

EFFECT OF DISTANCE LEARNING ON UNDERGRADUATE STUDENTS' "IT" SELF- EFFICACY AND ANXIETY LEVELS

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Abstract

This study investigated the effect of Distance Learning on undergraduate students' instructional technology self-efficacy levels, instructional technology anxiety levels and their statistical anxiety levels. A Pre/Posttest/Quasi Experimental research design was used to collect data from 10 face-to-face (control group) and 11 hybrid undergraduate students (experimental group) in two statistics courses in a mid-Atlantic Historical Black University (HBCU). Modes of measurement consisted of the CSU- IT Self-Efficacy Scale, CSU-IT Anxiety Scale and the Statistical Anxiety Rating Scale. Quantitative data were coded numerically, and analyzed using non-parametric Mann Whitney and Wilcoxon Signed Ranks Tests. Qualitative semi-structured interviews were conducted with five randomly selected undergraduate participants (experimental group) to determine their perspectives on the merit of implementing Distance Learning. Results revealed that there was a statistically significant difference in undergraduate students' instructional technology self-efficacy levels, and although approaching significance, there was not a statistically significant difference in undergraduate students' statistical anxiety levels subsequent to the Distance Learning intervention program between the experimental and control groups. In addition, there was not a statistically significant difference in undergraduate students' instructional technology anxiety levels between the experimental and control groups at posttest. Recommendations for future research and implications for educators and students are provided.

Key Words: Pupil, Internet, Lecture Capture, Course Management, Teaching

Introduction

The term anxiety has come to mean for many a state of feeling nervous, a lack of and sense of empowerment and feelings of helplessness. The causes of this disposition may vary for different individuals. There is a wealth of data to suggest that in the domain of education, anxiety is often experienced by students around performance related activities. Researchers and educators alike are concerned about this issue because test anxiety is associated with inhibiting students from performing at their optimal level (Onyeizugbo, 2010). In a recent study based on factor analyses, Bonaccio and Reeve (2010) reported results of three broad areas that college students perceived anxiety around: (a) student's perceptions of the test, (b) their self-perceptions and (c) perceptions of the test-taking situation. Other variables examined to help identify the causes of test anxiety have included personal knowledge and belief as defined by achievement goals and perceived academic competence (Putwain, Woods, & Symes, 2010). Math anxiety among college students has been the primary area of research in higher education. At the secondary level, where students were less willing to share their emotions about test taking anxiety around math, remains unresolved. At the college level, students are required to demonstrate basic math proficiency. Entry level college math test usually indicate that a large percentage of incoming students are not proficient. The climate and culture of a college setting often provides a safe haven for students to explore and acknowledge their anxiety about math. In a 2004 study, Wood described math anxiety in the following way: "*feelings of tension and anxiety that interfere*

with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations." Her work further suggested that negative attitudes about math and low-self esteem among students are factors that must be addressed by educators.

Test anxiety in the traditional academic setting still remains a challenge to educators. Students are often provided with resources such as workshops on study skills, time management, and content specific tutoring as a means to help alleviate the anxiety. The advent of technology has introduced another variable that must be taken into consideration: technology of online and/or Distance Education. While some of today's students are considered *Millennium Generation*, the technology they interface with on a day-to-day basis, is primarily for social networking purposes (i.e., blogs, tweets, facebook, ning, and texting). Technology used in the academic arena serves a different purpose and does not always resemble the *Millennium Generation's* personal technology. As a result, technology anxiety may be experienced by students. The students from *Millennium Generation* are not the only ones attending college. In light of the economic downturn experienced by many Americans in the last few years, individuals who believed they were done with higher education, found themselves going back to school in order to re-tool for the 21st century job market. While these two groups of students may be distinct, they are both faced with the challenges of adapting to technology use in higher education. According to Saade and Kira (2007) phobia around computers (technology) was self-reported to range from 25% to 50%. As course work becomes more reliant on computer use, Saade and Kira's work clearly state that

anxiety will become “critical” when taking online courses. Interestingly, these rates seem high given the influx of technology in everyday life.

