages
between 18 to 39. The sample consisted of 31% females, 13% students from underrepresented groups, and 3% international students. Four students were considered to be non-traditional. Group 1 (n = 37), comprised of students in two classes, one held in the morning and one held in the afternoon, employed the use of Math XL®. Group 2 (n = 33), comprised of the other two classes, also held in morning and afternoon settings, used the more traditional approach of having homework problems assigned from the text. The table below also displays the demographic characteristics of the two groups. Because previous math performance was considered the major potential confound of this study, t-test analyses were conducted to investigate any significant differences in the ACT or MPE scores of the two groups (see Tables 1 and 2). Both t-tests revealed no significant differences.

Table 1

*Act Group Statistics*

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<th>Mean</th>
<th>SD</th>
<th>SEM</th>
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<td>3.047</td>
<td>.523</td>
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<tr>
<td>Textbook</td>
<td>33</td>
<td>20.06</td>
<td>3.564</td>
<td>.530</td>
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Note: Three students did not have a recorded ACT score at the time of this study.

Table 2

*MPE Group Statistics*

<table>
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<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>MathXL®</td>
<td>34</td>
<td>12.79</td>
<td>2.952</td>
<td>.508</td>
</tr>
<tr>
<td>Textbook</td>
<td>32</td>
<td>12.19</td>
<td>3.605</td>
<td>.637</td>
</tr>
</tbody>
</table>

Note: Four students did not have a recorded MPE score at the time of this study.
Procedure

In both groups, students were assigned an average of 15 homework problems per night. These questions were selected so they were very similar in the phrasing of the directions and the skills being requested. Students were encouraged to ask questions about the assignments at the beginning of each class. Students were allowed to use graphing calculators on any graded material and were given periodic written exams. The two groups differed only in the method of assigning and grading homework.

The homework technique followed a more traditional approach. Students obtain credit for attempting to complete an assignment while a random generator was used to select a homework assignment to be graded for accuracy once every six-day period. The entire class was required to turn in the assignment corresponding to the number selected. This process was conscripted because the randomness was meant to prompt students to complete every assignment. One noted flaw in this method was the possibility that students may procrastinate and complete most of the weekly assignments the night before the collection date. A strategy of checking for completeness (not accuracy) three days after each assignment was used to help regulate the probability of procrastination. The amount of completion was recorded as a participation grade. The notion of being checked for attempts periodically was used to bolster students’ habit to complete the assignments outside the classroom, although at times being checked for attempts was inconvenient due to the increase of projects in other classes. Since only one homework assignment was assigned for accuracy on a weekly basis, students still had the opportunity to seek help outside the classroom setting on any assignment before the scheduled due date. While doing assignments daily was the most desirable plan from this instructor’s perspective,
the ability to complete and understand the assignments as time constraints allowed was also viewed as a desirable result.

The method for the other group implemented on-line assignments using MathXL®. Students were assigned the same number of similar problems as the traditional class on any given night. Since MathXL® assessed answers submitted instantaneously and provided the user multiple attempts on any question, students were also be given a three-day grace period to complete an assignment. At that time, the student was no longer able to gain access to the assignment to make corrections.

In addition to assessing homework, post-test surveys were administered after each unit test beginning with the third test. The reason for the delay was to be sure that students using MathXL® were comfortable with the technology and to help compensate for any potential initial prejudices against MathXL® from students who had no previous exposure to this type of learning tool. This was to prevent the reaction that Morgan (2003) noted in his study. These surveys were divided into three areas of interest: personal achievement, thoughts about the test, and overall feelings about the class (See Appendix A). A dominant theme throughout all three areas was the idea of working on, understanding, and reviewing homework. The questions relating specifically to homework were evaluated in the findings.

Two one-on-one interviews also took place with four randomly selected students in every class, although several chosen participants preferred to opt out of the interview for various reasons. These interviews were used to monitor and explain any potential anomalies in the results of the study. The first interview occurred around midterm and the last was conducted two weeks before final exams. The topic of all three interviews
focused on the importance of doing homework (See Appendix B). The discussion began by asking students if they felt that doing homework was helpful throughout the semester. Another topic of exploration noted if students recognized a connection between “doing homework” and being “academically successful.” Finally, the question was posed to students to see if any student could make a distinction between “the task of completing homework” and “understanding the topics under review in the homework.” All responses were written down immediately and proofed by the interviewee to insure accuracy in answers.

