Supplemental Instruction versus Traditional Remedial classes: Which method should be used by Community Colleges in the classroom?

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Traditional remedial classes involve students attending their remedial math classes and receiving traditional lecture, traditional class work, and traditional assessments. However, in recent years the success rate of those classes and the traditional method of lecture have been questioned, because of the ever growing remediation need and students failing those remedial classes or their first college level math class. So many new methods of instructing remedial classes have been and are now currently being researched. Many Community Colleges are employing the use of Supplemental Instruction (SI) within their classes, where students not only receive many of the tools from traditional method classes, but also receive support through their supplemental instructors. In this proposal, we will investigate whether or not remedial math classes that include supplemental instruction have higher success rates with their students compared to traditional remedial math classes.

Purpose

The purpose of this study is to investigate students’ success rates in remedial math classes with Supplemental Instruction, and compare those success rates to students who attend the traditional remedial classes.

Justification

As educators, we have a moral obligation that what we teach is being learned so that our students can not only pass their classes, but use the tools that they learn and apply them to future classes as well. First, nearly 50% of entering students to community colleges are required to take remedial classes. So the education system has already failed them once. Another issue is most of the students entering these remedial classes are either foreign-born or are from lower socioeconomic backgrounds. The success rates of these students are low. (Cohen, A. M., & Brawer, F. B., 2003) Ethically the educational system
is failing these students. So this research is necessary in order to come to the aid of our students.

*Research Question*

Our research question is the following: Do more students pass their remedial math class and first college level class with Supplemental Instruction than students who attend traditional remedial math classes?

*Definitions*

a. Developmental classes (remedial classes) - tending or intended to rectify or improve; "a remedial reading course"; "remedial education"

b. Supplemental Instruction- The use of tutors, additional instructors, and peer tutors in addition to the students’ regular instructor.

c. Traditional Remedial Instruction- There is many, as Community Colleges decide which developmental programs they are going to use. However, we will compare with the remedial math classes that are taught the same way as a traditional college level math class, in which mainly lecture is used with sometimes graded homework assignments. Of course, quizzes and exams are involved as well.
Review of Literature

Community colleges are concerned about the problem of increased enrollment, which involves the enrollment of more underprepared students. While there is an open door to attending school there are still more students dropping out without receiving their degree or any future skills to aid them in the work force in their future. Community college educators maintain that many entering students are unprepared in terms of poor study habits and not having a clear goal for college and a career, in addition to lacking in basic academic skills (Zeidenberg, Jenkins, & Calcagno, 2007). Another problem is the student to teacher ratio in some situations there is 100:1. This hinders almost all of today’s innovative methods of teaching. Finally, there has been a shift of responsibility of learning. The teacher used to be responsible for their students learning the material, but now it is solely the responsibility of the student to learn the material. So the question is can tutoring alleviate some of the current problems facing students today? A possible hypothesis is that tutoring provides support, motivation, and prepares students during and before taking a class (Vasquez, 2004).

Instructional Methods / Peer Instruction

Supplemental Instruction sessions create a learning community consisting of the instructor, peer leader and students. The peer leader has already successfully completed the course. The peer leaders are trained in proactive learning and study strategies. The result from these sessions is integrating “how to learn” with “what to learn” (Arendale, 1998). The sessions provide structure and they show students how successful students think about and process course content. The peer leader shares the underlying study and
learning strategies that will lead to competency with the content and more importantly transferable academic skills to their subsequent classes (Arendale, 1998).

The key to the success of Supplemental Instruction is that it is not labeled as remedial. Any and all students can take advantage of these sessions. Thus remedial students who use this opportunity to get the additional help that they need are more motivated to persevere and succeed. They are taking ownership in their learning. (Arendale, 1998)

Wright and Lamb ask whether or not Supplemental Instruction is effective or not in remedial math courses. The purpose of their article was to do a case study of students receiving SI and students not receiving SI and compare their success rates, therefore, evaluating the effectiveness of SI. The problem is that SI is a recent educational innovation and “lacks the familiarity of the course-based approach to the developmental classes.” (Wright, Wright, & Lamb, 2002, p. 6) However, the major concern or problem is the extremely low success rates of students passing their remedial math classes. The possible hypothesis could have been: Do more SI students pass the developmental math classes than non-SI students?

Students who attended the group at least three times a week were considered SI students. The students who visited less than three times a week were considered non-SI students. A suitable SI instructor could not be obtained by the authors until after exam two, thus exam one was excluded from the analysis. The study compared all tests between the two groups (except exam one) and the number of students who passed the course.
A passing grade for the course was defined as a C or higher. The second pilot of the program involved the SI tutor more in the classroom as well as motivating students and attending SI meetings to improve SI instruction. After a few more improved pilots, 25 of 174 (14.3%) students enrolled in SI. Eighteen of the 25 (72%) enrolled in SI passed the course with a C or higher, whereas only 59% of nonparticipants passed the course.