The role of self-efficacy must be examined in relation to math anxiety and technology anxiety. Work on Bandura’s 1986 concept of self-efficacy, the feeling of adequacy, efficiency, and competence in coping in life has garnered widespread respect in the field of social science. Williams and Coomb’s (1996) factor analyses on Bandura’s MSPSE revealed the existence of efficacy in three areas: (a) social efficacy, (b) academic efficacy and (c) self-regulatory. Academic efficacy is of particular importance given that research findings suggest that one’s self-efficacy beliefs have an impact on GPA (Voung, Brown-Welty & Tracz, 2010).

We conducted a study to accentuate the significance of a Distance Learning intervention on undergraduate students' instructional technology self-efficacy levels, instructional technology anxiety levels and their statistical anxiety levels. Thus, this study addressed the following research question: What effect does a Distance Learning intervention have on undergraduate students' instructional technology self-efficacy levels, instructional technology anxiety levels and their statistical anxiety levels?

Method

Participants

Twenty ($n = 21$) undergraduate students in a required behavioral and social sciences statistics course as part of the psychology bachelors program from a regional HBCU participated in the study. We conveniently (non-random sample) selected 10 face-to-

face (control group), and 11 hybrid/online undergraduate students (experimental group) from two intact statistics classes during the Fall 2010 semester. Their ages, socioeconomic status and gender were diverse. Although a larger number of statistics students were originally identified (12 from the experimental group and 14 from the control group), due to course withdraws resulting from personal (i.e. death or illness in family) to student transfers (i.e. registered for more credits than their advisor approved), the total sample size was reduced to 21. Our HBCU is an residential liberal arts fully accredited mid-Atlantic university, comprised of approximately 4,000 undergraduate and graduate students, offers academic programs in teacher education, nursing, arts and sciences and graduate studies and continuing education. As a result of participating in the study, the students earned an additional two bonus points to their final course grade.

Intervention

Undergraduate students in the experimental group participated in the hybrid/online Distance Learning intervention which lasted 15 weeks/1 semester. This included a face-to-face once- a-week class session and the implementation of Blackboard (Course Management System) and Tegrity (Lecture Capture System) as essential course Distance Learning components. The online component included Blackboard syllabus posting, Blackboard weekly announcements, Blackboard quizzes designed to cover course material and pre-recorded Tegrity modules covering pertinent material.

Blackboard is a course management system (CMS) that enables faculty to create a website for a class. It includes tools such as a grade book, discussion board, and online tests; a faculty member can customize the class site with the course syllabus, reading materials, and assessments. Online classes make extensive use of Blackboard course tools, yet even traditional face-to-face classes can benefit from the online course site. Students can always access course materials in Blackboard, even if they lose their printed copy of the syllabus or class handouts (Blackboard, 2011).

Tegrity is a lecture capture system that allows a faculty member to easily record audio and video, including the computer screen, so that students can review the lecture later. The Tegrity software works in tandem with Blackboard, so that the recorded lecture becomes parts of the course materials that students can access easily through Blackboard. To get started with Tegrity, a faculty member just needs a microphone; the Tegrity software will take care of recording the computer screen and attaching the instructor's audio (Tegrity, 2010).

Materials

Statistical Anxiety. We used the Statistical Anxiety Rating Scale to measure the students' statistical anxiety (Cruise and Wilkens, 1980). Utilizing a 5-point Likert scale, factor analysis among the instrument's 51 items reveals six factors: Worth of Statistics, Interpretation Anxiety, Test and Class Anxiety, Computation Self-Concept, Fear of Asking for Help and Fear of Statistics Teachers. Latest data reveal a concurrent validity of .76 and a test-retest reliability ranging from .671 to .833.

Instructional Technology Self-Efficacy. We used the CSU Instructional Technology Self-Efficacy Scale to measure the students' instructional technology self-efficacy levels (Brittan-Powell, 2009). The scale examines how confident one is about using instructional technology during the learning process. In particular, the scale has 10 statements using a 4-point Likert scale. Our study reported Cronbach Alpha coefficients to be .529.

