Examining the Effectiveness of BlendFlex Instruction in Relation to Student Academic Outcomes in Mathematics

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Abstract

The study was to examine the effectiveness of BlendFlex instruction in relation to student academic outcomes in mathematics. BlendFlex instruction offers additional flexibility for students to choose between face-to-face, online asynchronous and online synchronous instructions according to their needs and change delivery methods at any time. Final grades for students who enrolled in a math course that was offered using three different delivery methods, BlendFlex, face-to-face and online, during the AY 2016-2017 and AY 2017-2018 were collected. Course success rates including grades A, B and C were calculated to indicate student academic outcomes. Chi-square analysis was performed to examine if statistically significant differences existed between students who chose BlendFlex, face-to-face and online instructions when compared course success rates. The results showed that the course success rate of online instruction was significantly lower than BlendFlex and face-to-face instructions. In addition, gender was a significant factor influencing course success rates of these instructions. The course success rate of online instruction for female students was significantly lower than BlendFlex and face-to-face instructions. The results implicated that BlendFlex instruction produced positive student academic outcomes. Instructors do need to consider gender differences when offering courses with different delivery methods.

Keywords: BlendFlex Instruction, Blended Instruction, Academic Outcomes, Course Success Rates, Mathematics

Introduction

Blended instruction is getting popular and offers several advantages over face-to-face and online instructions. As with face-to-face instruction, blended instruction provides direct contact with instructors and other students. Unlike face-to-face instruction, blended instruction allows students to work in a self-paced environment that accommodates other scheduling needs (Currie, 2017). Blended instruction, also referred to as hybrid instruction, was defined in varying degrees of specificity (University of Washington, 2012). Gomes (2015) stated that in blended instruction, instructors provide content via a combination of face-to-face and online instructions, delivering between 30 percent and 79 percent of the course content online, with the remaining contact delivered through face-to-face or other non-Internet mediums.

The online portions of blended instruction can be completed on the student's schedule; however, the face-to-face portions are at a set time and location, and therefore have the potential to create scheduling conflicts. Students who need the instantaneous feedback provided in the face-to-face portions may struggle in the largely self-guided online portions that afford little to no direct interaction with the instructor. Additionally, the required face-to-face portions of blended instruction can potentially negate any cost savings in travel, room and board, and the accommodation of employment schedules that are typically associated with online instruction.

To better accommodate the evolving needs of students, BlendFlex instruction was pioneered predominantly by a technical college in Georgia. The college received a $2.622 million grant from the United States Department of Labor Employment and Training Administration on September 25, 2013 and developed the BlendFlex instruction to provide services to those students who would not have local access to the instructional content but might not be comfortable with the self-paced format and demands of an online instruction. BlendFlex is a form of blended instruction that melds the face-to-face, online and telepresence methods into a single methodology. Rather than being restricted to only one delivery method of interaction for the duration of a course, students enrolled in BlendFlex courses can, at any time, participate in as many, or as few, of the delivery methods as they wish. To further clarify, a student registered for a BlendFlex course can choose to attend an in-class session during the pre-determined class meeting times on one day, attend an in-class session at a different campus the next day, then completely bypass the scheduled meeting times and participate online on another day. The student need only inform the instructor of their wish to change their delivery method and continue completing assignments according to the course syllabus.

The college has presented its BlendFlex instruction at various higher education conferences such as the 2016 Southern Association for Community College Research conference (Quinn & Lee, 2016) and has been featured in the University Business Magazine as an honoree in their Model of Excellence recognition program (Durso, 2017). At the time of the current study there is very little research focused on BlendFlex instruction. With the attention that BlendFlex instruction is receiving, and in consideration of the fact that other institutions could replicate the instruction, a complete analysis of the academic outcomes is critical.

