Setting the Climate: The Impact of Multimedia on Online Learning

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Abstract—**The innovation of information technology has transformed the education world. Multimedia has been integrated into online classrooms in various ways. The use of multimedia could result in a positive impact on student's learning experience. A master's course offered exclusively online is redesigned to incorporate multimedia into course content, courses delivery, and assessments. The aim of this case study is to investigate the relationship between student's satisfaction, as well as student's learning outcomes, and the effectiveness of the multimedia-enhanced course. Student's performance, student's engagement, and student's stratification show improvement in the redesigned course. The implications, limitations and further research are also discussed in this paper**.

Keywords-multimedia; online learning; learner-centered teaching; student engagement; student satisafction.

I. INTRODUCTION

With the advance of the Internet, distance learning in the higher education has developed its popularity in the world [1]. The Internet has shortened the distances among people, while distance learning transforms the way education has been delivered and defined; this new way of interactive teaching uses the latest technologies to deliver the instructional materials to learners [2]. Thus, the geographical boundaries and scheduling conflicts are no longer the obstacles to learning. The paradigm has shifted to a learning environment that promotes learning through the interactivity feature of the technology [2][3][4].

The research described in this paper investigates the effectiveness of a multimedia-enhanced online course. A literature review on the impact of multimedia and learner-centered teaching will be presented. The research methodology, results, and discussion will be reviewed. Finally, implication, limitation, and further research will be examined.

II. THEORETICAL FRAMEWORK

A. Multimedia

Multimedia refers to the combinations of different types of media that appeal to more than one perceptual sense to convey information; the examples of media include sound, text, animation, audio, video, image, and mixes of all these objectives [1]. With the rapid development of telecommunication technology, multimedia has been increasingly used in education, especially in the online environment, as it provides the learners with an alternative means to acquire new knowledge. Four main benefits of multimedia have been attributed to better learning outcomes.

- Multimedia can help students with various learning styles learn better because multimedia instructional materials are more dynamic than text-oriented online classrooms [3][5].
- Multimedia can engage the learners to keep learning [3]. As an effective instructional tool, multimedia is playing an active role in education because the content delivery of multimedia is more vibrant and can draw the learners' attentions better.
- The use of multimedia fosters deeper learning [3]. Multimedia instructional materials, indeed, help learners better comprehend key course ideas by stimulating learning at both cognitive and emotional levels—reaching a deeper learning.
- The multimedia tools help transform the traditional instructor-centered teaching toward learner-centered teaching [2][3].

B. Learner-Centered Teaching

In the learner-centered environment, students play an active role in the learning process. They are actively engaged in constructing new meaning within the context of their current knowledge and experience. When learners construct their acquired knowledge successfully, they tend to work in collaboration with others [6]. Learners share their commitments to learning and see collective learning as an imperative part of their educational experience. Learner-centered instructors also promote the development of a learning community to engage learners and provoke the learners' critical thinking and problem-solving skills [3][6]. However, this approach can work well only for the mature and self-efficient learners [7].

III. CASE STUDY

An U. S. university offers the master's program of healthcare administration exclusively online. The original courses relied solely on text, requiring a large amount of reading and writing. Such a course design may have a negative impact on students' learning and satisfaction. In 2014, the author redesigned a healthcare administration course in the master's program. The redesigned course has incorporated multimedia into course content, course delivery, assignments, and e-textbook. Assessing the effectiveness of

the redesigned course and student's learning outcomes is needed to reflect the depth and breadth in instructional design principles. Thus, two research questions are raised: (1) How do multimedia instructional materials enhance student's learning? (2) What are the relationships between multimedia instructional materials and student's satisfaction? The purpose of this study is to examine the association between the effectiveness of this redesigned course and student's satisfaction, as well as student's learning outcome.

A. Research Methodology

The data were analyzed with a comparison between FY13-14 and FY14-15 courses. Simple comparative tests including analysis of variance (ANOVA) were performed using Statistical Package for the Social Sciences (SPSS) software. Student achievement was evaluated by a 10 to15-page final research paper. Student engagement was measured by the number of posts and time spent per discussion board in the five selected discussion boards. Students' satisfaction was investigated using the University's standardized end-of-course evaluation survey.

B. Results and Discussions

1) Student Achievement: As shown in Figure 1, the mean score of the final research paper from the FY14-15 courses (n = 621) was 23.1, which is statistically higher ($p < 0.001$) than 22.3 of the FY13-14 courses (n = 695).

2) Student Engagement: Figure 2 exhibits a signficant lower ($p < 0.05$) number of postings, 3.27, per discussion board in FY14-15 comparing to 3.39 in FY13-14. This might result from the impact of a new university policy. Two months after this revised course was implemented, the univiersity changed its discussion board expectation for the instructors by reducing the requrired postings. Research studies have shown that instructor's intervention affects the quantity of students' posts in the discussion boards [8][9]. The result from this research study is in accordance with other research findings. Even though students in the FY14-15 courses posted fewer responses, they indeed spent signficantly longer time reading their peers' postings. Students in FY14-15 courses spent 158.2 mintues per discussion board in the five selected discussion boards comparing to 106.06 mintues in FY 13-14 courses ($p < 0.001$) displayed in Figure 3.