The author concluded that there was limited information in the study. Also, it did not compensate for motivation, and the results were mixed. However, most of the results were positive and SI does offer an avenue for reformed teaching of the remedial math classes. The author then points out that additional research is needed to establish the consistency of success rates.

The greatest strength of the study is the evolution of the SI instructor throughout the improved pilots. In our study we will employ random selection of remedial math classes as stated before to improve internal validity. However, the article benefits the research problem because we want to look at the involvement of SI instructors in a new intensive math program and the possible benefits.

In a study by Xu, Hartman, and Uribe (2001) the procedure was that they were only considering freshmen students (graduating less than 12 months ago from high school, only had fewer 24 credits to transfer) who voluntarily attended tutoring sessions. A multiple regression equation was established for the many variables such as: differences in tutoring, teacher office hours, and differences in students’ motivation. The final examination was used as the dependent variable of determining the students understanding of the mathematics course. The independent variable was student attendance of the tutoring sessions.
Researchers concluded that tutoring is helpful in promoting scholarly improvement, but notes that universities want and require proof before establishing a costly program. This study is important to our research discussion because we want to study the success of a math program that involves assigning students to a personal tutor with whom they must have weekly meetings in the developmental math class.

However, many community colleges offer math labs, where students may receive additional aid when needed as a form of additional tutoring. However, the math lab is a peer based tutoring facility where students voluntarily attend the math lab for additional aid. So understanding how students feel about tutoring and the math lab would aid in understanding students perceptions of being tutored. Duranczyk, Goff, and Opitz (2006) used surveys to get students’ perception. The most important result attained was that students who received a grade of B or C in the classroom reported obtaining confidence through the math lab. However, students who received grades of A, D or I (incomplete) reported no improved confidence in the classroom. Students that received an A probably do not need to use the Math lab and so did not, hence they did not receive a benefit from it, while students who received a D or I as a grade probably did not attend the lab enough or there were some other circumstances involved.

It is clear to see that peer tutoring, tutors, and SI all had positive effects on students in developmental classes. These positive effects were achieved through mastery of basic math skills, to the point that students will be able to recall basic facts until it becomes second nature. This expertise is achieved through sustained practice and drills (Siadat, Musial, & Sagher, 2008). So further research should investigate the combination of one or more possible methods of instruction, which is what we propose to do.
Other Strategies to Improve Pass Rates of Remedial Math Students

In order to properly design the study, we need to examine other factors that contribute to whether our hypotheses will be supported with regard to the adoption of Supplemental Instruction at a community college. This section will briefly describe case studies from other community colleges of similar methods of addressing the high failure rates in remedial math classes.

Montgomery County Community College in Alabama found that using real world applications to teach beginning algebra courses motivates students in that they see a greater relevance to the subject. Their just-in-time curriculum approach starts with applied problems and then looks for the right algebraic skills to solve it. Students discover the need for variables, and are thus motivated to solve equations. When combined with multimedia tools, the college saw a significant improvement in student grades and course effectiveness. The greatest benefit gained was improving student attitudes towards math (Hofmann & Hunter, 2003).

Daley College in Chicago conducted experimental research on the use of the Keystone method in randomly selected remedial math courses. The theoretical framework of the Keystone method identifies behaviors which contribute to students’ failing math courses. Among them are the following: short attention span, not completing homework assignments, failure to learn from mistakes, passive attitude, poor attendance, poor study habits and low self-esteem. To address these problems, students must take a short, time-pressured test at the beginning of each lecture. This teaches students to integrate knowledge of the material and to work both fast and accurately.
Frequent testing produces regular and steady study habits and mitigates test anxiety (Siadat, Musial, & Sagher, 2008). The benefits of this method transcend remediation of subject. Students at all ability levels could effectively use these tools and improve their performance and retention significantly. Acquiring basic skills in learning contributes to the acquisition of higher-order learning in math (Siadat, Musial, & Sagher, 2008). Then, higher-order conceptual understanding occurs.

Math Anxiety

Math anxiety is an underlying factor in determining the likelihood of success for a student in a remedial math course. This section will examine articles that studied the impact of math anxiety on student outcomes.

Self-efficacy refers to an individual’s situational specific belief that (s)he can successfully perform a behavior required to produce a given outcome. Assessing math skills through a standardized test such as the SAT increases the role of self-efficacy in explaining performance (Siegel, Galassi, & Ware, 1985). If we want to increase math performance, it is best to start by concentrating on increasing skills. This would increase performance and efficacy expectations and, as a by-product, reduce math anxiety (Siegel, Galassi, & Ware, 1985).