The Current Study

The purpose of the current study was to investigate student academic outcomes in BlendFlex instruction at a large two-year technical college in Gegoria as compared to face-to-face and online instructions. The college offers over 120 programs of study that include short-term certificates, diplomas, and associate degrees. Subject range from traditional college courses such as English, Math, History, and Psychology to trade and industry focused courses such as Automotive Technology, Air Conditioning Technology, and Welding Technology. The college has averaged 6,008 students per term since fall of 2016. The student population has averaged almost 35% male and just over 65% female since fall of 2016.

BlendFlex instruction was launched on September 25, 2013 to provide multiple pathways for students in the college to take courses for healthcare training. Since its inception, BlendFlex instruction has expanded from healthcare-related courses to credit courses in other programs, non-credit adult education programs, and preparation classes for the GED® high school-equivalency test. The current study focused on general education courses, specifically Math XXXX due to the high number of sections offered by the college and the diverse student population registered for the course since it is a requirement for several different majors offered by the college.

During AY 16-17 and 17-18, 2,749 students who registered for MATH XXXX that was offered using three different delivery methods, BlendFlex, face-to-face and online instructions. Of those 178 students participated in BlendFlex instruction while the rest were in either face-to-face ($N = 1485$) or online instructions ($N = 1086$). Among the students who chose BlendFlex instruction, 49 were male (27.5%) and 129 were female (72.5%). In face-to-face instruction, there were 543 male students (36.6%) and 941 female students (63.4%). One student did not indicate his or her own gender. In addition, 274 male students (25.2%) and 812 female students (74.8%) chose online instruction (see Table 1). The average age of BlendFlex group ($M = 27.29$) was slightly younger than face-to-face ($M = 27.59$) and online groups ($M = 29.96$) (see Table 2).

Table 1. Gender of Students by Delivery Method during AY 16-17 and 17-18

Delivery Method	Gender		
	Male	Female	Other
BlendFlex	49 (27.5%)	129 (72.5%)	0 (0%)
FTF	543 (36.6%)	941 (63.4%)	1 (0.1%)
Online	274 (25.2%)	812 (74.8%)	0 (0%)
Total	866	1882	1

Table 2. Age of Students by Delivery Method during AY 16-17 and 17-18

Delivery Method	Age			
	M	*SD*	*Min.*	*Max.*
BlendFlex	27.29	8.96	17	62
FTF	27.59	9.47	16	67
Online	29.96	9.31	15	70

Final course grades were collected to examine student academic outcomes between BlendFlex, face-to-face and online instructions. The following grading scale was used in the college (see Table 3). Most courses require students to earn a minimum grade of C to receive graduation credit for the course. Therefore, course success rates including grades A, B and C were calculated as student academic outcomes to answer the following two research questions.

1. Were there any differences in course success rates between BlendFlex, face-to-face and online instructions?
2. Was gender a significant factor influencing course success rates between BlendFlex, face-to-face and online instructions?

Table 3. Grade Scale

Letter Grade	Description
A	100-89.5
B	89.4-79.5
C	79.4-69.5
D	69.4-64.5
F	64.4 and below
W	withdrawn before the middle of the semester
WP	withdrawn with a passing grade at the time of withdrawal
WF	withdrawn with a failing grade at the time of withdrawal
I	incomplete

Results

During AY 16-17 and 17-18, 178 students participated in BlendFlex instruction; 114 of them received grades A, B and C. According to the descriptive statistics shown on Tables 4 and 5, the course success rate of BlendFlex instruction (64%) was higher than face-to-face (60.6%) and online instructions (51.3%). A chi-square test was performed to examine if there were any statistically significant differences in course success rates between BlendFlex, face-to-face and online instructions. The *p*-value of the chi-squared test was .000 < .05, X^2 (2, $N = 2749$) = 25.931, which indicated that course success rates between BlendFlex, face-to-face and online instructions were not equal. Based on the z scores using the bonferroni's method for comparison of column proportions, the course success rate of online instruction (51.3%) was significantly lower than BlendFlex (64%) and face-to-face instructions (60.6%). Students who chose BlendFlex instruction (64%) performed slightly better than face-to-face instruction (60.6%), but there were no significant differences found between these two delivery methods.

