Effects of Tutoring as an Intervention for First-Year Developmental Math Students

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Abstract

Developmental math in colleges and universities throughout the United States have experienced recent conflict and uncertainty. Some institutions are eliminating developmental coursework while others are changing the math placement requirements. Various research studies suggest that developmental math and its related academic support services are beneficial to students and can help them progress through their required coursework to reach degree completion. Opposing research indicates that developmental math courses put additional barriers and stressors on its students such as paying for more classes, taking a course that does not count for college-level credit or toward their GPA, and potential self-confidence strains. Numerous studies demonstrate that when students utilize an academic support service, or engage in help-seeking behaviors, such as tutoring, they may be more likely to increase their self-efficacy and feel more motivated with that content. This research proposal seeks to identify a relationship between first-year college students in developmental math who use free drop-in tutoring and those who do not. The research proposal is interested to see if there is a significant difference in overall final course grade for students who attend free drop-in tutoring at least five times compared to students who do not utilize tutoring. This is a quantitative study that will use a causal-comparison dependent two-tailed t-test to assess data. The population will be first-year students enrolled in developmental math during Fall 2017 at a four-year public institution in the southwest United States. Simple random sampling will select 235 students who attended math drop-in tutoring at least five times and 235 students who did not attend drop-in tutoring. This research proposal will not control for any other variables in the population or sampling besides first-year students enrolled in developmental math who did or did not use tutoring at the campus academic support center.

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Chapter 1: Introduction

Background

According to the U.S. Department of Education, developmental math is the most difficult higher education course to pass (Bonham & Boylan, 2012, p. 14). This is quite concerning data for colleges and universities whose ultimate goal is to retain and graduate students. Bonham & Boylan (2012) referenced the National Center for Education Statistics (NCES) who found that 72% of colleges and universities offered at least one developmental math course. This statistic brings up a conflict in the world of higher education and the lack of preparedness of incoming students. "There are a large number of students who place into developmental courses, particularly mathematics, and are prevented from achieving their educational goals because they never complete these courses" (Bonham & Boylan, 2012, p. 14).

Students who lack the required college-level skills and knowledge may be less likely to succeed and be retained (Li et al., 2013, p. 14). Because of this challenge, institutions implemented developmental education courses as one way to help students progress toward obtaining their degree. At their inception, developmental courses were meant to be a gateway into higher education; however these courses have become an obstacle for many students. Many studies demonstrate that students who pass their developmental coursework do well in college, but an "unacceptable number fail to complete these courses...this is most true in developmental mathematics" (Bonham & Boylan, 2012, p. 18).

College Transition

The transition into college is far from smooth. A "successful" college transition is looked at as one of the specific factors that impacts student persistence, retention, and ultimately graduation. The college transition goes beyond academics, as social and economic factors are critical components as

well. Unfortunately, students who struggle with the transition during their first year are much less likely to persist, especially if those academic, social, or economic challenges occur in their first semester (Stewart, Lim, Kim, 2015, p. 12).

College is filled with unknowns, new opportunities, and learning experiences. One of those new experiences is college coursework, and particularly the difference between math in college compared to high school. For example, the pace of college coursework is much faster -- what previously was learned over the course of an academic year in high school is now covered in 16 weeks or less. College students most likely will not have their math class Monday through Friday, but rather just a couple times per week, and perhaps hybrid or fully online. College expectations can be vastly different as well. There often is not dedicated in class time devoted to working on homework -- students are expected to spend about two to three hours outside of class per every hour they are in class. Exams in college can be few and far between, accounting for a large portion of the overall course grade. Extra credit and makeup work are rarely part of the college vocabulary.

Math anxiety

Students of all ages can experience math anxiety. In an article from *The New York Times*, the author posed a thought-provoking question. "So does being 'bad at math' whatever that is, make you anxious, or does being anxious make you bad at math?" (Klass, 2017). It is possible that both scenarios are true as there is research that suggests both circumstances can happen (Klass, 2017). Symptoms of math anxiety can be physical and psychological (psychological symptoms include lower self-confidence, forgetting content, and negative self-talk; confidence/self-efficacy is discussed later in this research proposal).

Academic Support

Previous research shows that tutoring programs can help students "overcome precollege academic deficiencies and associated disadvantages" (Stewart et al., 2015, p. 12). In addition, some

research also states remedial coursework helps to increase academic performance for students during their first year and can potentially positively impact them in the long-term (Stewart et al., 2015, p. 12). DeFeo, Bonin, and Ossiander-Gobeille (2017) noted that there are specific learned behaviors among college students, whether they are in developmental courses or not. Lower achieving students are more likely to be passive in their learning process and they are less likely to ask for help. This passivity is a learned behavior (DeFeo et al., 2017, p. 15). These factors create a paradox in the academic support world where the students who could benefit the most from support are very likely to be the ones who do not seek out the support (DeFeo et al., 2017, p. 15). This presents a challenging situations for math instructions and academic support centers at colleges and universities -- the students must choose to utilize the support and resources.

