

Success And Retention Of Community College Students In Hybrid Versus Face-To-Face Anatomy Courses

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Abstract

As community colleges are increasingly offering distance education courses, it is of great interest to examine student performance specifically in science courses. The objective of this study was to examine the student success and retention rates in anatomy courses that were offered face-to-face (F2F) compared to hybrid offerings. In the F2F courses, both lecture and lab sessions were on campus while the hybrid version involved on-campus labs and online lectures. Student grade point average (GPA), as a performance factor, was also examined. The results indicated that the student success and retention rates were significantly lower in the hybrid anatomy courses compared to the F2F. In addition, student GPAs were significantly lower among those students who failed the classes compared to those who passed, regardless of the delivery mode.

Studies on student performance in distance education environments are needed to close the achievement gap among community college science students, particularly minority and nontraditional students. It is more likely that most nontraditional and minority students begin higher education at community colleges, and a lack of success in their science classes will place them at higher risk to drop out of college and may deter them from continuing in the sciences.

Keywords: Hybrid, face-to-face, Anatomy, Student Success, Student Retention, Student GPA

Introduction

As technology advances, online education has increasingly become a significant part of higher education to provide an accessible and flexible learning environment (Choy, 2002; Kumi-Yeboah, 2018). Hybrid learning is one of the most popular education methods of the 21st century due to its combination of traditional and online learning formats (Ahmad and Ismail, 2013 & Suwantara-rathip 2019). Hybrid courses are defined as courses that combine online and face-to-face (F2F) instruction, also known as blended courses. This unique mode of teaching provides students with control in their learning and accommodates their overloaded schedule by providing some flexibility in terms of time and location (Snart, 2017 & Stumpf et al, 2005).

While the rise of distance education has expanded learning opportunities for all students, it is most attractive to nontraditional students within the community colleges who are more likely to have employment and family obligations (Aslanian, 2001; Choy, 2002; Doherty, 2006; Radford, 2011). Nontraditional community college students are defined as either older than 24, part-time or full-time workers, or having delayed enrollment, and regrettably these students are more likely to drop out than traditional students (Bean, and Metzner, 1985; Parker and Greenlee, 1997; Tilley, 2014). This further demonstrates that online courses must go above and beyond in accommodating this student demographic by providing a more flexible schedule with a more interactive learning environment than F2F courses (Kaymak and Horzum, 2013). As the influx of student learning moves toward hybrid curriculum, it is essential to determine how best to chart academic success in the online domain (Broadbent and Poon, 2015).

Although hybrid courses have been reported to be more accessible to nontraditional students aiming to complete a larger number of courses per semester while juggling their other social obligations (Jaggars, 2014), there are not many studies addressing why science courses are less successful in the online environment (Rivera 2016; Hauser 2016). Some research has concluded that laboratory-based science courses are poorly suited for distance learning (Bradley, 2007; Flowers, 2011). On the other hand, Hauser (2016) explains that, based on F2F and online introductory biology courses at Virginia community college, the two different course styles did not affect student success rates.

To better understand the relation between the mode of delivery and factors impacting performance, such as student grade point average (GPA), Avi and Gold (2007) reported that there is not a statistically significant difference between the student retention or GPA in the traditional F2F vs. hybrid courses. However, another study reported that students with higher GPAs will perform better in online courses while students with lower gpa perform worse when taking online compared to F2F courses (Cavanaugh and Jacquemin, 2015). These studies show that additional research is required to better understand student success and other performance factors in hybrid vs F2F courses.

This study specifically focuses on the comparison of

student success and retention between two different instructional modes of delivery, F2F vs hybrid, and student gpa at a community college. This study will be a vital part in the advancement and transition into distance learning, especially in the sciences.

Materials and methods:

Course design

Human anatomy is an introductory course required for students who plan to apply to nursing, medical, physician assistant, and other health sciences programs. In addition to the regular community college students who have yet to earn a college degree, students who hold an undergraduate degree in non-science fields also enroll in these courses to fulfill the prerequisite requirements for health sciences programs. Topics covered in the anatomy class are histology as well as the anatomical structures of all organ systems. In our study, the lectures (16 weeks; 54 hours per semester) were accompanied by corresponding lab experiments for both modes of instruction (54 hours per semester). In the F2F classes, students attended lecture twice a week followed by the lab. In the hybrid classes, the lecture was completely online, and the labs were on campus. During the labs, for both hybrid and F2F courses, short introductions were presented followed by hands-on lab activities. The format of the syllabus, due dates, and course outlines were exactly the same for both F2F and hybrid courses. The main difference was that in the F2F courses, the lectures were given in person in the classroom, whereas in the hybrid classes, the same powerpoint based lectures were recorded for students to view on their own time. In addition, to make the online portion of the hybrid courses more interactive, the hybrid students also had to participate in weekly online discussions. The discussions covered the topics that were reviewed in the recordings during that week. Students were required to respond to specific questions and reply to two other students. The instructor provided feedback online on a regular basis. Both courses provided 45 minutes of office hours on campus, before the lecture in the F2F courses and before the lab in the hybrid format. Both courses used canvas as the learning management system. The final course grades in both F2F and hybrid courses were based on online chapter quiz-