Instructional Technology Anxiety. We used the CSU Instructional Technology Anxiety Scale to measure the students' instructional technology anxiety levels (Brittan-Powell, 2009). The scale indicates how comfortable one is learning about new computer technology(ies). Like the CSU ITSE Scale, participants respond to 20 statements using a 4-point Likert scale. Our study reported Cronbach Alpha coefficients to be .941.

Procedure

We were first granted permission to conduct this study from our Department's Chair and (Department of Applied Psychology and Rehabilitation Counseling). Next, we obtained permission to conduct our study from the Dean of the School of Professional Studies. Subsequently, confirmation from the University's Committee on research with Human Subjects was secured. We later sent an informed consent form to the undergraduate students indicating the purposes of the study. According to the informed consent form, undergraduate students participating in the Distance Learning intervention would utilize technology as part of their statistics course thereby assisting them to improve their performance and reducing potential anxiety levels. Those

undergraduate students willing to participate in this study were asked to respond by signing and dating the appropriate lines on the informed consent form. At the beginning of the course, the students were provided an orientation to the nuances/intricacies of successfully integrating Blackboard and Tegrity.

The CSU Instructional Technology Self-Efficacy Scale, the CSU Instructional Technology Anxiety Scale and the Statistical Anxiety Rating Scale were completed by the experimental and control groups prior and subsequent to the 15 week Distance Learning Intervention. We hand scored the instruments, data were coded numerically using the SPSS 17.0 database, and reported in aggregate form in order to preserve the participants' confidentiality.

Five randomly selected undergraduate students who took the statistics course via the online/hybrid mode were interviewed by us to determine their perspectives of the benefits of incorporating lecture capture and course management systems as major tools of future course requirements. The interviews were semi-structured, audio taped, lasted approximately 15 minutes and the students' identities were protected at all times. Two outside people reviewed a random sample of our taped interviews to determine if there was similar interpretation. After the completion of the interviews, we transcribed the interviewees' comments into narrative form.

Results

We implemented a pre- and posttest/Quasi Experimental research design to determine if there was a statistically significant difference in undergraduate students' instructional

technology self-efficacy levels, instructional technology anxiety levels and statistical anxiety levels between those who took statistics via online/hybrid and face-to-face modes prior and subsequent to the implementation of a Blackboard/Tegrity teaching intervention. The pretest was used as a statistical control to measure change scores (Goodwin and Legum, 2006).

It was our intention to determine if there were mean differences between the experimental and control groups using parametric two-sample t tests. However, due to a small sample size, the utilization of intact groups and the lack of a normal distribution of data, parametric assumptions were breached (Fraenkel & Wallen, 2006). As a result, we used non-parametric Mann Whitney and Wilcoxin Signed Ranks Tests to test the null hypotheses (Wiersma, 2000).

Pretest and posttest scores on instructional technology self-efficacy levels, instructional technology anxiety levels and statistical anxiety levels were calculated for the experimental and control groups. The experimental group's posttest instructional technology self-efficacy score was 39.46 ($SD = 4.39$) while the pretest instructional technology self-efficacy score was 29.09 ($SD = 4.55$). The control group's posttest instructional technology self-efficacy score was 30.60 ($SD = 7.01$) while the pretest instructional technology self-efficacy score was 31.30 ($SD = 5.40$). The experimental group's posttest instructional technology anxiety score was 27.18 ($SD = 7.60$) while the pretest instructional technology anxiety score was 29.27 ($SD = 11.51$). The control group's posttest instructional technology anxiety score was 31.70 ($SD = 13.50$) while the

pretest instructional technology anxiety score was 30.30 ($SD = 15.98$). The experimental group's posttest statistical anxiety score was 94.64 ($SD = 20.64$) while the pretest statistical anxiety score was 124.27 ($SD = 42.38$). The control group's posttest statistical anxiety score was 127.20 ($SD = 44.06$) while the pretest statistical anxiety score was 130.70 ($SD = 40.31$).