Opposition

While some research suggests that college students enrolled in developmental math improved their algebra knowledge needed for future credit-bearing math courses, other research is in opposition to developmental math (Li et al., 2013, p. 14; Martin, Goldwasser, & Harris, 2015, p. 402). There are a few different opposing viewpoints. For instance, some contend that developmental courses do not help increase graduation rates and the courses lead to taxpayers paying for students to learn the same information more than once (Martin et al., 2015, p. 402). Another countering perspective suggests that developmental courses "may actually reduce student success because they have a negative psychological impact on the students who enroll in them due to the stigma attached to such courses" (Martin et al., 2015, p. 402). Despite the conflicting opinions about developmental education, this research proposal looks at the impact of free drop-in tutoring for developmental math students and their final overall course grade.

Statement of the Problem

The debate about developmental education in the United States is ongoing. Many higher education decision-makers see its benefits, while others see the costs. Developmental math can be a barrier for some students in completing their requirements and earning their degree. Numerous research studies assess the effectiveness of academic support such as tutoring for developmental courses. It is important to look at what factors help this population of students and what factors hinder their progression or retention. It is also important to consider intangible factors such as academic self-efficacy, motivation, and math anxiety. There is a need to further investigate how students feel about being placed in/enrolled in developmental math coursework and how those feelings may impact their academic self-efficacy, motivation, and math anxiety. It would also be helpful to further observe how developmental math students' academic self-efficacy and motivation may change depending on their major and the amount of require math they need.

Purpose of the Study

The purpose of the study is to look for a relationship between students with at least five free developmental math drop-in tutoring visits and overall course grades for first-year students in developmental math.

Research Question

Does drop-in math tutoring positively impact first-year students' overall course grade in developmental math?

Hypothesis

There is one alternate and one null hypothesis for this research proposal.

Alternate: First-year students who attend free drop-in math tutoring five or more times earn a significantly higher overall fall semester grade in their developmental math class compared to their peers who do not utilize tutoring.

Null: First-year students who attend free drop-in math tutoring five or more times show no significant overall difference of fall semester grade in their developmental math class compared to their peers who do not utilize tutoring.

Significance of Study

This research proposal is significant for a variety of people as developmental education has a wide reach and impact. First and foremost, this entire research proposal is about the students in developmental math. Keeping in mind what is best for students and what helps students be most successful should be at the forefront of all decisions. There are many additional groups of people whose decisions can impact the students such as higher education decision-makers and stakeholders, taxpayers, and developmental education instructors. The continuing conflict with developmental education has potential impacts on its instructors. First, some institutions are revamping their developmental course content which means these instructors have to put in time and effort to change their curriculum. Second, other institutions are eliminating their developmental education coursework completely, which results in job losses for those staff members (Mangan, 2017). This research proposal is also significant for academic support centers and their peer tutors. Academic support centers and peer tutors need to implement best practices and provide world-class support to the students they serve. Numerous research studies discuss the importance of a positive, welcoming tutoring environment and that is the responsibility of the academic support centers and their peer tutors.

Definitions of Terms

- Academic self-efficacy: A way of thinking about the beliefs students have about their competencies and can be defined as a belief, or confidence, that one can achieve a specific academic goal or attain a particular outcome on a specific academic task (Drago et al., 2016, p. 435)
- Academic support center: Centralized, on-campus hub available to all students at a four-year public university in the southwest United States; the center provides a variety of academic services, including free drop-in math tutoring
- ALEKS: Computer software, specifically related to beginning algebra/developmental math in this research proposal. The ALEKS program

  > "...uses artificial intelligence (AI) to map the details of each student's knowledge. ALEKS "knows," at each moment, with respect to each individual topic, whether each individual student has mastered that topic. If not, ALEKS knows whether the student is ready to learn the topic at that moment. ALEKS uses this knowledge to make learning more efficient and effective by continuously offering the student a selection of only the topics she is ready to learn right now. This builds student confidence and learning momentum" (McGraw-Hill Education, 2018).

- College-bearing (math) course: A university-level course in which students earn credit that counts towards their Grade Point Average (GPA) and graduation requirements; may also be referred to as a college-level course
- Developmental education: Pre-college level coursework, most often in writing, reading, and math; students do not earn college credit and the grade towards GPA (can also be referred to as remedial education or remediation).