zes (8% of the total course grade), weekly lab experiments (13% of the total grade), on campus exams (3 plus 1 final exam; 54% of the course grade), and lab practical exams (2 plus 1 final practical exam; 25% of the course grade). All exams for both modalities were administered on campus. The exams for F2F courses were given during the lecture period before the lab, and the exams for the hybrid courses were also given on campus right before the lab.

Courses studied:

For the purpose of this study, we reviewed the final grades of two anatomy courses that were offered on campus and two courses that were offered hybrid. The courses were offered in fall semesters over four years. All four courses were taught by the same faculty member with the same schedule (semester, time).

Data collection & analysis:

The final course grades for all four courses were obtained from the office of institutional effectiveness. The project was approved by the IRB committee and deemed as exempt (IRB: Protocol ID: 2020-04-107). The passing grades were considered as A (90% or above), B (80-89%), and C (70-79%), and the failing grades were D (60%-69%) and F (59% and below). Retention rates were defined as the percentage of students enrolled at census who completed the course and received a grade (i.e., did not withdraw from the course). All students who had earned at least one undergraduate degree were excluded from this study. This was done to avoid skewing the data with students who have already achieved college or university degree. Our primary interest is in the more typical community college students who are in the early stages of their higher education. Wolff et al. (2014) reported that many factors, including credits previously completed, play a role in student performance in a community college.

StatCrunch statistics software was used to analyze the statistical data in this study. Data for each course over the four semesters included in this study were organized into appropriate data files (hybrid vs F2F). Comparisons of final grades (passing vs failing grades) were analyzed using a t-test. To further compare the passing grades between the two groups (hybrid vs F2F), a proportion test was also performed. GPA of the students in the F2F and hybrid courses were also analyzed using a t-test. Withdrawal (W) in the hybrid vs F2F was analyzed using a proportion test. The data were analyzed at the 0.05 level of significance.

Results

Student demographics

Table 1 shows the student demographics, gender, and age in F2F and hybrid courses. The numbers indicate that the student population was similar in these courses.

	Hispanic	White	Asian	Black	Multiethnic	Native American	Unknown Ethnicity	Female	male	age
F2F	69.0%	10.9%	11.0%	7.4%	2.8%	1.8%	1.9%	70.9%	29.1%	18-65
Hybrid	70.0%	12.3%	11.3%	4.7%	1.9%	0.0%	0.0%	79.5%	20.6%	18-54

Table 1. Average percentages of student demographics in the F2F and hybrid courses.

Grade distributions

110 students were enrolled in the F2F courses and 107 in the hybrid courses at census. Students with one or more undergraduate degrees were excluded from success and retention rate calculations. Table 2 shows the data after the exclusion of these students.

Analysis of failing vs passing grades in F2F vs hybrid courses using t-test and two-sample proportion test

To conduct the t-test, only failing and passing grades were used for the calculations. A two-sample t-test was

conducted to evaluate if there is a significant difference in the success rates between F2F and hybrid courses. Students in the F2F courses had significantly higher success rates than students in the hybrid courses, $t(139) = 2.35, p = 0.0205$.

To further analyze the difference between the passing grades in the two groups (F2F and hybrid), a proportion test was performed. The F2F classes had a statistically significant higher passing rate (0.7805) than the hybrid courses (0.5763). $z = 2.60, p = 0.0094$. The p-value of 0.0094 also shows that the F2F courses had significantly higher success rates than the hybrid courses.

Grades	Passing (A, B, C)	Failing (D, F)	Withdrawal (W)
F2F (total of 104)	64 (62%)	18 (17%)	22 (21%)
Hybrid (total of 89)	34 (38%)	25 (28%)	30 (34%)

Table 2. Absolute numbers and percentages of students passing, failing, or withdrawing from the courses.