The Mann Whitney Test was used to determine if the experimental and control groups came from the same population distribution by testing for respective differences at the .05 level of significance (Siegel, 1956). At pretest, the experimental and control groups were statistically equivalent for instructional technology self-efficacy ($p = .479$), instructional technology anxiety ($p = .498$) and statistical anxiety ($p = .481$). After the treatment, the observed posttest sample differences were statistically significant for instructional technology self-efficacy ($p = .016$), approaching significance for statistical anxiety ($p = .067$) and not significant for instructional technology anxiety ($p = .972$).

The Wilcoxin Signed Ranks Test was selected to ascertain if the paired pre-post changes statistically varied within each treatment at the .05 level of significance. The experimental group showed a statistically significant gain in instructional technology self-efficacy ($p = .003$), statistically significant decrease in statistical anxiety ($p = .010$) but did not exhibit a statistically significant gain or loss in instructional technology anxiety ($p = .324$). No statistically significant gains or losses were found for instructional technology self-efficacy ($p = .959$), instructional technology anxiety ($p = .345$) and statistical anxiety ($p = .838$) in the control group.

Selection of non-parametric tests typically result in less precise output.

Nonetheless, the loss of statistical power did not affect the large difference between the experimental and control groups with respect to instructional technology self-efficacy and the statistical decrease in instructional technology anxiety for the experimental group from pre- to posttest (Triola, 2006).

Qualitative Findings – Interview Summary

We randomly selected undergraduate students from the Distance Learning experimental group to determine their perspectives regarding the impact of Tegrity and Blackboard on the successful completion of the statistics course. Moreover, we sought the participants' thoughts regarding the advantages and disadvantages of Tegrity and recommendations/suggestions for Tegrity/Blackboard's future use. Since we wanted to gather information on the participants' use of Tegrity and Blackboard after the completion of the statistics undergraduate course, members of the control/face-to-face group were not interviewed.

Several pivotal themes emanated after conversing with the undergraduate participants. First, the integration of Tegrity and Blackboard helped to elucidate some of the more challenging concepts presented in statistics. Specifically, the students felt less nervous about using Blackboard/Tegrity and understood statistics better after the completion of the course. Second, students suggested that professors/instructors should integrate Tegrity into their respective lessons in conjunction with power-point presentations. One student reiterated " Professors can give us as much detail as they

want and we know that we won't miss a thing cause we can listen to it as many times as we want on Tegrity til we get it." Third, for those being taught using a hybrid realm, the students stated that Tegrity can provide a better understanding of course material in preparation of an upcoming face-to-face session. Upon doing so, the undergraduates indicated that they could use their class notes and go back to Tegrity to review and for better clarification of key concepts. Fourth, the students stressed that if a student misses a face-to-face class and is being recorded using Tegrity, he/she can determine what transpired. Fifth, the students highlighted a couple of potential disadvantages when considering Blackboard/Tegrity. Among them was that they must have access to a computer to complete any lessons/assignments in Blackboard. As importantly, among the student concerns was that some sessions in Tegrity may be too long to maintain their attention. Accordingly, the participants further explained that if they did not understand a concept, based on the current lecture capture system technological design, the instructor could not provide immediate feedback at that time.

Discussion

The investigation of the effect of Distance Learning on undergraduate students' instructional technology self-efficacy levels, instructional technology anxiety levels and their statistical anxiety levels is paramount. Past research (Raafat and Kira, 2009) showed that computer anxiety influences how users perceive ease of use of an information system. However, fear of technology can be decreased when the perceived

outcome of its use is positive as can be inferred from the results of the Mann Whitney and Wilcoxin Signed Ranks Posttests in our study.

At our university, the majority of faculty use Blackboard, Tegrity and other instructional technology. Each semester, approximately 1,100 classes are offered, and 10% of those are online. Blackboard has been in use on the campus since 2000, and 80% of the faculty currently use it for their classes. Since Tegrity was introduced to the faculty in Spring 2005, the number of faculty recording their lectures has increased exponentially from an initial pilot group of 6 to the current group of 90 who regularly record lectures. Each semester, more than 1,000 students view Tegrity lectures for their classes.

The statistical results of this study combined with students' qualitative requests that more professors employ the use of Tegrity because students preferred to be able to update notes, clarify confusion, and review power points as often as they liked until the material is understood is significant. Such requests provide positive incentive for administrators to provide such capabilities that have such potential for increasing retention and graduation rates.

