What Happened During COVID-19? Instructional Setting as a Predictor of Students' Academic Achievement

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Article Info	Abstract
	Our goal in the current study was to identify the degree to which instructional setting (remote versus traditional) predicted students' academic achievement during the COVID-19 pandemic. A matched sample of data from 194 undergraduate students who were continuously enrolled at a private university in the southeastern United States from the spring semester of 2020 through the spring semester of 2021 was selected for this study. Data from students enrolled remotely across 37 majors were matched by sex, enrollment status, and Spring 2020 GPA. Our findings showed that neither instructional setting, students' sex, nor the number of hours they attempted were important predictors of students' academic performance during the COVID-19 pandemic. Furthermore, the academic performance of students enrolled remotely on average remained unchanged from Spring 2020 through Spring 2021. Incidentally, our results revealed that the preceding academic performance was the only important predictor of students' academic achievement during this period. This finding confirms former research on the role that previous performance plays in the academic performance of undergraduate students.

Introduction

Millions of students take advantage of postsecondary online educational opportunities. Institutions have offered distance learning for at least 100 years, beginning with correspondence courses (Means et al., 2009), and the U.S. Department of Education reported that in the fall of 2018, 5.7 million undergraduate students, approximately 34 percent, participated in distance education (Hussar et al., 2020). Higher education institutions have been quick adopters of online learning as an instructional medium, and the prevalence within higher education of students completing an online course is increasing (Means et al., 2009, Seaman et al., 2018). The potential benefits of virtual learning are connecting students with educational opportunities globally and making higher education more affordable and accessible (Parker et al., 2011). The issue for instruction outside the traditional classroom centers around the ability to control the quality of the product delivered when the method is not face-to-face instruction.

COVID-19 changed higher education. In March 2020, many institutions closed their campuses, and students were forced to finish the semester online (Unger & Meiran, 2020). Facing the challenges of the 2020-2021 academic year in a pandemic, some institutions opted to offer online courses only, while others decided on a hybrid of

remote and traditional, face-to-face learning. A remote course is a course that was initially designed to be delivered in person but converted to also be taught online (BestCollege, 2021). These circumstances provided an opportunity to examine how students performed academically while enrolled in the same institution, taught by the same instructor, with one cohort receiving online instruction remotely and the other group on campus receiving traditional, face-to-face instruction.

Related Literature Review

The research on the efficacy of virtual learning is mixed. For instance, Means et al. (2009) observed that students who participated in online classes performed better academically than those who participated in face-to-face instruction. Furthermore, online students have been reported to be more engaged, have worked harder, and having been more satisfied (McMurtrie, 2021). Stack (2015) concluded that while evidence exists that online students have significantly higher achievement in classes compared to traditional courses, researchers need to be aware that online students are also more industrious, mature, older, and self-motivated. Therefore, the reason online students are likely to do better academically has more to do with the students' character rather than the instruction medium. Wilchia (2020) listed the strengths of virtual learning to include the variety of web-based resources, ease of accessibility, improved team-working skills, and improved self-directed learning. Although the expectation of online learning is high, not everyone agrees virtual learning is living up to its potential.

One criticism of remote learning is the struggle instructors and students have engaging with one another on an online platform. Mackey and Evans (2011) noted that the learning environment should allow students to absorb the material and develop knowledge used in real-world scenarios. However, Fedynich (2013) observed that online learning's lack of face-to-face time with the instructor hampered students' capabilities in meeting learning objectives and the ability of faculty to design online courses to meet students' needs. Consequently, the capacity of faculty to teach effectively and maintain students' attention in an online environment also impacts student learning (Perrotta & Bohan, 2020). McMurtrie reported that meaningful interaction is difficult online, especially in large classes (2021). Additionally, virtual teaching and learning weaknesses are technical issues for the instructor and student as the student struggles to maintain focus and concentration while staring at a screen for a protracted period (Wilchia, 2020). However, attempting to maintain a student's attention is not a unique problem in virtual learning. The online format appears to make maintaining student attention more difficult for the instructor to engage students and provide rigorous learning. Therefore, an ongoing need exists to examine how well students learn in an online environment and how effective teachers are in engaging students and communicating the required concepts to them.