Analysis of withdrawals in F2F vs hybrid courses using a two-sample proportion test

A two-sample proportion test was conducted to determine if the withdrawal rate in F2F courses was different than the withdrawal rate in the hybrid courses. The F2F courses had a statistically significant lower withdrawal rate (0.212) than the hybrid courses (0.337). $z = -1.96, p = 0.025$. The p-value of 0.025 shows that proportion of F2F students who withdrew from the class were significantly lower than proportion of students in the hybrid courses. Overall, this analysis shows that the hybrid courses have a lower retention rate than the F2F courses.

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Average GPA	Passing (A, B, C)	Failing (D, F)	Withdrawal (W)
F2F	*3.04	*2.47	2.30
Hybrid	*3.08	*1.98	2.54

Table 3. The average term GPAs for F2F and hybrid courses (*= $p < 0.0001$)

Analysis of failing vs passing grades in F2F vs hybrid courses in relation to their GPA using a t-test

To better understand if the student GPA played a role in passing or failing the classes, t-tests were conducted. The analysis showed a significant difference in the GPA between failing vs passing in both F2F and hybrid (see Table 3: F2F failing vs passing: p -value < 0.0001 ; hybrid failing vs passing: p -value < 0.0001). The results indicate that students who failed the courses, regardless of the mode of delivery, had a lower GPA than those students who passed the courses.

Discussion

As technology advances, higher education is no longer restricted to traditional real-time teaching. Institutions of higher education are adopting new principles of learning in the form of hybrid and online education to accommodate more students (Ferguson, 2020). Community colleges, 4-year colleges, and technical colleges have all seen a rise in distance learning (Andrews Graham, 2019).

As the offering of distance education courses increases, it is crucial to examine student success and retention in these courses. In particular, it is of a great interest to learn more about student success in the science courses. The

results of this study demonstrate that student success and retention rates were significantly lower in the hybrid compared to F2F anatomy courses even though the lab sessions were taught F2F in the lab for both modalities. Though more accessible and convenient, studies have indicated that online education in community colleges have poorer outcomes in student achievement and retention. Our results are consistent with other studies that demonstrated lower success and retention rates in online courses (Crawford and Persaud, 2013, Verhoeven and Wakeling, 2011). Shea and Bidjerano (2016) have also reported that online learning has delayed degree completion among racial minority students working towards their associate degrees, while increasing achievement gaps.

Many factors play a role in student performance within an online learning environment at a community college level. Some factors that were studied and contributed to lower performance included financial hardship (Shea and Bidjerano, 2019), time management (Yilmaz, 2017), workload (Wolff et al., 2014), faculty engagement (Bolliger and Martin, 2018), and student ethnic background (Kaupp, 2012). In our study, the student demographics enrolled in both F2F and hybrid courses were similar and statistically not significant. Another factor that was examined in the present study was the effect of the student GPA in the F2F vs hybrid courses. There was a statistical significance between the student GPA who failed compared to those who passed the courses regardless of the mode of delivery. This means that students with a higher GPA did better in both F2F and hybrid classes. Our results supported the findings of Avi and Gold (2007) that showed no statistically significant difference between the student retention and GPA in the traditional F2F vs. hybrid courses. In their study, students were selected from both undergraduate and graduate students. However, another study reported that students with higher GPAs performed better in online courses while students with lower GPA performed worse when taking online compared to a F2F courses (Cavanaugh and Jacquemin, 2015). This study utilized over 5,000 courses from various disciplines taught at a large four-year university.

To our knowledge, there has not been any research study that demonstrated lower retention and success rates in science F2F compared to hybrid courses at a community college. In addition, the present study confirmed that while student demographics did not play a role in the student performance, a higher GPA contributed to passing both F2F and hybrid courses. Further studies are needed to identify the key factors that affect the lower success rates in science courses when offered in a hybrid format to community college students. Identifying these factors will assist faculty and policy makers to better support students when such courses are offered.

It is noteworthy that this study was concluded before COVID-19. Due to virtual offerings of science labs during the pandemic, learning more about student performance in distance learning environments is now more critical than ever.

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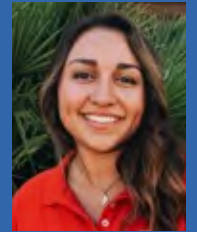
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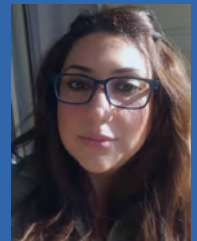
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