

COMPARATIVE ASSESSMENT OF ONLINE HYBRID AND FACE-TO-FACE TEACHING METHODS

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Abstract

Comparison of the effect of two teaching methods (online hybrid and face-to-face) was made on grade outcomes of non science major students taking four credit hours physical science courses at Bowie State University, MD, USA. The courses were offered with the same content: all course materials and assessments posted online through Blackboard/ANGEL learning management systems. Both groups had to attend lab experiments in presence: the main difference being that students enrolled in the face-to-face courses also attended three lecture classes in a week. The enrolment capacity of face-to-face courses is a maximum of 26, while that of online hybrid classes is 70. The overall assessment on pass and fail proportion of students as well as indications from letter grade distributions from data collected during three semesters indicated that there is no statistically significant difference between the two teaching methods in terms of students pass and fail grades. Results show that the online method is adequate for large sections with no detriment to outcomes.

1 INTRODUCTION AND BACKGROUND

The fast development of internet technology and availability of strong and reliable online learning management systems in most university and college systems, as well as the ease of access to these facilities by students through computers, laptops, and very recently through mobile internet facilities, have made online learning system very popular and necessity from the perspective of both students and higher learning institutions. The fostering of rapid growth of distance education by the increasing sophistication, affordability, and accessibility of technology has been outlined by most researchers ([2], [5], [4]). Although online courses are increasingly becoming more popular, there are still uncertainties about its effect on students' outcomes compared to the face-to-face method. Most researchers suggest that students who completed online courses learn as much as those in face-to-face, earn equivalent grades, and are equally satisfied ([2]). Some comprehensive studies have shown that, on average, students in online learning conditions performed moderately better than those receiving face-to-face instruction [1]. Others, however, believe that students who have limited access to internet facilities and are academically underprepared, may be at a disadvantage when taking online courses, unless they get additional support ([4], [3]). Although there are different opinions and results on the comparative advantages and disadvantages of online learning, the fast development of online learning management technologies, as well as the amazingly fast expansion and availability of mobile internet technology to most students, necessitates the change to ultimately inevitable online teaching and learning management system. The situation at Bowie state University (BSU) is not also different from that of other higher learning institutions. During the last 10 years, online learning management technologies and facilities have gradually improved, and as a result of the strong support from the Division of Information Technology (DIT) and availability of essential facilities to the faculty, most courses at the university have now online options through Blackboard/ANGEL learning management systems. The smaller size of most of the classrooms at BSU has been the major limiting factor for the expansion of enrolment in some of the courses offered by the university. Considering the availability of a well developed online learning management system at the university, and realizing the need for urgent expansion of enrolment capacity, the Department of Natural Sciences initiated offering physical science online hybrid courses in the Fall Semester of 2010, in addition to the face-to-face courses already being offered. Although follow-ups on implementation indicated an overall satisfaction with online hybrid courses, from the part of both students and instructors, it was found necessary to initiate this comparative study on grade outcome of students taking face-to-face and online hybrid courses, before making a full-fledged shift to online hybrid teaching method. For this comparative study, the grade outcomes of students who were enrolled in two physical science courses, offered in both teaching methods from Fall 2010 to Summer 2011 semesters, were considered.

2 OBJECTIVES

The intent of the study is summarized in the following statements:

- To compare the relative effectiveness of two teaching methods (online hybrid and face-to-face) on the bases of students' letter grades pass and fail proportions, and relative frequency distributions.
- To obtain information on the weakness and strength of online hybrid courses for future improvement and expanded utilization of this learning method at BSU.
- If online hybrid courses found equally effective, to attract more students to be enrolled in physical science courses.
- To share results, if promising, with other BSU departments and similar institutions for possible improvement and expansion of online hybrid teaching methods.

3 METHODS

For this comparative study on teaching methods, two physical science courses (physical science PHSC 100 and earth science PHSC 101), offered concurrently at BSU as hybrid online and customary face-to-face from Fall 2010 to Spring 2011 semesters, were considered. The assignment of students to the teaching methods was not randomized and controlled, in that, course enrolments were open and students themselves decided in which one to enrol. The enrolment capacity of online hybrid courses was much higher than that of face-to-face. The total numbers (N) of students enrolled in the two courses during the study period were: For online hybrid courses PHSC 100 N=150 and PHSC 101 N=126; for face to face courses PHSC 100 N=55 and PHSC 101 N= 45. In both teaching methods, students had to come to the lab once a week in person to do experiments. The course content in both methods were the same and course materials organized into modules, consisting lecture notes, video clips, and study guide exercises were posted online on Blackboard/ANGEL. In the face-to-face method, however, lecture notes that are posted online were also presented in classrooms on PowerPoint and discussed during 3 lecture periods a week. For course assessments, auto graded quizzes, one hour tests as well as mid-term and final exams were given online in both teaching methods under supervised conditions. The type and number of tests, as well as the grading systems and other course expectations were clearly outlined for all students in the course syllabi and course activity schedules posted online. The study outcomes were assessed based on students' grade outcomes, by comparing actual and relative percentile grade frequency distributions, and statistically comparing pass and fail proportions of students' grades, using the hypothesis test statistics for comparing two population proportions in the two teaching methods. Letter grades were A, B, C, D, & F, where A, B, & C are pass and D & F are fail.