Measures

To measure persistence, students were monitored to see how much of the work was being accomplished during the 3-day work period. In the traditional class, this was recorded as a tally. Math XL® had a function that permitted the instructor access to all assignments. This allowed for the recording of continued progress.

To measure test performance, chapter exam grades were also recorded. This course had five chapter exams. As the material presented in this course employed the use of building on previously learned material, it was assumed that success on each subsequent exam indicated retention of previously taught material covered on earlier exams.

The overall measure of success was judged by the final grade for the course. In both groups, a combination of grades on homework, quizzes, chapter exams, and a comprehensive final exam was used to determine the final average.
Data Analysis

Several standard statistical procedures, including descriptive statistics, student $t$ tests, and repeated measures were used to investigate potential group differences in persistence (homework completion), test performance, and overall course grades. In order to provide insight for any differences between homework methods, results on the post-test surveys or interviews were analyzed.
Results

In order to draw conclusions to the questions under investigation, analyses were run on the participation rate of each homework method, test scores, midterm and final grades were noted, and an in-depth investigation was taken on the three post-test surveys. As noted in the discussion section of this paper, the number of returned surveys of eligible participants was sparse. However, analyzing these evaluations as they relate to homework shows each class's attitude towards homework. The responses of the questions relating to the study were tallied according to the method of homework used. Insights from students given on the survey or during interviews were also included. Perceptions of the results complete the investigation of each topic.

To answer the first research hypothesis, "At-risk" College Algebra students completing homework using Math XL® will show greater persistence in doing homework over a semester than those students completing more traditional homework, I calculated the completion rate of each student based on the number of assignments completed divided by the number of assignments possible. A look at the completion rate of both methods reported in Table 3 suggests that students participating in the traditional method of assigning problems from the book had a higher percentage of completion at mid-term and continued to be slightly higher at the end of the course.
Table 3

Completion Rates At Midterm and At End of Semester

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of students</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math XL®</td>
<td>37</td>
<td>74.62</td>
<td>9.689</td>
<td>1.593</td>
</tr>
<tr>
<td>Textbook</td>
<td>33</td>
<td>91.38</td>
<td>10.501</td>
<td>1.828</td>
</tr>
<tr>
<td>End of Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math XL®</td>
<td>37</td>
<td>78.42</td>
<td>24.352</td>
<td>4.003</td>
</tr>
<tr>
<td>Textbook</td>
<td>33</td>
<td>83.02</td>
<td>13.608</td>
<td>2.369</td>
</tr>
</tbody>
</table>

To test whether these apparent group differences in completion rate were significant, the Student's $t$ test was calculated on both midterm and end of semester results. Analysis revealed significant differences in midterm completion rate, $t(68) = -6.95$, $p = .000$, but not for end of semester completion rate, $t(57.67) = -.99$, $p = .327$ (equal variances not assumed).

To investigate the next hypothesis in the study, “At-risk” College Algebra students completing homework using Math XL® will perform better on tests than those students completing more traditional homework, an average of test scores for each student was calculated. Table 4 reveals that the overall testing average of those doing homework on Math XL® was slightly higher than those using the traditional method.
Table 4

Test Averages

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of students</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math XL®</td>
<td>37</td>
<td>71.56</td>
<td>11.582</td>
<td>1.904</td>
</tr>
<tr>
<td>Textbook</td>
<td>33</td>
<td>68.75</td>
<td>15.491</td>
<td>2.697</td>
</tr>
</tbody>
</table>

To test whether this apparent group difference was significant, the Student’s $t$ test was again calculated and revealed no significant difference, $t(68) = .87$, $p = .39$.