- Developmental math: Pre-college level math (similar to beginning algebra), students do not earn college credit and the grade does not count towards GPA (can also be referred to as remedial math)
- Drop-in tutoring: A free service available to all students for particular courses; no appointment is needed, students can show up at any point during the specified hours
- Math anxiety: negative affective reaction to situations involving numbers, math, and mathematics calculations; reactions be physical or psychological (Ashcraft & Moore, 2009)
- Motivation: "Activation to action. Level of motivation is reflected in choice of courses of action, and in the intensity and persistence of effort" (Bandura, 1994)
- Tutoring visit: A student attending the academic support center and logging in with front desk staff; length of visit is irrelevant
- TutorTrac: Web-based application with ability to schedule appointments, log visits, record student contacts, "track activity of specific populations of students, to identify usage and support needs" (Redrock Software Corporation, n.d.).

Abbreviations

ALEKS: Assessment and LEarning in Knowledge Spaces

CRLA: College Reading & Learning Association

GPA: Grade point average

SID: Student identification number

Assumptions

There are only a couple assumptions with this research proposal. First, the researcher assumes that the grades students earn in ALEKS are correct and fair. The researcher assumes that the software and algorithms used within ALEKS are accurate. Second, the researcher assumes that the tutor visit data pulled from TutorTrac is accurate. TutorTrac is discussed more as a limitation in the following section.

Limitations

There are several limitations that the researcher identified with this proposal. First, the researcher only has access to data from one particular public four-year university in the southwest United States. This data is not public, so the researcher needed specific access to software programs such as TutorTrac and ALEKS. Only certain staff have these privileges and access as it directly relates to/helps with supporting students. Additionally, this study will not control for any other factors besides the students' enrollment in developmental math and whether or not students attended free drop-in tutoring or not. Demographics and other student data such as age, major, first-generation status, financial aid eligibility, or ethnicity will not be collected. The study will also not know if students are receiving tutoring from another resource outside of the specific on campus academic support center. The study plans to only look at data for students with five or more drop-in math tutoring visits to the on campus academic support center. This will exclude students who had between one and four visits. Additionally, because the student visit tracking program, TutorTrac, relies on manual data entry and cleanup, it is always subject to errors. Missing visits may include 1) students who forgot to check in with the front desk staff at the beginning of their visit or 2) students who checked in with the front desk staff but were never logged into the system due to an error on the desk staff. The majority of TutorTrac discrepancies are due to human error. These errors can be corrected, as long as a trained staff member

is diligent with the data cleanup. Lastly, the researcher has six years of experience working with first-year college students who place in developmental math.

Delimitations

There are a few delimitations that were under the researcher's control. The researcher chose to look at a particular public four-year university in the southwest United States. Because of this, the findings may not be generalizable to other institutions or students in developmental coursework. In addition, the researcher also chose the specific semester in which to do the causal-comparison study and also chose the type of sampling method (simple random) to obtain the most representative sample from the population as possible.

Summary

Chapter 1 provided the background, statement of the problem, purpose of the study, research questions, hypothesis, significance of the study, definitions of terms, assumptions, limitations, and delimitations. The research proposal seeks to identify a relationship between first-year students who attend free drop-in tutoring for developmental math at least five times in the semester and their overall course grade in developmental math. The alternate hypothesis is that first-year students who attend free drop-in math tutoring five or more times earn a significantly higher overall fall semester grade in their developmental math class compared to their peers who do not utilize tutoring. The null hypothesis is **f**irst-year students who attend free drop-in math tutoring five or more times show no significant overall difference of fall semester grade in their developmental math class compared to their peers who do not utilize tutoring.

The research proposal is significant for many populations involved, such as developmental education instructors, academic support centers, peer tutors, and ultimately the students. Lastly, the

research proposal has a few limitations such as not controlling for any factors besides student enrollment in developmental math during Fall 2017 and attending five or more free drop-in tutoring visits. Chapter 2 will explain relevant theories and research about tutoring, developmental math, academic self-efficacy and motivation. Chapter 3 will outline the methodology and data collection and analysis procedures.

Chapter 2: Review of the Literature

Historical Background

The lack of preparedness for college-level coursework and the percentage of students who enroll in developmental coursework is a trend observed across the United States. A 2012 study noted that about 34% of high school graduates are not prepared for college-level work and over 40% of high school graduates are underprepared for community college (Bissell, 2012, p. 49). This prevalence of underprepared students entering college presents a few challenges. Students who enroll in developmental coursework do not receive college credit for these courses, may still need to take a least one more course to "catch up", and many experience financial implications (Bissell, 2012, p. 49). In the past 10+ years, institutions have started to improve their services and resources for students in developmental coursework. One of the ways institutions have improved resources for students in developmental coursework is through the use of tutoring services. Colleges are seeing more students placing into developmental math and are under more pressure to help those students progress "efficiently and effectively" through their requirements and as such, "tutoring services play an instrumental role in student learning and success" (DeFeo, Bonin, and Ossiander-Gobeille, 2017, p. 14).

