Student Perceptions on the use of Clickers, Tegrity, and Blackboard when Learning Science

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Abstract- Chalkboards and piles of handouts are quickly becoming ancient teaching tools. In today's high-tech and fast-paced society, it is imperative that we are proficient in the use of computers and other revolutionary electronic devices. Specifically, teaching science, technology, engineering, and mathematics (STEM) disciplines with current technology can enhance learning. In order to understand current student perceptions on the use of technology when learning science subjects at Coppin State University, 166 students participated in a survey. This survey included questions over the use of automated response systems (clickers), the Tegrity lecture capture program, and the Blackboard course management system. Results demonstrate students had an overall positive view of these technologies and in particular would like to see more of these technologies implemented in other courses.

Index Terms- Automated Response Systems, Blackboard, Clickers, Lecture Capture Technology, Tegrity

I. INTRODUCTION

The ever present and expanding world of technology is a revolution that many embrace readily while others adapt to over time. The use of technology in the classroom setting has increased dramatically over the years, from the introduction of the PC, internet and World Wide Web, to Blackboard, lecture capture technology, and clickers (Selwyn, 2007; *The Hanover Research Council,* 2010); and yet research as to the impact on student learning and pedagogical value is still in its infancy. Chalkboards have played a central role as an instrument for presenting information, yet today's Millennial students are technologically savvy as exemplified by the dissemination of information by gadgets that include personal computers, cell phones, PDAs, iPods,… In today's high-tech world, it is imperative that instructors are proficient in the use of computers and other innovative electronic devices. Instead of traditional teaching tools such as chalkboards, many instructors are now turning to web-based learning management systems such as Blackboard, Angel or Moodle to enhance the student learning experience. Additionally, instructors have incorporated the use of lecture capture software such as Tegrity and Panopto to record lectures and then post them in Blackboard. In the classroom, instructors are now using audience response systems or 'clickers'

to assess student comprehension. Moreover, it is not only higher education using the aforementioned e-learning systems, but K-12 students are being introduced to these educational technologies; therefore, the question is not if we should use technology in the classrooms, but what is the best method in which to incorporate these systems and future technologies into our higher education learning pedagogy.

As an urban liberal arts university, Coppin State University (CSU) is an HBCU (Historically Black College and University) that offers 53 majors that serve approximately 4,000 students, 80% of which reside off campus (http://www.coppin.edu). The student body includes the traditional type that matriculate after high school; and the non-traditional type such as those that are employed, are raising children, or are returning to complete their college degree after several years' hiatus. CSU is dedicated to its motto, "Nurturing Potential … Transforming Lives" (http://www.coppin.edu). One avenue that demonstrates that CSU is nurturing the potential of its students is by its incorporation of new learning technologies. In 2005, Coppin received an EDUCASE award for innovation in network technology thereby distinguishing itself as the first HBCU to be selected and the first institution in Maryland to receive this honor (EDUCASE, 2005).

Furthermore, many faculty members in the CSU Department of Natural Sciences have incorporated the use of technology in order to make course information more readily available to nontraditional students and also more user-friendly to all students.

Utilizing the available teaching tools to connect these students to their professors and classmates may have posed a problem in previous times, but with the use of current technology, instruction can be both in the classroom as well as supplemented with web-based learning, lecture capture technology, and student response systems. Well-developed information technology tools are essential to all students, but perhaps more so to the non-traditional students that may need the additional support provided by these educational technologies (Roach, 2005). Teaching science, technology, engineering, and mathematics (STEM) disciplines with current technology can enhance the learning experience. MacArthur and Jones' review examined the use of clickers in undergraduate chemistry courses

and noted assessable increases in student erudition (MacArthur & Jones, 2008).

Student positive perceptions of e-learning and technology are important conduits in the student's desire and continued use of technology tools in the learning environment (Liaw, 2008). Students that self-identify as 'auditory learners' have benefitted from reviewing material using a lecture capture technology system (Bacro, Gebregziabher, & Ariail, 2013). Therefore, it follows that one hypothesis is that positive student perception regarding technology in the classroom may translate into increased active learning which then may lead to improved educational outcomes, e.g. academic performance and retention.

An aim of this study is to understand student perceptions on the use of technology when learning science subjects at Coppin State University. One hundred and sixty-six students participated in the survey which included questions over student experiences with clickers, Tegrity, and Blackboard.

II. METHODOLOGY

Surveys were administered to 166 students who took the following courses: Introduction to Biology, Fundamentals of Cell Biology, Botany, Ecology, Microbiology, and Biochemistry. The Introduction to Biology course was the only non-major course, the other courses were for majors. The TurningPoint 2008 software was integrated into Microsoft Office PowerPoint 2007. Clicker questions were created in TurningPoint and administered to students during class period for several activities including reviewing concepts, preparing for tests, and taking attendance. Turning Technologies response card IR (Infra-Red) and the RF (Radio-Frequency) receiver were used to survey students during clicker sessions. This study utilized the Blackboard version 7 computer management systems, and the Tegrity 2.0 lecture capture technology. For group trivia, students formed groups of 4-5 members and were able to consult each other in order to answer review questions.