4 RESULTS AND DISCUSSION

The overall grade outcome of the comparative assessment showing letter grade distributions for students enrolled in the two courses under the two teaching methods during the study period is summarized by gender and total in Table 1. The proportional comparison of the number of passed and failed students in the two courses, under both teaching methods, are also shown in Table 2 and Fig. 1. Frequency distribution of letter grades for absolute number of students in the two courses and two teaching methods is shown in Fig. 2, and for adjusted number of students to equivalent ratio is shown in Fig. 3. The percentage distribution of letter grades by gender and total are shown in Fig. 4 and Fig. 5, for physical science and earth science courses, respectively. The data on Table 1 and Fig. 2 show that the number of students enrolled in the online courses was much higher than in face-to-face, never the less, the overall grade distribution trend in both teaching methods is more or less similar. The results of proportional comparison of pass and fail population in both courses (Table 2 and Fig. 2) also show that there is no significant difference at $P=0.05$ between the two teaching methods. Such lack of differences in effectiveness of online and face-to-face teaching methods has also been reported by other investigators ([5]). The letter grade distribution for the two courses and teaching methods (Table 1) and the adjusted equivalent ratio number (Fig. 3) show that, when the two courses are compared, more students in earth science course (PHSC 101) seem to be making higher grade (A) in the face-to-face than in online hybrid. Such outcome indicates the possible influence of type of subject matter on the effectiveness of teaching methods on students' grade outcomes.

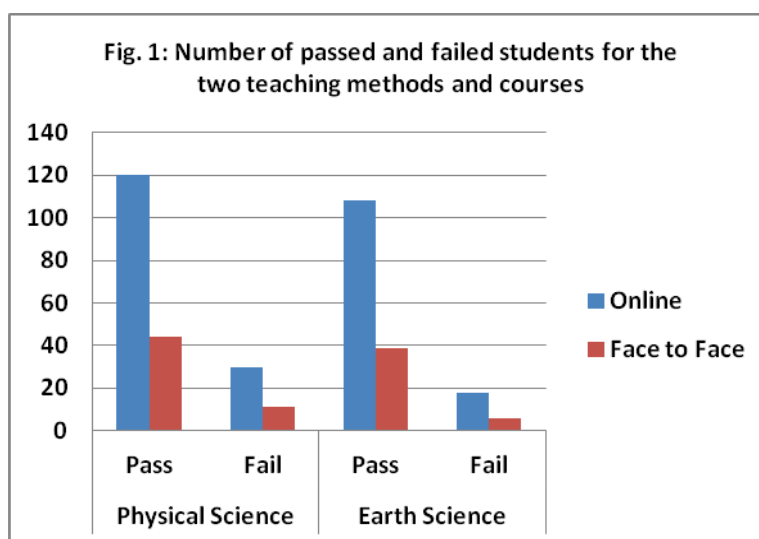
Table 1: Letter grades distribution by gender and total for students enrolled in the two courses and teaching methods

Teaching Methods	Grade	Physical Science			Earth Science		
		Male	Female	Total	Male	Female	Total
Online Hybrid	A	11	9	20	4	9	13
	B	17	27	44	21	44	65
	C	16	40	56	10	20	30
	D	8	6	14	2	5	7
	F	7	9	16	4	7	11
Face-to-Face	A	3	5	8	9	10	19
	B	6	12	18	8	7	15
	C	7	11	18	3	2	5
	D	3	5	8	2	2	4
	F	0	3	3	1	1	2