3) Student Satisfaction: Figure 4 shows students' perception and feedback on the course in the 16-item end-of-course survey. The overall satisfaction score, 3.46, in the FY14-15 courses (n = 156) is higher than 3.38 in the FY13-14 courses (n = 134) ($p < 0.05$).

C. Conclusions and Implications

Despite the fact that students' learning styles influence the outcomes of the collaborative learning [7], the findings from this study show positively on students' performance, engagement, and satisfaction. The findings suggest that with the exponential development of multimedia technology, educators might integrate it into the course content and course delivery to engage learners in a deeper learning, as well as raise learners' interest and satisfaction in the online environment. Educators might also take advantage of a wide variety of multimedia learning tools to improve the quality of online experience, foster a sense of community, and prepare learners to be lifelong learners with critical thinking and problem-solving skills.

D. Limitations

Several multimedia creations are used to enhance the course, and there is no way of knowing exactly which multimedia is responsible for the improvement. Additionally, there are potential confounding factors, such as student's job status, student's family issue, instructor's profile, and instructor's teaching style, all of which may interfere with students' learning and objective evaluation on the course.

E. Future Reseach

The examination of the correlation between students' attitudes about multimedia learning materials and their actual academic achievement is demanded. There is a need to investigate the relationship between the instructor's teaching style and students' achievement, students' engagement, as well as students' satisfaction. There is also a need to explore the association between the instructor's profile, such as age, gender, race or ethnicity, and students' achievement, students' engagement and students' satisfaction.

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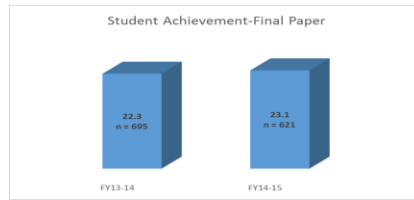
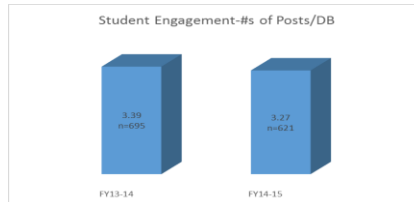Figure 1. Mean scores of final reach papers from FY13-14 and FY14-15 (p<0.0001).

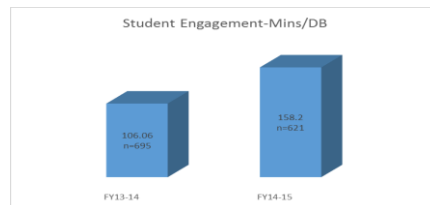Figure 2. Average numbers of posts per discussion board from FY13-14 and FY14-15 (p<0.05).

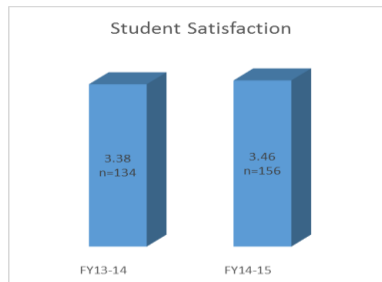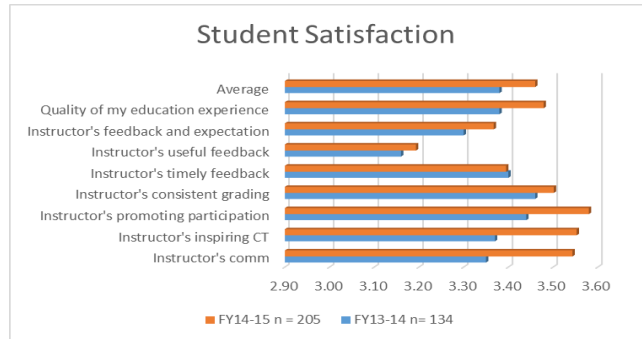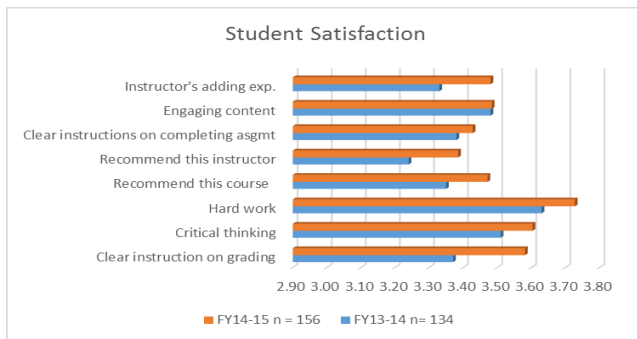Figure 3. Average time spent per discussion board from FY13-14 and FY14-15 (p<0.0001).

Figure 4. Student satisfaction scores from FY13-14 and FY14-15.