Table 4. Final Grades for Students by Delivery Method during AY 16-17 and 17-18

Delivery Method	Final Grades								
	A	B	C	D	F	WP	WF	W	I
BlendFlex (N = 178)	29 (16.3%)	50 (28.1%)	35 (19.7%)	7 (3.9%)	28 (15.7%)	17 (9.6%)	5 (2.8%)	5 (2.8%)	2 (1.1%)
FTF (N = 1485)	331 (22.3%)	301 (20.3%)	268 (18.0%)	90 (6.1%)	187 (12.6%)	110 (7.4%)	117 (7.9%)	47 (3.2%)	34 (2.3%)
Online (N = 1086)	242 (22.3%)	172 (15.8%)	143 (13.2%)	48 (4.4%)	202 (18.6%)	103 (9.5%)	123 (11.3%)	31 (2.9%)	22 (2.0%)

Table 5. Course Success Rates for Students by Delivery Method during AY 16-17 and 17-18

Delivery Method	Course Success Rates		
	No (W, WP, WF, D, F, I)	Yes (A, B, C)	Total
BlendFlex	64 (36%)	114 (64%)	178
FTF	585 (39.4%)	900 (60.6%)	1485
Online	529 (48.7%)	557 (51.3%)	1086

According to the descriptive statistics shown on Table 6, the course success rate of BlendFlex instruction for female students (65.9%) was higher than face-to-face (64.2%) and online instructions (50.5%). For male students, the course success rate of BlendFlex instruction (59.2%) was also higher than face-to-face (54.5%) and online instructions (53.6%). Chi-square tests were performed to examine if gender was a significant factor influencing course success rates between BlendFlex, face-to-face and online instructions. First, the *p*-value of the chi-squared test for female students was .000 < .05, X^2 (2, N = 1882) = 36.849, which indicated that course success rates for female students between BlendFlex, face-to-face and online instructions were not equal. Based on the z scores using the bonferroni's method for comparison of column proportions, the course success rate of online instruction for female students (50.5%) was significantly lower than BlendFlex (65.9%) and face-to-face instructions (64.2%). Female students who chose BlendFlex instruction (65.9%) performed slightly better than face-to-face instruction (64.2%), but there were no significant differences found between these two delivery methods. Second, the *p*-value of the chi-squared test for male students was .774 > .05, X^2 (2, N = 866) = .513. It indicated that there were no significant differences in course success rates for male students between BlendFlex, face-to-face and online instructions.

Table 6. Course Success Rates for Female and Male Students by Delivery Method during AY 16-17 and 17-18

Gender	Delivery Method	Course Success Rates		
		No (W, WP, WF, D, F, I)	Yes (A, B, C)	Total
Female	BlendFlex	44 (34.1%)	85 (65.9%)	129
	FTF	337 (35.8%)	604 (64.2%)	941
	Online	402 (49.5%)	410 (50.5 %)	812
Male	BlendFlex	20 (40.8%)	29 (59.2%)	49
	FTF	247 (45.5%)	296 (54.5%)	543
	Online	127 (46.4%)	147 (53.6%)	274

Discussion

Several findings were discovered from the current study. First, according to the descriptive statistics, the course success rate of BlendFlex was higher than the other two instructions, which confirmed the positive results from the previous studies related to the comparison between BlendFlex and non-BlendFlex instructions (Durso, 2017; Quinn & Lee, 2016). These two studies found that BendFlex students have achieved slightly higher course success rates than their peers. BlendFlex instruction combines the benefits of both face-to-face and online instructions to enhance student learning with additional flexibility.

