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ORIGINAL ARTICLE

Comparison of interactive video test performance to overall class performance in a biomechanics course

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Objective: This study compared interactive video test performance and students' overall class performance. The hypothesis was that there would be a difference in video test performance compared to overall class performance.
Methods: A total of 30 students participated in the pilot study from a master's level biomechanics course. Students completed four interactive video tests using EduCanon; content of videos included base of support, lever systems, scapulohumeral rhythm, and postural analysis. This content was reviewed with class discussion after completion of the interactive video test. The tests administered counted toward the participation portion of the final student grade. Student performance on the EduCanon interactive video test was compared to overall class grade using a paired *t*-test.
Results: All 30 students completed the 4 EduCanon interactive video tests. Final class grades were greater compared to cumulative EduCanon test performance. There was no difference between performance using interactive video testing compared to students' overall class performance ($t[29] = -1.43$, $p = .16$).
Conclusion: The results of this study did not support improved student assessment performance with incorporation of interactive video testing in the classroom environment. Continued research into new testing strategies is recommended to identify additional effective testing in the classroom.

Key Indexing Terms: Education; Testing Strategies; Learning Styles; Active Learning

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INTRODUCTION

Innovative teaching and assessment strategies are considered important because the student experience is evolving constantly. In the past, students have learned with reading, attending lecture, and diligent note-taking. Assessment of their comprehension traditionally has been done with a written exam, practical exam, or class projects. Technology progressed from PowerPoint presentations to video, incorporated into the classroom significantly since 2005, possibly as a result of improved data connection at home and school as well as the boom of YouTube.[1] There have been gradual changes to the methodology by which content has been delivered to the students, whereas only a small movement has been noted in the methods used for student assessment.[2]

The general student body from grammar school to university demonstrates significant variation in amounts of exposure to and practice with new media and technology. Students are educationally, ethnically, and culturally diverse, leading to varying exposure to and experience with technology.[3] When adding new assessment styles, the teacher must be sensitive to the variation and adapt so all students can benefit from a technologically evolving classroom. The student must be guided and provided with resources on the use of new media and technology in the classroom.

Student exposure to the media-rich environment should be used to the teachers' advantage. Current college students are computer savvy, having been exposed to them throughout their schooling experience. Because of evolving technology, teachers can develop creative approaches, solutions, and practices to prompt the attention of students.[4] Video is one component of the classroom environment, as it provides a multisensory learning environment that may improve learners' ability to retain information. The value of video is enhanced further if interactivity is incorporated into use.

In an active learning classroom students engage in activities or are involved experientially in the learning processes that lead to analysis, synthesis, and evaluation of class content. The active learning environment can be achieved in an endless amount of ways, many of which include incorporation of Web 2.0 tools. Using video content may reinforce and promote active learning by seeing content, doing variations of content, saying or

repeating content, and engaging or interacting with content.[5,6]

The application of video for assessment-active learning environments has received little attention in the scholarly literature. In one study, active learning materials were better remembered when videos were used to make the class more memorable and enhance student learning.[7] In a separate study, an instructor compared three classes with differing techniques for covering material.[8] In this study, student performance was better on items testing materials covered with active learning techniques compared to other formats, specifically autonomous readings or video without discussion.[8] Having a student assessed in an active learning format also may be beneficial.

In a study in 2006, "Researchers found that students already, in their own initiative, make the Web the "first point of call" for their self-regulated study activities where they, in sophisticated ways, find and synthesize information, integrated across multiple sources of data."[9] The term Web 2.0, first used in 2004, refers to what is considered the second generation of Web-based services emphasizing collaboration, sharing, and adds to a learning environment.[10,11] Applications and websites, such as EduCanon, EdPuzzle, Vialogues, and Raptmedia allow the transfer of video content into interactive learning, enhancing the active learning environment, which is a new trend and is progressing and evolving constantly.[12]