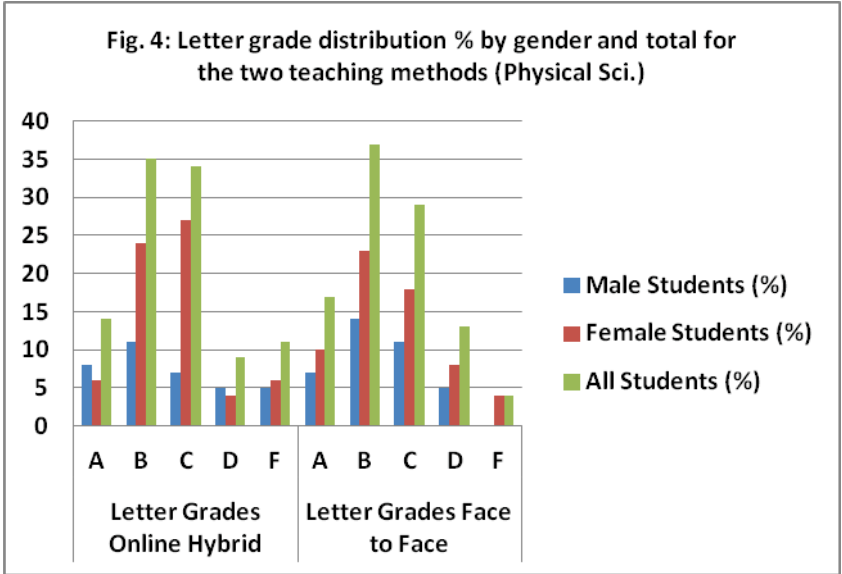
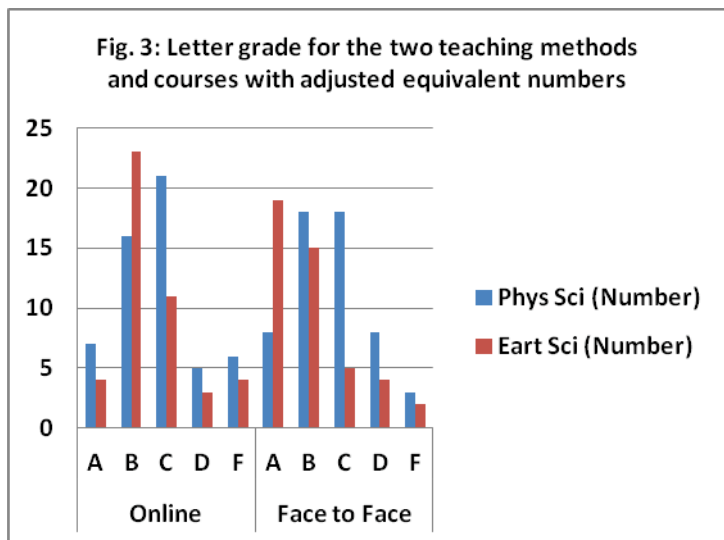
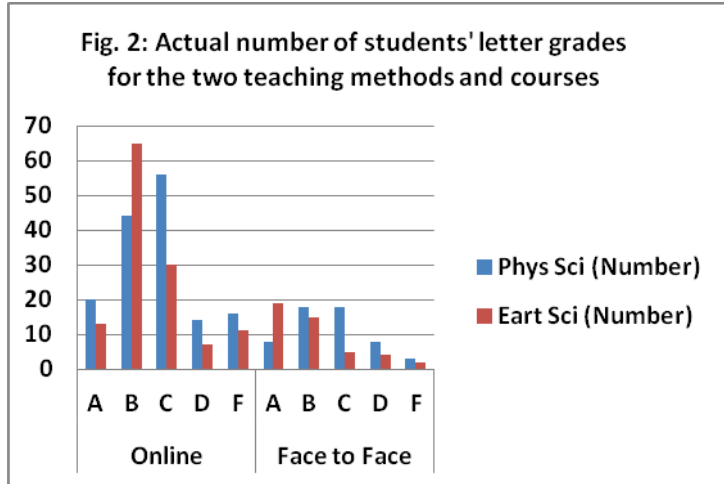
Table 2: Number of passed and failed students in the two courses for the two teaching methods