Theory Relevant to Research Questions/Hypotheses

According to Albert Bandura, self-efficacy is an individual's beliefs about "capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994). Broadly, the theory of self-efficacy is an individual's belief in their abilities to accomplish a task or goal. Self-efficacy is fluid. As individuals continue to develop and move through different stages of their lives, self-efficacy is expressed in different ways, in school, with peers, through adolescence, into adulthood, and so on (Bandura, 1994). The concept of self-efficacy can be applied to academia as well because self-efficacy permeates all aspects of a person's life such as how they feel, think, and behave (Bandura, 1994). Self-efficacy is particularly applicable to developmental math students as previous research findings indicate that self-efficacy is "among the most significant predictors of mathematics achievement" (Spence & Usher, 2007, p. 268). Someone with high self-efficacy tends to be more likely to take on a challenge or attempt something new than another person with lower self-efficacy. As such, self-efficacy also impacts motivation (Bandura, 1994). The theory behind motivation is very similar to self-efficacy. When motivation is high, self-efficacy is also high, and in turn, math anxiety is low.

Ashcraft & Moore (2009) noted in their research that students who experience math anxiety are more likely to "avoid elective math coursework, avoid college majors that require math, and avoid career paths that involve math" (p. 204). Some research also suggests that students who experience math anxiety may learn less during their math class compared to students who do not experience math anxiety (Ashcraft & Moore, 2009, p. 204). Math anxiety can prohibit an individual's short-term memory from correctly recalling information, which can potentially result in lower scores (Ashcraft & Moore, 2009, p. 203). Some research indicates there is no relationship between self-efficacy, motivation, and math anxiety while others indicate an inverse relationship. For instance, low self-efficacy can translate into high math anxiety (Jameson & Fusco, 2014).

Current Empirical Literature Relevant to Research Questions/Hypotheses

Numerous research studies have looked at the effectiveness of tutoring on academic performance, GPA, and persistence or retention. Tutoring, especially peer tutoring, falls under the umbrella of academic support. A myriad of research findings strongly suggest that academic support positively impacts student performance compared to students who do not utilize these services (Grillo & Leist, 2013, p. 391). More specifically, drop-in peer tutoring is the most popular math tutoring model (DeFeo, Bonin, & Ossiander-Gobeille, 2017, p. 15). Previous research has already evaluated many variables that play into the academic success of college students in developmental coursework. Through earlier studies and their findings, DeFeo et al. (2017) stated "Tutoring is effective for developmental students' learning, academic success, and longitudinal retention and graduation".

This literature review summarizes numerous studies and research about developmental math in higher education. Three overarching themes were identified amongst the literature and are discussed in the following order: academic self-efficacy/confidence, motivation, and math anxiety. Even though these themes are discussed separately in this literature review, they should be thought of as closely woven together.

<u>Academic self-efficacy/confidence</u>

Bonham & Boylan (2012) discussed the relationship between students' attitude and their achievement in developmental math. In addition to looking at attitude, their research also indicated that factors such as low self-efficacy, math confidence, test anxiety, and math anxiety "can become barriers to students' success" (Bonham & Boylan, 2012, p. 16). As such, these factors can negatively affect their math learning and performance (Bonham & Boylan, 2012, p. 16). Previous research suggested that developmental math students working together in small groups can help increase math confidence, in particular for underrepresented populations (Bonham & Boylan, 2012, p. 16). DeFeo, Bonin, and Ossiander-Gobeille (2017) summarized earlier research and found "students with strong self-

efficacy are more likely to use help-seeking strategies effectively, and those with low self-efficacy avoid asking for help" (p. 15). Choosing to attend tutoring is an example of a help-seeking strategy. It is understandable that students who feel more confident with the content may be more likely to demonstrate a help-seeking behavior such as attending drop-in tutoring.