Perception of Online Learning

Furthermore, if online learning becomes more mainstream, the perception of the medium of instruction needs to improve. Parker et al. (2011) revealed that less than half of adults believe an online class is equal to traditional, face-to-face instruction due to the apparent ease of cheating. Pomerantz and Brooks (2017) asserted that faculty have a love-hate relationship with online learning, believing that while the medium of instruction is beneficial,

they do not want to teach online. Moreover, they found that almost half of the instructors felt that students would not benefit or would be harmed by participating in an online class (Pomerantz & Brooks, 2017). Faculty are not the only individuals who question the value of virtual learning. Unger and Meiran (2020) pointed out that most students required to move to an online format in March 2020 did not find that virtual learning provided a similar experience as traditional, face-to-face learning. While the expectation of online learning is high, in reality, the public, faculty, and students are skeptical of remote learning as a viable medium of instruction that allows students to learn as well as those in traditional classrooms.

Sex of the Learner and Online Performance

The effectiveness of online learning also needs to be examined in light of how students' sex influences their academic performance. Women have outpaced men in postsecondary enrollments and graduation rates since the 1970s (Conger & Dickson, 2017; Seifert et al., 2013). Hussar et al. (2020) calculated that college enrollment for 18- to 24-year-olds is higher for females than males across all ethnic groups, while several researchers have documented that females, on average, have higher collegiate GPAs than males (Allensworth & Luppescu, 2018; Bazalais et al., 2016; Dai, 2020; Liang et al., 2018; Marini et al., 2019). Allensworth and Luppescu (2018) concluded that males receive lower grades than females with similar test scores taking similar courses under similar conditions. Women outperform men in attending postsecondary education institutions and in their academic performance.

The reasons for this gender gap are not entirely understood. Birnbaum and Yakaboski (2011) proposed that males drop out of high school at a higher rate and are more likely to enlist in the military or be incarcerated, and therefore do not enroll in higher education. Conger and Long (2010) stated that men take fewer credits and choose majors associated with lower GPAs and rates of persistence. However, Griffin, et al (2012) maintain that sex is not what influences GPA and academic performance but instead learning skills and strategies. If secondary education institutions are geared more toward females' learning styles, then Ewert (2012) is correct that males are less likely to perform scholastically and graduate because they are less academically integrated. Regardless of the reasoning, females are outperforming males academically.

The online learning environment does not affect the advantage women have over men academically. A stereotype exists that females are less adept at science and technology than their male counterparts (Trusz, 2020). Kupczynski et al. (2014) examined the difference in online course achievement between students' sexes. While their study did find that overall males had a slightly higher online course grade than females, a further test conducted among groups at the low, medium, and high overall GPA revealed different results. Students at the lower end of overall GPA, a significant difference was noted between grades with females receiving higher grades than males. Among students at the medium level of the overall GPA, females received slightly higher online course grades, but the difference was not significant.

Finally, for students at the high level of overall GPA, males received higher online course grades, but the difference was also not significant (Kupczynski et al., 2014). Even though males did better than females in online

classes, overall the results of further testing revealed only a significant difference in favor of females at the lower end of the overall GPA. Therefore, the online environment does not appear to provide an advantage to males over females.

Although findings, in the literature, regarding the role of instructional setting and demographic factors such as gender in the literature are variable, findings regarding the role of previous academic performance on students' performance at all levels has been consistent (Dika, 2012; Gooding et al., 1990; Manganelli, et al., 2019; Silva et al., 2020). This pattern is such that previous academic performance is a positive correlate and an important predictor of current academic performance. These findings are consistent across instructional settings (Abdullah & Mirzah, 2019; Cheung & Kan, 2002), gender (Blažev, et al, 2017; Mash et al., 2019), and across a range of majors (Bahri Yusoff et al, 2013; Blackman et al., 2007; Malmberg, 2006). There is no disputing the fact that the COVID-19 pandemic created exceptional and unusual circumstances in the higher education space. It is, however, not clear if these circumstances were such that they influenced the academic performance of students, particularly those students who received remote instruction.