The final hypothesis, At-risk” College Algebra students who persist in completing homework using Math XL® will receive higher final grades than those students who persist in completing more traditional homework., deals with the overall success of students in this course when using Math XL® instead of the traditional method. As the descriptive statistics presented in Table 5 would suggest, the Student’s $t$ test analysis revealed no significant difference, $t(68) = .08$, $p = .94$.

Table 5

Final Averages

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of students</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math XL®</td>
<td>37</td>
<td>70.61</td>
<td>13.440</td>
<td>2.210</td>
</tr>
<tr>
<td>Textbook</td>
<td>33</td>
<td>70.87</td>
<td>13.657</td>
<td>2.377</td>
</tr>
</tbody>
</table>
Discussion

When looking at the first hypothesis regarding the persistence level of the completion of homework throughout the semester, it appears that those individuals in the more traditional homework setting maintained a slightly higher completion rate. This may be understood by looking at the human factor of someone physically checking for participation. This is an example of "Operant Learning" which Huitt (2001) defines its "primary factor is consequences: the application of reinforcers provides incentives to increase behavior". In the MathXL® classes, one student noted that a feeling of anonymity while working on the computer contributed to a lack of enthusiasm as the semester proceeded. In fact, many students mentioned on post-test surveys that as the semester progressed they became discouraged at the rigidity of entering answers into the MathXL® program. This preciseness may have caused some students to complete fewer homework assignments. However, regardless of homework method, the amount of participation, as measured by homework completion, deteriorated as the semester progressed.

As described earlier, post-test evaluations were administered (see Appendix A) and one-on-one interviews (see Appendix B) were conducted after each unit test beginning with the third test. The return rate on the evaluations was very limited. Initially, sixty-five percent of qualified Math XL® students and 61% of those students in the traditional setting returned their evaluations. This number steadily declined until only 27% of the Math XL® students and 30% of those students in the traditional setting returned their evaluations by the last test. Since there was no means of requiring participation many students did not feel compelled to return the evaluations. The one-on-one interviews also had a low response. Only 15% of randomly selected participants kept
their appointment. However, those that did participate helped provide me better understanding on the student’s attitudes regarding homework. Evaluations and interviews results related to the first question on persistence and/or success in doing homework are described below.

For the first evaluation question, how often do you ask questions in class, it appears that the traditional class asked questions more frequently. Sixty-eight percent of these students reported that they asked questions at least a portion of the time, by responding with either “Frequently” or “Sometimes,” as compared to 44% of those using Math XL®. Since Math XL® has a built in tutorial as well as instantaneously assessing their progress, the lack of questions in the early part of the semester was not a concern. However, the Math XL® class improved in asking questions as the course progressed with 80% of the students reporting that they asked questions during the lecture material that covered the last test. This matched the percentage of students using the textbook asking questions during the same period.

Regarding the second evaluation question, how often do you complete the homework assignment, 89% traditional method and 93% Math XL® answered either “Frequently” or “Sometimes.” It appears that both classes completed their assignments most of the time. Fewer students reported completing the homework in the traditional class. This was surprising because it was observed by both the instructor and the teacher assistants that there was a tendency in the MathXL® classes to begin the homework the evening it was due, which created a lapse in time between the lecture and actual practice of the material. Features that MathXL® offers such as the immediate feedback and additional homework help may be encouraging this delay. As one student commented in
the traditional class, pencil and paper homework can become mundane as the semester progressed.

For the third question, how often do you understand the homework material, it appears that more students completing MathXL homework (93% responding with either “Frequently” or “Sometimes”) felt that they understood the homework than those students completing the more traditional homework (84%). The students using Math XL® had the option of asking for a step-by-step example on how to solve a problem, then given another opportunity to solve a similar problem. The more traditional class had the option of emailing me; however, two obstacles hindered this approach: One, most students did not take advantage of this choice; and, two, when they did email, my response was not instantaneous.

When checking for accuracy in the traditional classes, it was observed that the same errors were being made by several students in the traditional classes, possibly indicating this additional pressure may have encouraged students to copy answers from each other without striving to understand the procedure. The purpose of class was not the completion of each assignment but the understanding of the material presented. Doing some of the problems on homework and getting additional exposure when difficult homework problems are explained the next day in class may be more advantageous than just making sure students complete each assignment.