Tutoring can be beneficial for students in college-bearing coursework as well. Drago, Rheinheimer, & Detweiler (2016) conducted a study about locus of control, academic self-efficacy, and academic performance and their potential relationship with tutoring. Part of their results suggest that tutoring was "a significant predictor for GPA" and observed an increase in students' GPA (Drago et al., 2016, p. 447). For their population of students at a mid-size northeastern public university in the United States, tutoring was "an effective strategy for improving academic performance and can level the playing field even for students who exhibit characteristics of less academically prepared learners" (Drago et al., 2016, p. 448). It should be noted that academic support such as tutoring does not exist solely for students who may be struggling. Tutoring is a resource available to anyone in the course, no matter how they are feeling about the content. In addition, Grillo & Leist (2013) found that students who utilized academic support services such as peer-tutoring increased their self-efficacy and confidence which is "necessary for college success" (p. 402). Peer tutoring can be beneficial for students in college-bearing coursework as well as students in developmental coursework. Self-efficacy and confidence are important characteristics of successful students.

Motivation

Several research studies acknowledge that students' course behavior is an important component to their success in that class. Not surprisingly, research indicates that course behavior, entering skill level, and student motivation/effort are all important factors in developmental math success. Li et al. (2013) suggested that a student's likelihood to be successful in a course in which they placed depends on "both entering skill levels and student motivation or effort". While much research

about developmental math is about community college students, motivation is needed at four-year universities as well. Li et al. (2013) posited that students who put in more effort in their math course are expected to receive higher grades and success rates compared to students who put in less effort. One can infer that choosing to attend drop-in tutoring may indicate that a student is expending more effort outside of class time than a student who does not choose to attend tutoring. Research also indicated that "a student's willingness to do the work is essential for learning and course success" and is just as important as mastery the content (Li et al., 2013, p. 20). Results of their research propose that making developmental math courses more accessible (incorporating relevant information at applicable times) can help increase "students' sense of mastery, which...is related to increased motivation and engagement" (Li et al., 2013, p. 20). Understandably if a student feels like they can master a certain math topic, that will help them feel more motivated to continue working. In addition, prior research suggests that students who are intrinsically motivated, or have intrinsic learning goals, may be more likely to utilize the tutoring services to help them gain an understanding of the process, than simply be focused on a particular outcome. Students who have performance or ability goals, for instance getting an A on an exam, may be more likely to avoid seeking help (DeFeo, Bonin, Ossiander-Gobeille, 2017, p. 15).

Math anxiety

Zakaria & Nordin (2007) assessed anxiety and motivation in students at the end of their second semester in college. Through specific scales and tests, they found that students with high math anxiety had lower achievement and that math anxiety significantly affected motivation (Zakaria & Nordin, 2007). Overall, the study concludes that math anxiety impacts students and their performance in the class (Zakaria & Nordin, 2007).

Chapter 3: Methodology

Introduction

The following section details the research variables, research methodology, research design, population and sample, instrumentation, data collection procedures, and data analysis procedures. Rationale and explanation will be provided. The alternate hypothesis is first-year students who attend free drop-in math tutoring five or more times earn a significantly higher overall fall semester grade in their developmental math class compared to their peers who do not utilize tutoring. The null hypothesis is first-year students who attend free drop-in math tutoring five or more times show no significant overall difference of fall semester grade in their developmental math class compared to their peers who do not utilize tutoring.

Research Variables

There is one independent variable and one dependent variable in this research proposal:

Independent variable: Visiting free math drop-in tutoring at least five times in Fall 2017.

Dependent variable: Final overall course grade (as a percentage) in developmental math in Fall 2017.

The measurement scale for the dependent variable is ratio, because there is a true zero point. The dependent variable is overall final course grade, written as a percentage. While not common, It is possible that a student's final overall course grade can be 0%.

Research Methodology

This is a quantitative study with a causal-comparison between first-year students who attended (five or more) free drop-in developmental math tutoring, students who did not attend tutoring, and

their overall course grade (written as a percentage) in developmental math during Fall 2017. Qualitative or mixed methods were not used because this study tests a specific hypothesis, there is no contact/communication with participants of the sample or population, and no visual or narrative data will be collected. Participant data will not include their name, however their student identification number is needed to match students who attended tutoring with their overall course grade and students who did not attend tutoring with their overall course grade. Even though the student identification number will be utilized, the researcher or reader will not be able to decipher any other information about the student. This is a causal-comparison study because the research seeks to identify cause and effect relationships among groups. For this study, the cause is students choosing to attend drop-in math tutoring and the potential effect is a significant difference in their overall course grade compared to students who did not attend tutoring.

When developmental math students choose to visit the specific academic support center mentioned in this study, they will work with peer tutors. The academic support center has guidelines, qualifications, and job requirements for all their peer tutors. See Appendix A for information about the peer tutor application from the academic support center website. Additionally, as part of training provided by the academic support center, all peer tutors are certified by the College Reading Learning Association (CRLA). See Appendix B for CRLA tutor certification requirements.