Purpose of the Study

Since the outbreak of COVID-19, institutions have sought ways to replace hands-on learning with virtual teaching. Thirty-three percent of institutional leaders plan to continue to offer online options for students, while twenty-two percent will pursue more online opportunities in the future (BestCollege, 2021). Additionally, almost half of remote learners, defined as a student enrolled in an on-campus program who is taking online courses, anticipated enrolling in an online course even after their campuses return to normal operations (BestCollege, 2021). Whether or not the perception of the value of online education is accurate demands further research. A best practice to determine the efficacy of virtual learning is when the same instructor is teaching a remote and face-to-face course, and student performance can be measured by exam scores (Stack, 2015). Since students feel online learning is a viable option and many institutions plan to allow a mix of traditional face-to-face and online courses, research is needed to determine if instructors can effectively engage students and provide rigorous learning environments in an online setting. Our goal in the current study was to identify the degree to which instructional setting (remote versus traditional) predicted students' academic achievement during the COVID-19 pandemic. The hope is to understand, at least in part, if there were differences in academic performance between those students who received instruction remotely/online and those who were instructed in traditional face-to-face settings while completing the same course during the onset of the pandemic.

Research Questions

To accomplish these goals, we examined the following research questions:

RQ1 - To what extent does the combination of instructional setting (remote versus face-to-face), sex, semester course load, and previous academic performance predict the academic performance of college students during the Fall 2020 semester?

RQ2 - To what extent does the combination of instructional setting (remote versus face-to-face), sex, semester

course load, and previous academic performance predict the academic performance of college students during the Spring 2021 semester?

RQ3 - Are there differences by semester in the academic performance of college students who received remote instruction during the 2020/2021 school year?

Method

Sample

A matched sample of 194 undergraduate student scores across 37 majors from a private university in the southeastern United States were selected for this study. Table 1 provides a demographic summary of the characteristics of students for whom data were obtained. Only data from students who remained enrolled as either remote students or traditional students for the Fall 2020 and Spring 2021 semesters were included in the sample. Data from students who switched instructional settings or were not continuously enrolled during the period from Spring 2020 through Spring 2021 were excluded from the sample. The same cohort of students will be examined both semesters to determine if a significant difference exists between remote and traditional students' semester GPAs in the Fall 2020 and then for the Spring 2021. Students were grouped by sex and by the number of hours completed, either fewer or more than 60, by the end of the Spring 2020 semester.

Table 1. Demographic Characteristics of Students

	Traditional Instruction ($n = 92$)		Remote Instruction ($n = 92$)	
	Female (50 %)	Male (50 %)	Female (50 %)	Male (50 %)
Degree				
Bachelor of Arts (BA)	11 (23.9)	10 (21.7)	10 (21.7)	10 (21.7)
Bachelor of Business Admin. (BBA)	11 (23.9)	23 (50.0)	11 (23.9)	23 (50.0)
Bachelor of Fine Arts (BFA)	4 (8.7)	3 (6.5)	5 (10.9)	2 (4.3)
Bachelor of Science (BS)	20 (43.5)	10 (21.7)	20 (43.5)	11 (23.9)
Fall 2020 Enrollment Status				
Less Than Full Time (<12 hours)	1 (2.2)	0 (0.0)	5 (10.9)	4 (8.7)
Full Time (12 hours +)	45 (97.8)	46 (100.0)	41 (89.1)	42 (90.2)
Spring 2021 Enrollment Status				
Less Than Full Time (<12 hours)	3 (6.5)	4 (8.7)	7 (15.2)	8 (17.4)
Full Time (12 hours +)	43 (93.5)	42 (91.3)	39 (82.6)	38 (83.7)

Second, to maximize having students in the same course with the same instructor, students with the same or similar degree programs within the same department were compared. For example, male and female remote business majors were paired with non-remote business students. These students needed to have remained in the same degree program for the length of the study.