Some of the answers given during the one-on-one interviews suggest that at least some students understood the importance of the distinction between just doing the homework and comprehending and understanding the material covered in the homework:

“Yes, you must understand the information to do well in the class. Plus homework
is not only graded on completion (sic), it is also graded on correctness.”

“Yes, you need to know how to apply the work.”

“If you only want to complete the assignment you won’t be as concerned about getting the answers right. There is more to just getting the answers right as well, you have to commit to learning the material.”

“Yes… a person can finish their homework and still lack complete understanding. For example, a student who has to look at their notes for each problem and never seems to cut the reliance and is therefore, unable to perform well on the exams because they never understood enough to independently do their homework.”

For the fourth question, on average, how many hours per week do you spend working on homework (since the last test), most students reported spending between 5 and 7 hours a week doing homework. These numbers seem to coincide with the 2001 National Survey of Student Engagement and the 2005 Administration of YFCY National Aggregates at UCLA studies. Within this time frame, 52% were those students using Math XL® as compared to 43% using the textbook. These numbers seem comparable with the 2001 National Survey of Student Engagement studies. Only 12% of the Math XL® students and 11% of those students using the traditional method claimed to spend the 8 to 10 hours recommended by the instructor. The mean of the traditional homework method lessened slightly as semester progressed. The time period before the fourth test fell immediately before Thanksgiving break and many students talked about time-consuming projects in other classes. The more consistent time spent in the MathXL® classes might bear on the fact that the answer must be typed in precisely to be scored correctly. This attention to detail may have required additional time.
To the fifth question, what do you think about the length of the assignments, 91% of students who used MathXL® felt the assignments were fair in length compared to 72% of those in the traditional method classes. Many of the MathXL® questions are broken down so a student is not required to do much paper/pencil work. This may help explain why the traditional students had a higher tendency to think the assignments were too long, when in fact they covered the same material and had the same number of problems.

Although exploring the second question of the investigation as it relates to the retention did not lead to statistically significant results, reviewing groups’ results on each test, as well as post-test evaluation responses, yielded some interesting data. When comparing the individual tests, it appears that the MathXL® classes began improving around the midterm period. Scores on tests 3, 4, and 5 were all higher than the traditional classes. In addition to the test scores, the post-test evaluations indicate that all classes equally noted that test material could be learned if homework was practiced. Additional post-test evaluation questions related to test performance are discussed below.

The evaluation question, how much of the material on the test was discussed in class or in the homework, was considered an important one because many students do not see the connection between the test material and the material discussed in class. The overall reporting showed that 86% of those in the traditional method observed a strong connection by responding “A Lot” as compared to the 79% using Math XL®.

Based on student responses to the question, how much did doing the homework help you on the test, it an analysis of the data indicates that many students do not feel that doing homework is helpful for performing well on tests. When only 39% of Math XL® students and 27% of the students using the text reported favorably with the response “A
Lot,” it appears that most students feel that homework is still “busy work.” Although the
importance of doing homework in order to practice the skills introduced in class was the
intent of the class, it appears this message is not being received by the student.

However, the one-on-one interviews gave a different view, although most gave an
answer that was “expected”:

“Doing homework every night helped me practice for tests.”

“Similar problems show up on quizzes and tests.”

“A person needs to practice to imprint what they learn into their long term
memory.”

The results for the final hypothesis of this investigation regarding the final success
rate of the two samples showed little group difference. As was stated previously, the
averages were less than three tenths of a point apart in total method average. However,
because the MathXL homework approach was the primary focus of this study, one
additional evaluation item related to its helpfulness was included. By responding
favorably, 75% of students returning the survey felt the use of MathXL® was of some
usefulness.