A paired two-tailed T-test will assess if there is a significant difference in overall course grades for students who visited free drop-in tutoring at least five times and students who did not attend drop-in tutoring. The researcher will use the T-test calculator found here: http://www.socscistatistics.com/tests/studentttest/Default2.aspx

Research Design

This is a quantitative research study using causal-comparison with a paired two-tailed T-test. A causal-comparison study is most appropriate for this proposal because the researcher wants to observe any potential significant difference between established groups with two different treatments (Gay, Mills, Airasian, 2012, p. 228). In this instance, the "treatment" is five or more visits to free drop-in tutoring during Fall 2017 and no visits to free drop-in math tutoring during Fall 2017. Causal-comparison is also necessary because it means the researcher has no control over the two treatment groups. The researcher is not deciding who attends tutoring and who does not. The two groups are already established based on students' choices and the researcher will gather the data after the fact (after the semester is over). Finally, in a causal-comparison study the researcher seeks to find a cause-effect relationship between the two identified groups, without manipulating participants in either group (Gay, Mills, Airasian, 2012, p. 229).

A paired two-tailed T-test is best for this type of study for a few reasons. A t-test is most appropriate because it looks to see if there is a significant difference between two groups of scores. In this case, the two groups of scores will be 1) students with at least five drop-in math tutoring visits and 2) students with no drop-in math tutoring visits. The t-test in both groups will include students' final overall course grade in their developmental math class. The t-test will be paired because every data point in the sample needs to be matched, or related, by student. Lastly, this will be a two-tailed test because the significant difference could be positive or negative.

Population and Sample

The population includes first-year college students enrolled in developmental math during Fall 2017 at a major public four-year university in the southwest United States. This cohort is approximately 600 students. The population of students in developmental math is determined by an online math

placement exam that all students must complete prior to their new student orientation the summer before the fall semester. The developmental math class that these students place into is about equivalent to intermediate algebra and is usually about two semesters behind where students need to be for their major requirements.

Simple random sampling will be implemented. This type of sampling is best for this study because the selection process is out of the researcher's control and all members in a specific population have a equal and independent chance of being selected (Gay, Mills, Airasian, 2012, p. 131). Simple random sampling also provides the most representative sample from the defined population compared to other sampling methods (Gay, Mills, Airasian, 2012, p. 131). It is also important to note that any differences that occur in the sample size are only due to chance and not because of researcher bias (Gay, Mills, Airasian, 2012, p. 131). The sample size will be 235 students who visited free drop-in math tutoring at least five times (Group 1) and 235 students who did not have any visits to the tutoring center for math (Group 2).

Instrumentation

This research proposal will utilize ALEKS, TutorTrac, and Microsoft Excel to help in data collection procedures and analysis. The researcher in this proposal previously had access to ALEKS. However, if another researcher does not have access to ALEKS, they will need to contact a developmental math staff member to request this access and create a username and password. In addition, the researcher in this proposal already had access and a profile set up for TutorTrac. To gain access, the researcher needed to work with the academic support center's director and administrative associate to set up a profile and be granted the appropriate provisions. Microsoft Excel is just used as a way to sort and filter data in a clean and organized way.

Data Collection Procedures

The following data collection procedures will be performed:

- Using ALEKS, the researcher will access final overall course grades for all students enrolled in developmental math in Fall 2017. See Appendix C.
- After the researcher has the list of all first-year students in developmental math and their final course grades, they will save that data in an Excel spreadsheet.
- Next, the researcher will need to pull data from TutorTrac to see who utilized the free drop-in math tutoring at least five times.
- Using the SIDs from Excel, the researcher can input them into TutorTrac and run a "Visits Export" report to show how many visits each student had.
- From the Visits Export list, the researcher will copy and paste the data into Excel and use the v-lookup function to match the final overall course grade list of SIDs to the list of SIDs for students who had at least five drop-in tutoring visits.

This list can and should be anonymous because the researcher will not have access to student names. The researcher will need access to student identification numbers to pair tutoring visit information from TutorTrac with final overall course grade percentage from ALEKS.

Data Analysis Procedures

After the researcher collects all necessary data (final overall course grades matched with students who attended tutoring at least five times and those who did not), the data is ready for the paired two-tailed t-test calculator. Through simple random sampling, 235 students who attended free drop-in tutoring and 235 who did not attend free drop-in tutoring will be selected. The two groups of data will be entered into the paired two-tailed t-test calculator from the Social Science Statistics

website. This website refers to paired tests as dependent, so the researcher will need to be aware of the wording in order to select the correct calculator. The researcher will also want to indicate a 0.05 significance level before using the online calculator to produce the final statistics.