Second, the chi-squared test results showed that the course success rate of online instruction was significantly lower than BlendFlex and face-to-face instructions. This was similar to the results of previous studies comparing face-to-face and online instructions (Amro, Mundy, & Kupczynski, 2015; Flanagan, 2012). Amro et al. (2015) examined course final grades in face-to-face versus online college algebra courses at a college in south Texas and found that the average grade of face-to-face students was higher than that of online students. Flanagan (2012) had a similar finding. She compared final course grades between face-to-face and online courses using one-way single factor ANOVA and found that without considering gender, face-to-face students scored significantly better than online students did. In addition, in the current study, students who chose BlendFlex instruction performed slightly better than students who chose face-to-face instruction, but there were no significant differences found between these two delivery methods. This was similar to the results of previous studies comparing face-to-face and blended instructions (Adams, 2013; Blissitt, 2016; Tseng & Walsh, 2016). For example, Adam (2013) implemented a quasi-experimental, mixed-method, posttest design to compare academic outcomes and course satisfaction between students who received face-to-face (face-to-face lectures and lab sessions) and blended instructions (web-enhanced CD-ROM lectures). She found that there were no significant differences in academic outcomes related to cognitive and psychomotor domains between these two delivery methods. Blissitt (2016) used a quantitative, quasi-

experimental, nonrandomized control group, pretest-posttest design to compare academic outcomes and course satisfaction between face-to-face and blended instructions in an introductory nursing pathophysiology course. She discovered that there were no significant differences found in posttest scores between these two delivery methods. Tseng and Walsh (2016) compared students' motivation, level of learning outcomes and skills, and learning achievements (final grades) in an undergraduate English literacy course using two different delivery methods, face-to-face and blended instructions. Although students in blended instruction reported significant higher motivation and higher levels of learning outcomes, Tseng and Walsh (2016) found no significant differences in final grades of students between these two delivery methods.

Third, in the current study, gender was a significant factor influencing course success rate between BlendFlex, face-to-face and online instructions. The chi-squared test results showed that the course success rate of online instruction for female students was significantly lower than BlendFlex and face-to-face instructions. Female students who chose BlendFlex instruction performed slightly better than the ones who chose face-to-face instruction, but there were no significant differences found between these two delivery methods. No significant differences were found in course success rates for male students between these three instructions. This was similar to the results of Flanagan's (2012) and Paden's (2006) studies. Flanagan (2012) compared the gender differences in academic outcomes in a junior-level business statistics course that was offered using two different delivery methods, face-to-face and online. She included 53 females and 36 males in face-to-face instruction, and 68 females and 77 males in online instruction. She discovered that the academic outcomes (final grades) for female students significantly decreased from face-to-face to online instructions. However, there were no significant differences in academic outcomes found for male students between these two instructions. In addition, Paden (2006) examined the impact of three delivery methods (blended, face-to-face and asynchronous online) on student retention rates and academic outcomes in an introductory undergraduate mathematics course at a large private university. The results showed that females retained at a significantly higher rate than males in the blended instruction.

Conclusions

To conclude, there were three main findings from the current study. First, the descriptive statistics showed that the course success rate of BlendFlex was higher than the face-to-face and online instructions. Second, the chi-squared test results showed that the course success rate of online instruction was significantly lower than BlendFlex and face-to-face instructions. Students who chose BlendFlex instruction performed slightly better than students who chose face-to-face instruction, but there were no significant differences found between these two delivery methods. Third, the chi-squared test results showed that the course success rate of online instruction for female students was significantly lower than BlendFlex and face-to-face instructions. Female students who chose BlendFlex instruction performed slightly better than female students who chose face-to-face instruction, but there were no significant differences found between these two delivery methods. In addition, no significant differences in course success rates were found for male students between these three instructions.

The academic outcomes of BlendFlex instruction were positive when compared to face-to-face and online instructions. The course success rate of BlendFlex instruction was slightly higher than face-to-face instruction and significantly higher than online instruction. BlendFlex instruction combines the benefits of both face-to-face and online instructions, which helps produce positive academic outcomes and enhance student learning. In addition, instructors do need to consider gender differences when offering courses with different delivery methods. The data collected for the current study were quantitative, so directions for future research could employ qualitative research methods (e.g., observation, interview and focus group) to explore more about BlendFlex instruction related to 1) student learning process, 2) student perception and satisfaction, and 3) gender differences.

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