Limitations and Future Research

Several factors have contributed to the limitations of this study. First, this study
was limited to Western Kentucky University students who were first-time students of the
College Algebra Extended course during the fall semester of 2007. Second, the same
instructor taught all the four sections of Math 116E. While attention was taken to be sure
that one traditional and one computer-assisted class was taught in both morning and
afternoon settings, the different times within these settings may have impacted the results.
Third, there were assigned teacher assistants in each class. The duties of the TA included aiding in tutoring, collection of papers, attendance keeping, and grading. One of these students was an international student who had a limited capacity to speak English. The members of this class were not as apt to approach this TA for help. Likewise, in another class, the TA was only able to come to class three days a week. This meant the members of this class did not develop a good rapport with the TA and record the keeping of materials turned in on time was constantly a struggle. Fourth, to ensure anonymity, every student in all classes was assigned a random code to write on the post-test evaluation, but because no master list was given to the instructor or TA, it was extremely difficult to trace down which students had not turned in a survey. As outlined above, the class that had the international and the part-time teacher assistants had unique obstacles and thus the number of surveys returned in those classes was substantially fewer.

Future studies could overcome these limitations by implementing these proposed suggestions. First, this study should be conducted over an extended period of several semesters. The data generated might produce different findings. In addition, several instructors could be included in the study to allow for a more heterogeneous sample of Extended College Algebra classes. In response to the limitations regarding the TAs, overcoming these conditions proves to be challenging. The choice of which TA works with a class is governed by the availability of those students willing to work in this position. Perhaps a select group of TAs could be assigned to those classes under study to minimize the before mentioned complications. Finally, a non-partisan member of the study could be appointed solely to retrieve a large, predetermined, percentage of the
evaluations before the responses were evaluated. This would allow for a more in-depth study to the questions presented without jeopardizing confidentiality issues.

In addition to minimizing the limitations of this study, other topics that could be investigated are listed below.

1. Would assessing the homework through quizzes that repeat select problems found in the assignments be an easier way for the instructor to see if the material was being learned? Or could the majority of the students succeed at the Math 116E without any homework assessment? Does only grading on completion show understanding is being obtained?

2. Would collecting the Post-test Evaluations from the first test cause different results?

3. When the classes were compared looking at times, morning classes did better in overall success rates. Does this pattern hold true no matter what method of assessment is being used?

4. If the classes were set on the quarter system instead of the semester system, would the shorter length of a course invite more students to stay motivated? Would the lack of a break about midterm help retain persistence? Does a quarter system warrant a higher success rate?

Conclusion

Results of this study suggest that using MathXL® as a tool versus the traditional book and paper/pencil method does not lead to significant increases in persistence, as measured by homework completion, test grades, or final course grades. Thus, it seems to support Bouknight’s (1983) assertion about “no one method appears to be more
Technology is not neutral, despite the fact that study after study has concluded that using it in the classroom neither improves nor diminishes instruction for the masses. The truth lies in the fact, often acknowledged but ignored, that students are not alike. Individual differences in learning styles dictate that technology will facilitate learning for some, but will probably inhibit learning for others, while the remainder experience no significant difference. Therefore, when lumping all the students together into a fictional "mass," those who benefit from the technology are balanced by a like number who suffer; when combined with the no-significant-difference majority, the conglomerate yields the widely reported "no significant difference" results.

However, one notable reason to use MathXL® is that educators may find it economical for time management of large classes. Having students' assignments/testing materials instantaneously evaluated could allow for more time for preparation and instruction. As was suggested in the study, the use of MathXL® appears to reduce the amount of time spent answering questions about homework. Whether this is a positive or negative consequence may well be in the hands of the individual instructor.
References


APPENDIX A

Test # _______  Post-test Evaluation  Code: _______

In order to learn effectively, we should reflect on our successes and our mistakes. Using the items below, please take a minute to evaluate yourself at this point in the class. For any item that does not apply to you, choose “NA.”