Educators may be better able to predict and control math anxiety levels by using fluency as a measure of academic performance. Cates & Rhymer (2003) examined the relationships between math anxiety and both math fluency and error rate. Math fluency is the second stage of an instructional hierarchy described by Haring and Eaton in 1978.
Fluency is the ability to perform a behavior correctly, quickly and with minimal effort. It is an important variable to measure because of the impact as the student progresses to math problems that require more complex steps to solve. Math anxiety is related to math performance in terms of the level of learning, as opposed to overall accuracy (Cates & Rhymer, 2003). Differences in anxiety levels are related to skill development. Thus, students should be encouraged to develop the ability to respond both accurately and quickly (Cates & Rhymer, 2003).
Methodology

In this proposed study, we wish to investigate which method would benefit Community College students enrolled in developmental math classes, Supplemental Instruction versus Traditional Remedial classes. The research involves an experimental design, where we will compare two major groups—one attending developmental math classes with supplemental instruction (math lab, and assigned mandatory tutors), and the other attending traditional developmental math classes. The methodology section will include the following: research design, participants, instrumentation, procedures, data analysis, threats to internal and external validity, and possible limitations of the study.

Research Design:

The purpose of this study is to discover whether or not developmental math classes taught with supplemental instruction is the preferred method to traditional methods of teaching developmental math classes. The research will be experimental where we will compare the two groups. The independent variable will be the instructional method used to teach the class, while the dependent variable will be whether or not students pass the developmental math class and their first college level math class. The study is expected to last 18 months. We deem this to be enough time for students to finish their developmental class and the next college level math course.

Participants

Cluster Random Sampling is the method of obtaining my sample, where the clusters are community colleges. Again the intended sample is remedial math classes taught at the community college, so randomly selected community colleges will be participating in the research. Again, randomly selected community colleges will be
selected and then developmental classes will be randomly selected for either teaching methods. Students at participating community colleges who have tested into the developmental math classes will be participating in the study. The sample size will be at least 40 intact classes.

Instrumentation

The instrument we plan to use is that community colleges send to the researchers a report stating how many students passed the remedial math class and how many students actually completed the math class. The report will consist of how many graduate remedial students passed their first college level math class out of the number of graduate remedial math students who complete the first college level math class. We can calculate success rates of the community colleges remedial programs and compare which programs are doing better. The grade analysis report will not have any personal identification attached to them.

Procedures

The researchers will present the research proposal to the Institutional Research Board at both the state community college system and the researchers’ home institution-the University of Central Florida several months prior to the desired start of data collection. This research should fall under the Category II or Expedited Review.

Prior to the start of the study, the researchers will meet with the head of the Math department at each of the selected community colleges. The researchers will share with them the details of the research study and determine how to best approach each instructor. Once grades are submitted at the end of the semester, the researchers will
contact all instructors to obtain the grade analysis reports. Then, the reports will be entered into the database. The researchers assume that the sample drawn is heterogeneous and reflects the subpopulation of students that take remedial math courses.

Data Analysis

The data that will be collected are the individual grades from the remedial math sections. Only the final course grade is of interest to the researchers. Frequency polygons for grades from both methods and overall will be created. To calculate the mean and standard deviation for grades, letter grades are converted to numbers based on the grading standards of the college (A=4, B=3, C=2, D=1, F=0). The researchers will examine mean scores of SI versus traditional lecture students. The effect size will be calculated to assess the magnitude of the difference between the means of SI students versus traditional lecture students. For inferential statistics, a t-test for independent means will be done to see if there is a statistically significant difference between the performance of participants and non-participants.

Then, all remedial students from the first semester of the study will have to be tracked until the first semester in which (s)he enrolled in a regular math course. The procedures for contacting the instructors will be replicated in terms of obtaining the final grade analysis report at the end of the semester.

Possible limitations of the study

The most significant threat to internal validity is the subjects, the students themselves. We are specifically referring to the student’s age, gender and ethnicity,
along with the socioeconomic status of their family. Mortality is a concern if there is a statistically significant difference in the percentage of either participants or non-participants who withdraw from the course.

Location threat is defined as the time of day the class is held. With a small sample size, we will not be able to determine conclusively if time of day plays a role in student performance. Some students perform at their peak in the morning, others at night. Not all students can choose to take the course at their optimal performance level.

Teaching ability and experience will differ across the various sections offered. This is a major threat because it impacts the degree of difficulty of exams and quizzes throughout the semester—which produce the final grade. The instructor’s enthusiasm and creativity towards teaching is an implementation threat.

Maturation can be a threat in terms of the adjustment students have to make to the demands of college work, along with the college setting and atmosphere. A comparison group will handle this threat. Because students are in a remedial course, regression threat potentially exists. Using an equivalent comparison group could handle this threat.

Conclusion

By completing our methodological design, and eventually collecting data, we hope to answer the question of whether more students who receive math instruction by the Supplemental Instruction method pass remedial math courses and their first college level math course than students in traditional remedial math courses. We will support our answer through grade reports compiled over multiple semesters.
REFERENCES