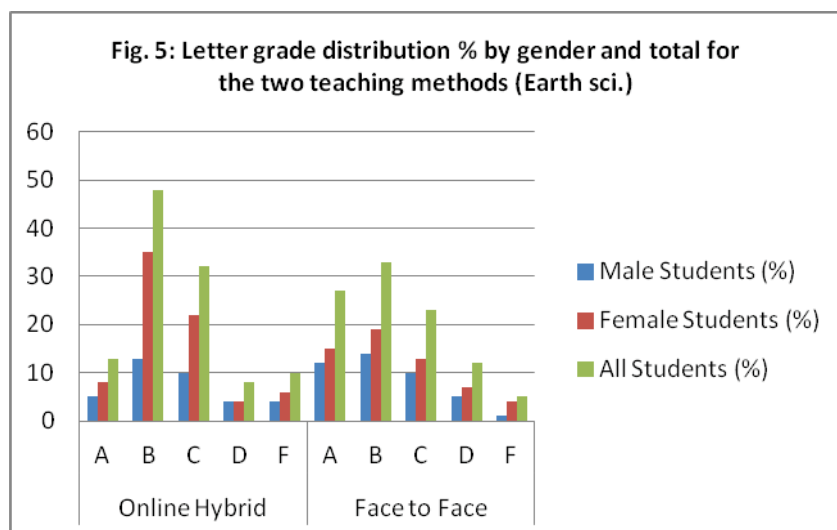
Courses	Teaching Methods				Critical Z-value*
	Online Hybrid		Face-to-Face		
	Pass	Fail	Pass	Fail	
Physical Science	120	30	44	11	0
Earth Science	108	18	39	6	-0.158

*not significant (P=0.05)



Letter grade distributions % by gender and for all students in the two teaching methods for physical science and earth science course are shown in Fig. 4 & 5, respectively.





Letter grade distribution trends on percentile basis, by gender and total for the two courses and teaching methods (Fig. 4 & 5) also show same trend as in Fig. 2 & 3. Since grade frequencies were not calculated on the bases of number of students by gender, results have no implication on gender outcome. The overall results of the study indicate that there is no distinct difference in students' letter grade outcomes when the two teaching methods are compared on physical science courses at BSU. The fact that there is no significant difference in the effectiveness of the two teaching methods on students grade outcomes indicates that the online hybrid teaching methods could possibly have an advantage over the face-to-face method because of to its higher student enrolment capacity at BSU. Provided that students have reliable access to computer and internet facilities, the online hybrid courses also have additional advantages for students in terms of accommodating part-time students, flexibility of schedule, minimizing time conflicts with other courses, and saving time and transport costs for commuting students. Higher tuition income from increased enrolment and less demand for lecture rooms are also additional advantages to the university from online courses. The effectiveness of online training and its advantage over the face-to-face has been reported by a number of investigators ([2], [5]).

Some worth noting problems frequently reported by students enrolled in online courses, however, are the lack of full access to computer and internet facilities, and freezing of computers and interruptions in internet connections. The limitation in expansion prospect of online education for low-income and technologically underprepared students has been reported by Jaggars and Bailey [5]. For duty minded and resolved students who are willing to use sufficient time in self-help, online training could be advantageous. However, it should also be noted that some students still prefer to be enrolled in face to face courses, because they don't feel comfortable to learn outside the customary way. This tendency, however, will gradually change and the ultimate teaching method will definitely be online. Recent trends in the registration of students for physical science courses at BSU indicates that, students are hesitant to register in face-to-face courses, and do it only when the online hybrid courses are filled. The rate of progress of online teaching and the ultimate replacement of face-to-face teaching method, however, is equally affected by the subject matter and the effectiveness of the online learning management system employed. Moreover, the ability of instructors to effectively utilize the adopted online learning management system and technology is also equally important.

5 CONCLUSIONS

The results of this study on pass and fail grade outcome of online hybrid and face-to-face teaching methods, and the overall letter grade distribution frequencies of students who took two physical science courses at BSU indicate that there is no significant difference between the two teaching method. As long as course materials are properly formulated and availed for students, strong support

is given through well established online learning management system, and reliable computer and internet facilities are in place for students, online education will not have a detrimental effect on students learning outcomes. Gradually, more students seem to be interested in online classes than in face-to-face classes of the same course, as evidenced by the registration trend of students. Most students register in face-to-face courses when the online courses are filled. The gradual increase in the preference of online education is advantageous to students and instructors, as well as to the university at large, as long as the required conditions are met by all parties involved.

REFERENCES

- [1] Barbara, et al. (2010). Evaluation of evidence-based practices in online learning studies. US Department of Education.
- [2] Bartley, S. J. and Golek J. F. (2004). Evaluating the cost effectiveness of online and face-to-face instruction. *Educational Technology and Society* 7(4), pp. 167-175.
- [3] Beatty-Guenter, P. (2003). Studying distant education at community colleges. *Journal of Applied Research in the Community College* 10(2), pp. 119-126.
- [4] Jaggars, S. S. and Bailey T. (2010). Effectiveness of fully online course for college students: Response to a Department of Education Meta-Analysis. Community College Research Centre.
- [5] Jahng, et al. (2007). Student achievement in online distance education. Retrieved: http://www.eurodl.org/materials/contrib/2007/Jahng_Krug_Zhan