Third, to ensure students of the same academic caliber were matched together, the Spring 2020 semester GPAs were used. The intention was to have a baseline of comparison in how well every student completed the Spring 2020 semester so similar students would be paired together. Students needed to be within 0.46 difference of their Spring 2020 semester GPAs to be matched together. The researchers also wanted to discover if a significant difference existed between remote and on-ground students who had completed 60 hours or more before the start of the Fall 2020 semester compared to their peers with less than 60 hours.

Procedure for Data Collection and Analysis

The university studied had no set policy for the design of remote courses. Therefore, instructors were free to plan online courses that included asynchronous and synchronous learning opportunities. Some instructors recorded the lectures they delivered to the on-ground students and uploaded these sessions for the remote students to listen to at their convenience. Other faculty required remote students to sign in to a live video feed of the lecture and participate in the on-ground class. The university did require all instructors to be available for remote students to set up appointments to discuss any issues or questions they had about the course.

This was a nonexperimental study that used a matched subject design in an attempt to control for extraneous and confounding factors. Matched subject designs are often used in education to compare results when selecting large randomized samples is not feasible (Shuttleworth, 2009). The goal of matched subject design is to emulate the conditions of a within-subject design while avoiding the temporal effects that can influence the results and while utilizing the strength of a between-subject design in that every subject is only tested once, eliminating order effects from affecting the results (Shuttleworth, 2009). The difficulty is the tediousness of matching every subject in one group to the other group. Remote students were matched with non-remote students based on sex, hours completed, degree program, and Spring 2020 semester GPA. To address the research questions in this study, we conducted simultaneous multiple regression at an alpha level of 0.05.

Results
Research Question 1

Before conducting analysis to address our first research question, we evaluated the data for outliers, influential cases, and other assumptions for multiple regression analysis. Correlations between the predictor variables and outcome variables were reasonable with no issues of multicollinearity. Table 2 presents descriptive statistics and correlation coefficients for all variables in the regression model. We then conducted regression to test if the combination of the predictor variables (instructional setting, sex, hours attempted, and spring semester GPA) predicted the academic performance of college students during the Fall 2020 semester.

The results of this analysis (see Table 3) revealed that although the overall model was statistically significant, the only variable that was a meaningful predictor of students' academic performance for the fall semester was their prior academic performance (Spring 2020 GPA). The other variables in the model (instructional setting, sex, and hours attempted) did not contribute in a significant way to the model.

Table 2. Descriptive Statistics and Pearson Correlation Coefficients for Academic Performance and Predictor Variables - Fall 2020

	Variable	Mean	SD	1	2	3	4	5
1	GPA Fall 2020	3.21	0.65		-.20	-.10	-.09	.99**
2	Instructional Setting	0.50	0.50			.00	-.17*	-.03
3	Sex	0.50	0.50				-.03	-.10
4	Attempted Hours Fall 2020	14.67	2.14					-.09
5	GPA Spring 2020	3.22	0.67					

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.

Table 3. Simultaneous Multiple Regression Analysis for Variables Predicting Academic Performance of College Students Fall 2020 ($n = 184$)

Variable	B	SEB	β
Instructional Setting	0.02	0.02	0.01
Sex	-0.00	0.02	-0.03
Fall 20 Hours Attempted	0.00	0.00	-0.00
Spring 20 Semester GPA	0.96	0.01	0.99***
Constant	0.15	0.07	

Note. $R^2 = .99$; $F (4, 179) = 1812.05$, $p<.001$

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.

Research Question 2

Prior to conducting analysis for our second research question, we checked the data for outliers, influential cases, and other assumptions for multiple regression analysis. We found no issues of concern with the data. Table 4 presents descriptive summaries and correlation coefficients for the variables in the regression model.

Table 4. Descriptive Statistics and Pearson Correlations for Academic Performance and Predictor Variables - Spring 2021

	Variable	Mean	SD	1	2	3	4	5
1	GPA Spring 2021	3.10	0.80		-.06	.04	.05	.64***
2	Instructional Setting	0.50	0.50			.00	-.11	-.03
3	Sex	0.50	0.50				-.05	-.09
4	Attempted Hours Fall 2020	14.21	0.67					-.05
5	GPA Spring 2020	3.21	3.33					

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.