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>How often do you ask questions in class?</td>
<td>Frequently</td>
<td>Sometimes</td>
<td>Seldom</td>
<td>Never</td>
</tr>
<tr>
<td>2.</td>
<td>How often do you complete the homework assignment?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>None</td>
</tr>
<tr>
<td>3.</td>
<td>How often did you understand the homework material?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>None</td>
</tr>
<tr>
<td>4.</td>
<td>On average, how many hours per week do you spend working on homework? (since last test)</td>
<td>8-10</td>
<td>5-7</td>
<td>2-4</td>
<td>&lt;2</td>
</tr>
<tr>
<td>5.</td>
<td>How much of the material on the test was discussed in class or in the homework?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>Not At All</td>
</tr>
<tr>
<td>6.</td>
<td>How much did doing the homework help you on this test?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>Not At All</td>
</tr>
<tr>
<td>7.</td>
<td>How much did reviewing the quizzes help you on this test?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>Not At All</td>
</tr>
<tr>
<td>8.</td>
<td>How much did the test review(s) prepare you for this test?</td>
<td>A lot</td>
<td>Some</td>
<td>A Little</td>
<td>Not At All</td>
</tr>
<tr>
<td>9.</td>
<td>How difficult was this test?</td>
<td>Very Easy</td>
<td>Somewhat Easy</td>
<td>Somewhat Difficult</td>
<td>Very Difficult</td>
</tr>
<tr>
<td>10.</td>
<td>How difficult is the material covered during lectures?</td>
<td>Very Easy</td>
<td>Somewhat Easy</td>
<td>Somewhat Difficult</td>
<td>Very Difficult</td>
</tr>
<tr>
<td>11.</td>
<td>What do you think about the length of this test?</td>
<td>Too Long</td>
<td>Just About Right</td>
<td>Too Short</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>What do you think about the length of the lectures?</td>
<td>Too Long</td>
<td>Just About Right</td>
<td>Too Short</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>What do you think about the length of the assignments?</td>
<td>Too Long</td>
<td>Just About Right</td>
<td>Too Short</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>The graded material is returned in a prompt manner.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>15.</td>
<td>The instructor is prepared for class.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>16.</td>
<td>The instructor is willing to help in class.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>17.</td>
<td>The instructor is willing to help outside class.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>18.</td>
<td>The Teacher Assistant is willing to help (in or out of class).</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>19.</td>
<td>The Math Lab/Math XL® is helpful.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>20.</td>
<td>The material during lectures helps me understand math.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
</tbody>
</table>

On what areas in this section do you need additional instruction? 
In the future, how will you get additional instruction on the material you don’t understand? 
Include any Additional Comments on the back.
APPENDIX B

INTERVIEW QUESTIONS

The following is a listing of questions asked to random individuals at the midterm and after the final test. These interviews were conducted on a voluntary basis. Responses were written down immediately and proofed by the interviewee to insure accuracy in answers.

One-to-one Response: Please answer the following as honestly as you can.

1) Do you feel that doing homework had any merit?
   Explain:

2) Is there a difference between “doing homework” and being “academically successful”?
   Explain:

3) Is there a difference between “the task of completing homework” and “understanding the topics under review in the homework”?
   Explain:

4) You are given a specific period of time between the time the assignment is given and the due date. Typically when do you START working on an assignment?
   ____ The day it was assigned.
   ____ Midway between assigned date and due date
   ____ The night before the assignment is due.

5) You are given a specific period of time between the time the assignment is given and the due date. Typically when do you FINISH working on an assignment?
   ____ The day it was assigned.
   ____ Midway between assigned date and due date
   ____ The night before the assignment is due.
APPENDIX C

WESTERN KENTUCKY UNIVERSITY
Human Subjects Review Board
Office of Sponsored Programs
301 Potter Hall
270-745-4652; Fax 270-745-4211
E-mail: Sean.Rubino@wku.edu

In future correspondence please refer to HS08-048, October 23, 2007

Twyla Harris
Mathematics
WKU

Dear Twyla:

Your revision to your research project, "The Effects of Two Homework Assessment Schemes on At-Risk Student Performance in College Algebra," was reviewed by the HSRB and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects' welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is required; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data. (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

This project is therefore approved at the Expedited Review Level until May 15, 2008.

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Sponsored Programs at the above address. Please report any changes to this approved protocol to this office. Also, please use the stamped Informed Consent documents that are included with this letter. A Continuing Review protocol will be sent to you in the future to determine the status of the project.

Sincerely,

Sean Rubino, M.P.A.
Compliance Manager
Office of Sponsored Programs
Western Kentucky University

cc: HS file number Harris HS08-048