The use of Web 2.0 tools in the active learning environment is a tactical strategy to engage more of the current student population that might not learn best with classic lecture format. Using new technology has advantages and disadvantages. Advantages include the student being an active part of the class, also collaboration and competition increases learning. Disadvantages include not every student has access to computing resources and apprehensiveness of students to learn web technologies.[13]

Assessment tools are used for evaluations of student knowledge. Currently, video is used for a variety of learning strategies; however, assessment with the use of video is not as prevalent.[14] Interactive video testing strategies to assess a students' understanding of content may be an effective evaluation of student learning. This is evidenced by mastery of standards and improvements in grades.[14] Since this is a relatively new type of technique for testing, there is limited research evaluating whether using video as an assessment tool would be a positive addition in the classroom.

We compared interactive video assessment performance to students' overall class performance. The hypothesis was that there would be a difference in video test performance compared to overall class performance.

METHODS

This study was approved by the institutional review board of the Tennessee State University. The procedures used were in accordance with the ethical standards of the Committee on Human Experimentation. The study was developed and completed with first year students in the second semester of an occupational therapy master's program. The student groups were a sample of convenience from two sections of one biomechanics course. The subjects self-registered based on desired class schedule of the participant. The study was anonymous and voluntary. Informed consent was acquired from each participant. The study population of the program consists of a majority of Caucasian female graduate students 21 to 40 years of age with an average grade point average (GPA) of 3.4, based on physical observation and statistical analysis of applicants.

The validity of the test was measured in the 2015 biomechanics course before administration to the 2016 class. Four interactive video tests were completed in the 2015 biomechanics course to ensure proper instruction for participation comprehension of the process. Videos were chosen based on the four areas of the course that video content could be applied effectively. Questions then were time-embedded into the videos. Testing data were collected from participants and evaluated for time to completion of a task, rewriting of unclear questions, and overall flow of the process. This process was deemed acceptable for future data collection in the 2016 class.

During weeks 2, 3, 4, and 10 in the spring 2016 semester, participants were administered four videos in class with a total of 18 questions embedded with EduCanon (available in the public domain at https://chrome.google.com/webstore/detail/playposit-fka-educanon-in/lnjmoiijkgfmefmkakinejkfjgampbjh?hl=en). EduCanon was the specific Web 2.0 tool being used in the active learning classroom to add video-based assessment for this study. EduCanon began with a selected video, and using embedded questions during strategic times during the video, transformed what would have been passive content into an active experience for students. There was no control group for this study. Biomechanics topics covered in the interactive video testing included base of support, levers, scapulohumeral rhythm, and postural analysis. Intermittently during the video, questions that covered video content were asked and the participants wrote their answer on a sheet of paper. After completion of videos, content from the video was reviewed during in-class discussion and was included as topics in standardized testing for the remainder of the semester. After completion of the video, answers were turned in to the professor. Completion of interactive video tests were included in participation points in the course to provide value for the participant for the activity; however, the numeric grade for interactive video testing was not included in overall class grade. The mean scoring from the four quizzes (combined) then was compared to the standard testing performance evidenced in the final semester grade using a 2-tailed paired t test ($\alpha = .05$). The final grade included points earned on quizzes and tests. Items, such as participation points and points for activities in class, were not included in the final grade.

RESULTS

A total of 30 students participated in the interactive video testing. The overall interactive video grade and overall class grade for each participant are reflected in