The model to address RQ2 included the same predictors as in RQ1, with students' Spring 2021 academic

performance (GPA) as the outcome variable. A summary of the regression model and the coefficients for the predictor variables is provided in Table 5.

Table 5. Simultaneous Multiple Regression Analysis for Variables Predicting Academic Performance of College Students Spring 2021 (n = 184)

Variable	B	SEB	β	
Instructional Setting	-0.05	0.09	-0.03	
Sex	0.16	0.09	0.10	
Fall 20 Hours Attempted	0.02	0.01	0.08	
Spring 20 Semester GPA	0.77	0.07	0.65	***
Constant	0.29	0.32		

Note. $R^2 = .65$; $F (4, 179) = 32.52$, $p<.001$

$*p < 0.05$ $**p < 0.01$ $***p < 0.001$.

As with the model for Fall 2020, although the overall model that included all the predictor variables was statistically significant, the only predictor that was important in the model was students' Spring 2020 GPA (a measure of their previous level of academic performance). The other predictors did not contribute significantly to the prediction of academic performance for the Spring 2021 semester.

Research Question 3

To address our final research question, we conducted a Wilcoxon Signed Rank test comparing the academic performance of students who received remote instruction during the Fall 2020 semester to their academic performance during the Spring 2021 semester. A total of 48 of the 92 students had higher Spring 2021 GPAs while 41 had higher Fall 2020 GPAs, and there were three ties. The differences in student academic performance between the two semesters was however not statistically significant $z = -1.22$, p =.224, $r^2 = .01$, a small effect size (Cohen, 1988). These results suggest that although GPAs were trending upwards from the fall to the spring semester, the differences between the semesters was not large enough to be considered statistically significant.

Discussion

The purpose of this study was to explore the extent to which instructional setting predicted undergraduate students' academic performance during the COVID-19 pandemic when compared to factors such as prior academic performance, sex, and course hours attempted. The Spring 2020 semester marked the beginning of the COVID-19 pandemic in the United States (Unger & Meiran, 2020). All but a few colleges and universities across the country switched to online-only instruction during this semester. However, by the fall of 2020, most schools were gradually returning to traditional in-person instruction while incorporating an array of COVID-related restrictions such as wearing masks, limited class sizes, and plexiglass shields.

Our findings show that neither instructional setting, students' sex, or the number of hours they attempted were important predictors of students' academic performance during the fall 2021 semester nor during the 2021 spring semester. Similarly, even when we only considered the performance of students enrolled in remote learning, there was no meaningful change in academic performance on average, as identified in previous work (Means et al., 2009; Stack, 2015; Wilchia, 2020). Ultimately, we found that the most important predictor of students' academic performance during this period was their prior academic performance. This finding regarding previous academic achievement is consistent with much of the extant literature where previous academic achievement is an important influence on the current academic achievement of students across all levels of education (Abdullah & Mirzah, 2019; Bahri Yusoff et al, 2013; Blackman et al., 2007; Blažev, et al, 2017; Dika, 2012; Manganelli, et al., 2019; Mash et al., 2019; Silva et al., 2020). In combination, these findings suggest that the instructional setting adjustments made at the peak of the COVID-19 pandemic did not alter prior patterns of academic performance among undergraduate college students.

Limitations

Foremost, a limitation of this study is that our sample is comprised of students from a single private university in the southeastern United States. Therefore, the single institution limits the generalizability of findings to other institutions. However, the postsecondary school does have students from all 50 states and several foreign nations.

Additionally, as a matched pairs design, participants could not, and were not, matched on every possible variable. While students were matched on semester GPAs, sex, and similar degree programs, other factors that could have potentially influenced outcomes were not matched. For example, if the students had a learning disability or if remote students were responsible for younger siblings or were working during times classes were meeting.