Summary

Chapter 3 explained the independent and dependent variables in the research proposal, established why causal-comparison and a two-paired t-test are the most appropriate methodologies, detailed the population and sample size, and described the data collection and analysis procedures.

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Appendix A: Peer Tutoring Application

Requirements:

- Tutors must maintain a 3.0 or higher cumulative G.P.A.
- Have an A or B in the course(s) they wish to tutor
- Must be a sophomore in semester of hire. You can apply as a freshman the semester prior to being a sophomore.
-

Applications will be reviewed only upon receipt of all the following materials:

☐ Current unofficial transcript, including transfer transcripts

☐ One letter of recommendation from an instructor in the area you wish to tutor (on letterhead or from the writer's official university email account)

☐ Essay response to the prompt(s) on the back of the application

Position description: Tutors are trained in methods to guide students towards independent learning. Training topics include guided questioning, learning preferences, content specific tutoring skills and more. Leadership opportunities and pay raises are available with each level of training completed.

Please note: There is mandatory, paid new tutor training during the week prior to the beginning of the semester of hire. Tutors are expected to commit to ongoing, paid tutor training throughout the semester.

Name: _____ _____ _____ SID: _____
Last First M. I.

Address: _____ _____
Street City, State, Zip

Phone Number: _____ UA email: _____

Major: _____ Minor: _____

Cumulative G.P.A.: _____ Anticipated Graduation Date: _____

Current Class Standing: ◯ Freshman ◯ Sophomore ◯ Junior ◯ Senior

Have you received CRLA certification? ◯ Yes ◯ No If so, what level? _____

Are you eligible for Federal Work Study? (not required) ◯ Yes ◯ No

Approximate number of hours you would like to work weekly (8 hours min. required): _____

Below are subjects/areas we generally hire for. Please select those you are interested in tutoring.

☐ Writing Center	☐ Chemistry 151	☐ Phys. 141 (calc. based)	☐ MIS 111
☐ Algebra	☐ Chemistry 152	☐ ASTR 170B1/203	Other _____
☐ Calculus 1	☐ Organic Chem. 241/3 A	☐ Accounting 200	_____
☐ Calculus 2	☐ Organic Chem. 241/3 B	☐ Accounting 210	_____
☐ Math 263 Stats	☐ Phys. 102 (algebra based)	☐ Econ 150	_____
	☐ Phys. 103 (algebra based)	☐ Econ 200	

Appendix B: CRLA Certification Requirements

ITTPC Certification Requirements

I. REQUIREMENTS FOR CERTIFICATION - LEVEL I

A. AMOUNT/DURATION OF TUTOR TRAINING:

Minimum of 10 hours of training as one or both of the following options

1. A quarter or semester or annual tutor training course
2. A quarter or semester or annual tutor training (non-course work)

B. TRAINING FORMATS

1. Minimum of 6 hours of the training must be must be **Tutor-trainer supervised, Interactive, Live, and Real-time** and can take one or more of the following forms
    a. Workshop instruction or seminar session
    b. Face-to-face or online discussions
    c. Multi-User Virtual Environment (MUVE, like Second Life)

2. The training time remaining can also use the following
    a. Videotapes, DVDs, and/or websites
    b. Conferences with tutor trainer or supervisor
    c. Webquests, podcasts, webcasts, wikis, blogs
    d. Texts, handouts, scavenger hunts
    e. Special tutor projects
    f. Other

C. AREAS/TOPICS TO BE COVERED IN TUTOR TRAINING

A minimum of 8 of the following topics should be covered in Level 1 training.

1. Definition of tutoring and tutor responsibilities
2. Basic tutoring guidelines (do's and don'ts)
3. Techniques for successfully beginning and ending a tutor session
4. Adult learners, learning theory, and/or learning styles
5. Assertiveness and/or handling difficult students
6. Role modeling
7. Setting goals and/or planning
8. Communication skills
9. Active listening and paraphrasing
10. Referral skills
11. Study skills
12. Critical thinking skills
13. Compliance with the ethics and philosophy of the tutor program, sexual harassment, and/or plagiarism
14. Modeling problem solving
15. Other (please specify)

D. REQUIRED TUTORING EXPERIENCE: 25 hours of actual tutoring

E. TUTOR SELECTION CRITERIA

1. Interview plus written approval of a content and/or skill instructor AND/OR Interview plus endorsement of tutor trainer and/or supervisor PLUS at least one of the following:
2. Grade of "A" or "B" in subject content being tutored
3. Documented experience equivalent to grade of "A" or "B" in subject content being tutored

F. TUTOR EVALUATION CRITERIA

1. A formal and/or informal evaluation process is in place
2. Formal and/or informal evaluation occurs on a regular basis
3. The results of the evaluation process are made known to the tutors

II. REQUIREMENTS FOR ADVANCED CERTIFICATION - LEVEL 2

NOTE: TUTOR MUST HAVE COMPLETED LEVEL 1 CERTIFICATION REQUIREMENTS.