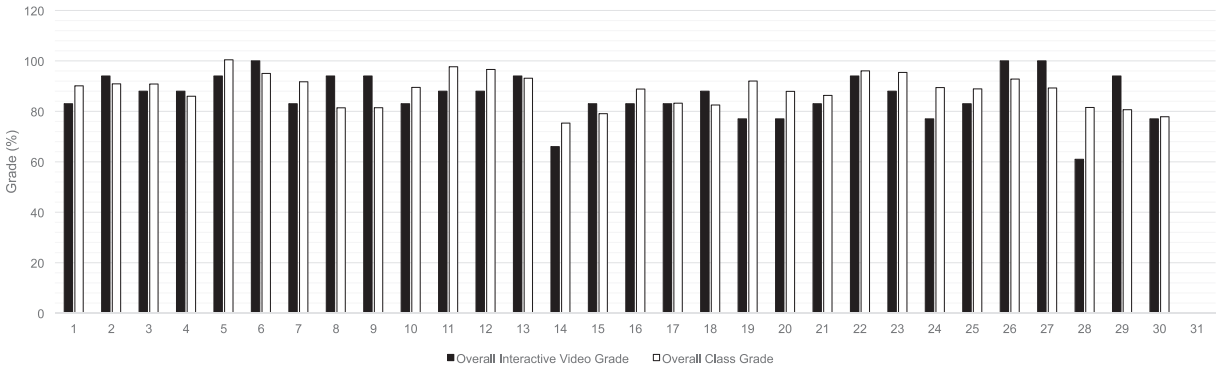

Figure 1 - Comparison of overall interactive video grade to overall class grade.

Figure 1. Figure 1 reflects the variability in results across the sample; 18 of the participants' overall class grades exceeded interactive video tests. The remaining 12 participants' overall class grades were less than those from the interactive video tests. The paired *t*-test results indicated a retention of the null hypothesis, as there was no statistically significant improvement ($t[29] = -1.43$, $p = .16$) with interactive video testing performance when compared to overall semester grade.

DISCUSSION

There are limited and mixed results with research evaluating the effectiveness of interactive video testing and the effect on test scores. This research addressed possible methods of testing with the addition of active learning through Web 2.0 tools into a testing environment. It has been said that, "Active learning, student-centered pedagogical approaches put the focus on the learner and what the learner does. However, active learning doesn't just happen; it occurs in the classroom when the teacher creates a learning environment that makes it more likely to occur. There is evidence that active learning, student-centered approaches to teaching work, and they work better than more passive approaches."[15] This study did not show such a difference.

Future research plans include modification of the parameters of this study that would compare students' perceived learning styles and performance of testing based on those learning styles using EduCanon interactive video testing strategies. This may provide insight as to whether student's information retention is improved in their perceived best learning style. Additional future plans include evaluating the duration of time of knowledge recall based on the time to answer questions with varied testing styles to determine if certain learning styles help to retain knowledge in a more readily available format. Future research could evaluate interactive video testing strategies with undergraduate and socioeconomically diverse populations. The future use of interactive video with potential for long-term success and applied as a cognitive tool for engaging students is a powerful motivation for additional studies.[16]

There were several limitations to this study. Use of a convenience sample did not reflect general college population demographics. The study demographic differs from the general college student population. The population also differs from Tennessee State University, which is an Historically Black College and University (HBCU) with a minimum of 65% African American students and a growing international population, a relatively balanced ratio of female to male gender, and minimum GPA of 2.5 for admission.[17] The limited duration of the experiment may be reflected in the lack of definitive findings in the study.

Interactive video test grades did not affect overall grade, instead participation in testing was reflected in participation points. This may have resulted in less than optimal effort during interactive video testing. The researcher administering the test was a faculty member, which could have led to bias because of student intimidation or desire to perform for faculty benefit. The small sample size may have biased the outcomes and should be addressed in future research. As this was a pilot study, future studies having a significantly larger participant size would improve validity of study. Finally, to improve upon validity and reliability, EduCanon interactive video testing should be used across multiple semesters and varied class content, adding strength to using this as a testing tool in any classroom setting.

CONCLUSION

This study showed no difference in interactive video testing strategies in graduate level students compared to final course grades. Additional research is needed to evaluate these strategies fully to meet more of our students testing needs.

FUNDING AND CONFLICTS OF INTEREST

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Author Contributions

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