Furthermore, it is unknown to the researchers the motivations of the students who decided to be remote. Did students choose to be remote because they or their parents were afraid of COVID-19 and wanted to control their environment? Were the students required to go remote because without schools open, there was a need for them to be caregivers to younger siblings? Did students choose to be remote because they thought it would be easier and would save them money? These motivations would factor into the students' ability to perform academically in their courses.

Implications/Recommendations

Despite reservations expressed in the literature regarding remote learning when compared to face-to-face instruction, our study found that students were not disadvantaged academically by their participation in online courses. No significant differences were found between remote and traditional students enrolled in the same course taught by the same instructor. However, we were also unable to support the conclusion that students who participated in the online portion of the course performed better academically than those who did not, which disagrees with Means et al. (2009). Neither cohort was significantly affected by their mode of instruction.

If student disengagement was a factor in remote learning, then we would have expected to find a difference in the GPAs of online students compared to traditional students, but no statistical difference was found. This disagrees with several researchers who reported that online learning made the instructors' ability to connect with students and maintain their attention more difficult than in the traditional classroom (Fedynick, 2013; Perrotta & Bohan, 2020; Wilchia, 2020). Perhaps this was the result of the fact that instructors were more aware of their remote students due to the special circumstances and made more effort to engage them. Although students may benefit emotionally from participating in face-to-face learning, this study shows that students who are engaged in the learning process will do as well online as they do in the classroom. It also demonstrates those students who may struggle academically in either setting would benefit from additional help regardless of the mode of instruction.

In order to combat the negative bias toward online learning, institutions will need to be purposeful in their willingness to address common misperceptions concerning the pitfalls of remote learning. Administrators will need to stop telegraphing their own beliefs that only in the traditional classroom can academic rigor be maintained, relationships built, and teaching more effective (Lu, 2022). Furthermore, the administration will need to address faculty load questions if a hybrid model is to be maintained. Students will continue to expect higher education to be adaptable to their needs, especially now that all of us know that it is feasible to offer remote instruction. Additional studies will be necessary to help shift the perception, but our study demonstrates that there is no statistical significant difference between face-to-face instruction and remote learning.

Our findings did not allow us to conclude that instructional setting, sex, or number of hours completed were a predictor of academic performance in either Fall 2020 or Spring 2021. Correspondingly, the performance of online learners neither improved nor declined during the two semesters of their remote participation during the pandemic. The only important predictor was the student's previous academic performance. Therefore, higher education practitioners should embrace online instruction as a viable medium of instruction. However, educators should provide online students who are struggling academically with additional resources to help bolster their performance.

Suggestions for Future Research

Since the motive for higher education to offer remote instruction during the 2020-2021 academic year was due to a worldwide pandemic, further research should be conducted on instructors' preparedness to teach online. Faculty were forced into the position of altering their existing traditional courses to an online-friendly format, and while they and students acclimatized as best they could, further research on how effective remote learning could be with instructors who have been given additional tools to teach online would be beneficial. Faculty at the institution studied would get together at academic meetings and share tips and tricks they had learned to make the remote learning experience more valuable to their students. The assumption would be that instructors with training on how to effectively engage students in remote learning would provide a better experience than their peers who did not have this training.

Another research suggestion would be to repeat the study by examining students enrolled in the same course with

the same instructor but to parse out and examine if there is any difference between asynchronous and synchronous online learning. Is there a significant difference between students who are required to engage with their fellow students in the learning environment versus those who are free to sign in when it is more convenient for them to do so? Understanding the best learning conditions for remote students would aid administrators, curriculum developers, and faculty in providing a conducive learning environment

Conclusion

Despite the perceptions of the detriments of remote instruction, this study demonstrates no difference was found between students who were enrolled in traditional face-to-face courses and those students who opted for remote learning. The only statistically significant finding was that student success was linked to students' prior academic performance (Spring 2020 GPA). Administrators in higher education must be willing to address negative preconceptions concerning remote learning in order to produce a quality online education for their students. The demand for flexibility from institutions will not go away as the pressures of the pandemic ease.

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