Limitations and Recommendations for Future Research/Educators

While this study provided a strong predictive index on the efficacy of Distance Learning in an undergraduate statistics course, specific limitations may have impacted experimental outcomes. The study involved a pre- and post-survey of two statistics classes, 10 and 11 students, respectively. This course is scheduled as a sophomore

course with a math prerequisite. A future study should expand the number of participants (gender based), include student classification while comprising several universities and not limiting this to HBCU's. This would better address a multiplicity of items which may impact outcomes including prior experience with Distance Learning, comfort with required technology, and student expected outcomes. Of further interest are the attitudes and dispositions of students toward the subject matter, in this study, mathematics and statistics. Clearly, attitude and disposition affect the active participation of students in various instructional modalities. Further, preparation of the student for Distance Learning instructional modalities could impact student anxiety levels. Of interest would be whether prior Distance Learning instruction had occurred for other courses. If so, is the perceived anxiety related to instructional modality or subject matter?

Future studies of great value can be built out from the current study taking into consideration the recommendations offered above. Our institution currently is aligning student learning outcomes with curriculum and university mission and reviewing general education requirements. Inherent in these actions is the responsibility of meeting the needs of our students, which require the exploration of creative and contemporary delivery of subject matter. It is essential that faculty and administrators understand the perceptions of our student to Distance Learning instruction.

Implications for Educators and Students

While the sample size is small, there are some significant insights to be gained from the findings of this study for both educators and students. First, the hybrid class format may be an ideal class structure to build student's confidence (i.e., their instructional technology self-efficacy) in terms of accessing technology in relationship to their educational experience. Second, the implications of the statistical anxiety scores nearing significance maybe that the fear of learning statistics (i.e., statistical anxiety) may be lessened by having access to Blackboard and a system like Tegrity where they can access previous lectures, and additional resources that students perceive as supportive. Third, technology anxiety, the fear of learning new technology, was not significantly different for face- to-face students than for the hybrid students.

Technology changes so quickly that once students learn one method, universities often change or buy new systems. Perhaps leaving a particular system in place over time will give students a chance to master technology skills needed to be successful in Distance Learning and hybrid classes and will lessen technology anxiety. Also, counseling centers may be able to offer groups for assisting students with their technology anxiety.

Students should take every opportunity to give voice to their concerns about using technology. Second, starting with a hybrid class may give time and support for gaining a comfort level with using technology in the educational setting. Third, accessing technology may assist with undertaking a difficult subject such as statistics where

hearing the lectures more than once and accessing other on-line resources like Blackboard may enhance their success with a complicated content area.

In a world where technology is becoming such an integral part of our day-to-day lives, providing access, opportunity, and support in the undergraduate educational environment will assist students who have been hesitant to access technology in relationship to learning to try hybrid or Distance Learning classes. Ultimately, both educators and students need to continue to explore options for making the use of technology more feasible in the educational setting.

Conclusion

The focus of our study was to determine if there was an increase or decrease in undergraduate students' instructional technology self-efficacy levels, instructional technology anxiety levels and statistical anxiety levels after having been exposed to a Distance Learning intervention. Our study indicated that the instructional technology self-efficacy levels increased for the student participants. Although, there was not proven to be significant findings for the students' instructional technology anxiety levels or statistical anxiety levels, the findings reflected that statistical anxiety levels approached the significance level in this study.

The promising information that was learned from this study will serve to be helpful to a rapidly increasing technology oriented future for students. The concept of Distance Learning may provide students with various and distinct opportunities. Students are able to analyze previously presented lecture materials to ascertain their

comprehension of the presented information. Repeated review of the materials can assist in the retention of it, and point out areas that require further assistance for the student. If a student is unable to attend class, they can access the work they have missed.

As the growth of Distance Learning further expands into the classroom, educators and administrators alike will be expected to make it increasingly available to all students so that they may be enhanced by this learning process. Distance Learning technological advances should prove to be successful in assisting in increasing the student retention rate at colleges and universities. Thus, making available to our students a new and rapidly growing technology should help them in achieving their graduation goals.

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