III. RESULTS

The survey revealed that over 98% of the students liked using clickers (Figure 1A). In addition, 70% had used clickers (Figure 1B) before and virtually all students wanted more of their science courses to implement their usage (Figure 1C). Of those students that were familiar with clickers, many said that they were exposed to them in high school or in non-science areas of study such as History, Health, and English.

In terms of Tegrity usage, 89% said they found Tegrity to be helpful while 6% did not find Tegrity to be helpful and 5% did not answer this question (Figure 2A). For exam preparation, most students (64%) said they preferred using clickers other than group trivia at 19%; twenty-seven percent liked using both methods (Figure 3 A). Students preferred taking computerized exams by 48% compared to recording their answers on a Scantron sheet (40%). Twelve percent chose other formats such as essays or other types of written exams (Figure 3B).
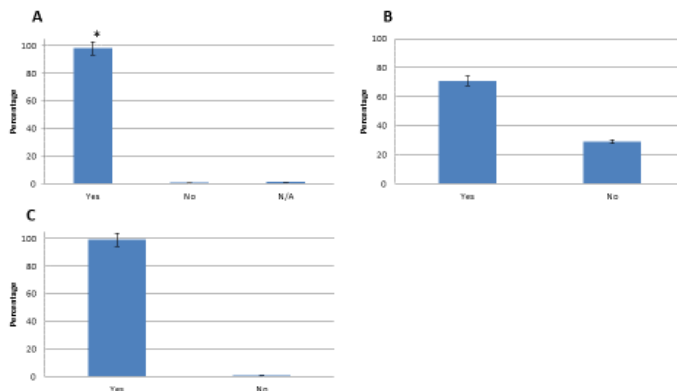

Figure 1.
Clicker Usage. A) Preference for using clickers. B) Use of clickers in a prior course. C) Preference for clickers in other science courses.
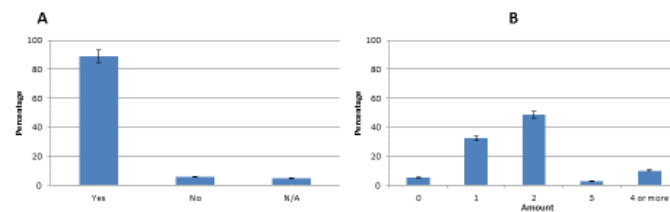*Error bars are displayed as 5% value throughout paper.

Figure 2.
Tegrity and Blackboard Usage. A) Helpfulness of Tegrity. B) Number of current professors that use Blackboard to record grades.
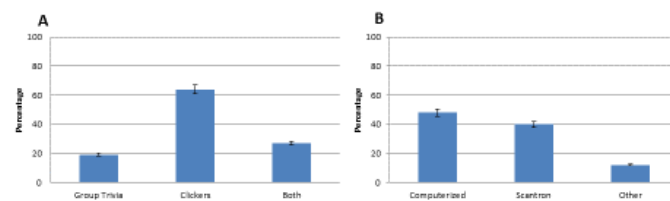

Figure 3.
Exam Preference. A) Preference for group trivia or clickers.
B) Preference for modes of taking tests.

Table 1. Survey questions and respective figures.

Figures	Questions
1A.	Did you like using clickers for this course?
1B.	Is this the first time you have used clickers in any course?
1C.	Would you like to see clickers in more of your science courses?
2A.	Did you find Tegrity helpful?
2B.	How many of your current professors use Blackboard to record your grades?
3A.	Did you prefer group trivia or clickers when preparing for an exam?
3B.	How do you prefer to take quizzes and exams?

IV. CONCLUSIONS

This study examined students' perception on the use of e-learning tools in science courses at CSU, a traditional HBCU, and a target population that is underrepresented in the literature. Concerning the use of clickers, students responded that they enjoyed using clickers, indicating they were 'fun'. Additional student feedback revealed that the students felt comfortable participating in classroom queries because the clickers provided them with a sense of anonymity. Conceivably the use of clickers fosters a sense of inclusiveness whereby students view themselves as active participants in class activities without the added constraints of shyness or the fear of being ostracized. The implementation of clickers in science courses, as the newest addition to CSU's e-learning assemblage, was well received by the students. In general, college students perceive clickers as useful and instructors indicate that communication and participation within the classroom is enhanced (Keller et al. 2007; Ortiz, Cavajal, Coral, Barrios, & Henao, 2010; Siau, Sheng, & 2006) particularly for the reticent student (Beckert, Fauth, & Olsen, 2009).

Concerning Tegrity, students found it to be helpful if they had missed class or were reviewing materials they missed during a live session. Future studies will include comparing the amount of time students viewed Tegrity with their overall course grade.

In summary, this study supports the literature indicating that Millennial students embrace the use of technology in the classroom and perceive it to be beneficial in terms of learning outcomes (Buzzetto-More, 2008; Fies & Marshall, 2006; Parker, 2003; Sloan, & Lewis, 2014). Students benefited from the use of these technologies and in particular wanted more of their science courses to employ the use of clickers. Future considerations and works in progress include examining: the use of Turnitin (online based plagiarism detection service), students in other fields, faculty members and their usage of e-learning technologies, and retention.

ACKNOWLEDGMENT

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