A. AMOUNT/DURATION OF TUTOR TRAINING:

Minimum of ten hours of tutor training as one or both of the following options

1. A quarter or semester or annual tutor training course
2. A quarter or semester or annual tutor training (non-course work)

B. TRAINING FORMATS

1. Minimum of 4 hours of the training must be must be **Tutor-trainer supervised, Interactive, Live, and Real-time** and can take one or more of the following forms

a. Workshop instruction and/or seminar session
b. Face-to-face or online discussions
c. Multi-User Virtual Environment (MUVE, like Second Life)

2. The training time remaining can also use the following

a. Videotapes, DVDs, and/or websites
b. Conferences with tutor trainer and/or supervisor
c. Webquests, podcasts, webcasts, wikis, and/or blogs
d. Texts, handouts, scavenger hunts
e. Special tutor projects
f. Other

C. AREAS/TOPICS TO BE COVERED IN TUTOR TRAINING

In addition to reviewing the topics covered in Level ,1 a minimum of 4 of the following topics should be covered in Level 2 training. The exact amount of time devoted to each topic may vary.

1. Review of Level 1 topics
2. Use of probing questions
3. Brain Dominance Learning
4. Cultural awareness, inter-cultural communications, diversity, and/or special needs students
5. Identifying and using resources
6. Tutoring in specific skill and/or subject areas
7. Assessing or changing study behaviors
8. Other (please specify) or substitution of one topic from Level 1 (not used before) or from Level 3 (include justification/need for substitution)*

D. REQUIRED TUTORING EXPERIENCE: 25 additional hours of actual tutoring **after** completion of all Level 1 requirements (a minimum of 50 cumulative hours of actual tutoring)

E. TUTOR SELECTION CRITERIA Met at Level 1

F. TUTOR EVALUATION CRITERIA Met at Level 1

* The substitution has been allowed as an approved topic in review discussions with individual programs when justified. Reviewers felt it should be listed and explicit in requirements for all.

III. REQUIREMENTS FOR MASTER CERTIFICATION - LEVEL 3

NOTE: TUTOR MUST HAVE COMPLETED LEVEL 1 AND 2 CERTIFICATION REQUIREMENTS.

A. AMOUNT/DURATION OF TUTOR TRAINING:

Minimum of 10 hours of tutor training as one or both of the following options:

1. A quarter or semester or annual tutor training course
2. A quarter or semester or annual tutor training (non-course work)

B. TRAINING FORMATS

1. Minimum of 2 hours of the training must be must be **Tutor-trainer supervised, Interactive, Live, and Real-time** and can take one or more of the following forms

a. Workshop instruction and/or seminar session
b. Face-to-face or online discussions
c. Multi-User Virtual Environment (MUVE, like Second Life)

2. The training time remaining can also use the following

a. Videotapes, DVDs, and/or websites
b. Conferences with tutor trainer and/or supervisor
c. Webquests, podcasts, webcasts, wikis, and/or blogs
d. Texts, handouts, and/or scavenger hunts
e. Special tutor projects
f. Other

C. AREAS/TOPICS TO BE COVERED IN TUTOR TRAINING

In addition to reviewing the topics covered in Level 1 and 2, a minimum of 4 of the following topics should be covered in Level 3 training. The exact amount of time devoted to each topic may vary.

1. Review of Level 1 and Level 2 topics
2. Self-regulated learning, brain learning, and/or memory
3. How to tutor/deal with target populations
4. The role of learning centers in higher education
5. Structuring the learning experience
6. Training and supervising other tutors (supervisory skills)
7. Group management skills (group interaction and group dynamics)
8. Other (please specify) or substitution of one topic from Level 1 or Level 2 (not used before--include justification/need for substitution)*

D. REQUIRED TUTORING EXPERIENCE: 25 additional hours of actual tutoring **after** completion of all Level 1 and Level 2 requirements (a minimum of 75 cumulative hours of actual tutoring)

E. TUTOR SELECTION CRITERIA Met at Level 1

F. TUTOR EVALUATION CRITERIA Met at Level 1

* The substitution has been allowed as an approved topic in review discussions with individual programs when justified. Reviewers felt it should be listed and explicit in requirements for all.

Note: Changes to this page were made to clarify the ITTPC requirements, not to change the requirements. 9/17/2011 RAS

Appendix C: ALEKS Example

View student overall final course grade as a percentage.