Performance and Experiences across a Traditional, Hybrid, and Online University College Curriculum

Veronique Dierkx, University College Roosevelt

Abstract

The switch from traditional to online education amidst the COVID-19 pandemic has left many wondering what the impact will be on the learning experience of students. The current study compared exam grades obtained by university college students in a psychology course with a traditional, hybrid and online class format (N=142) and distributed a questionnaire among other university college students (N=89) including items about levels of satisfaction, interaction and motivation in an online curriculum as compared to a traditional one. The main findings were that there was a statistically significant difference in performance on one of three exams, in which the online grades were significantly higher than those obtained in the traditional and hybrid format. Moreover, levels of satisfaction, interaction and motivation all dropped when students switched to an online curriculum. These findings are consistent with previous research and could be explained by the inexperience of both students and professors with an online curriculum before the pandemic, causing the learning experience to be less optimal because of the suddenness of the transition. As the frequency of interaction in class decreased, so did the motivation and satisfaction of students, as these three have been shown to be highly correlated by previous studies. The higher online grades in the last exam could be explained by the gaining of experience with online teaching towards the end of the semester, the lack of social activities that were possible during this time or the increased cheating efforts in the online format.

Introduction

The performance of students in online or hybrid class formats compared to the traditional in-person class format is dependent on various factors including student satisfaction, interaction, and motivation. [1, 2] Previous studies that examined the relationship between these variables were either dated, since improvements in technology are made at a very rapid pace, or conducted before the pandemic, meaning they failed to capture the suddenness of the switch and the effect that this had on students and their learning. Many of these studies found no differences in the performance of students, but did report a drop in student satisfaction, motivation and interaction in an online class format as compared to a traditional class format. [3, 4, 5, 6].

Present Study

The present study consists of two parts, the first examining student performance across different class formats and the second examining a self-report by students about the differences between traditional and online education. For Study 1 it was hypothesized that there would be no difference in performance based on exam grades between traditional, online, and hybrid education in an introductory psychology class. Study 2 examines the difference between online and traditional education in terms of student satisfaction, interaction, and motivation. It was hypothesized that student satisfaction, motivation and interaction would be higher in the traditional class format than in the online class format.

Study 1 - Analysis of grades

Methods

Participants. The participants in the first section of the current study were four groups of university college students (N =142) enrolled in the Introduction to Psychology course in the Fall 2019 semester, the Spring 2020 semester, the Fall 2020 semester and the Spring 2021 semester at University College Roosevelt.

Materials

Instruments. The grades that were used in the comparison were obtained by in-person exams conducted in the Fall 2019 semester, the first half of the Spring 2020 semester and the Fall 2020 semester, as well as online exams conducted in the second half of the Spring 2020 semester and in the Spring 2021 semester. The in-person exams as well as the online exams included 50 multiple choice questions with one correct answer and 3 alternatives sorted per topic. Three different setups were used in the four semesters as a result of the teaching methods changing according to COVID-19 restrictions (see Table 1).

Table 1. *Type of lectures that were compared per semester of students*

Situation	Semester	N	Type of classes	Type of exams
A	Fall 2019	47	In-person classes	3 in-person exams
B	Spring 2020	26	In-person classes 1st half semester + online classes 2nd half semester	1 in-person exam + 2 online exams
C	Fall 2020	46	Hybrid design: in-person classes and online classes throughout semester	3 in-person exams
D	Spring 2021	23	Online classes	3 online exams

Analysis. To analyse the variations in grades between the exams in the four semesters a one-way repeated measures analysis of variance ANOVA was conducted in SPSS. Only two out of the three exams were used for this analysis, as the results for the third exam of the spring 2021 students were not available at the time of the analysis. A second analysis was conducted comparing the results of the third exam of the fall semester 2019, spring semester 2020 and fall semester 2020 using a one-way ANOVA. The grades were analysed using a one-way ANOVA. To analyse the data SPSS version 26 was used, with an alpha level of .05 for all statistical tests.

Results

Two separate analyses were conducted to analyze the obtained grades in the three different class formats. Firstly, an ANOVA was conducted to evaluate the null hypothesis that there is no change in student's exam grades in Exam 1 and 2 based on the class format (N = 116, see Table 2). The results of the ANOVA did not indicate a statistically significant effect, Wilks Lambda = .98, $F(2, 113) = .95$, $p = .39$, η p2 = .02. There was no statistically significant main effect for the exams, $F(1, 71.26) = 1.16$, $p = .29$. There was no statistically significant interaction effect between the exams and class format, $F(2, 58.26) = .95$, $p = .39$. Thus, the null hypothesis was not rejected.

Table 2

Descriptive Statistics

	Approach	Mean	SD	N
Exam I	Traditional	74.68	11.49	47
	Hybrid	69.59	13.73	46
	Online	71.22	8.92	23
	Total	71.97	12.13	116
Exam II	Traditional	74.68	12.28	47
	Hybrid	72.62	13.60	46
	Online	71.70	9.71	23
	Total	73.27	12.34	116

A one-way between subjects ANOVA was conducted to evaluate the null hypothesis that there is no difference in student performance in Exam 3 in terms of grades, based on the class format (N =119). There was a statistically significant interaction between class format and student performance in Exam 3, $F(2, 71.78) = 5.65$, $p = .005$, therefore the null hypothesis was rejected. Levene's test showed that the variances for the grades of Exam 3 were not equal, $F(2,116) = 4.37$, $p = .015$, η p2 = .07. Post-hoc comparisons to evaluate pairwise differences among group means were conducted with the use of the Games-Howell test since equal variances were not assumed. The test revealed statistically significant pairwise differences between the mean scores of students in the online class format and traditional class format, as well as between those in the online class format and hybrid class format, $p < .05$. The mean scores of students in the traditional class format and the hybrid class format did not significantly differ, $p > .05$ (see Table 3).

Table 3

Multiple Comparisons

Dependent Variable: Exam III

Games-Howell

		Mean			95% Confidence Interval	
(I) Approach	(J) Approach	Difference (I-J)	SE	Sig.	Lower Bound	Upper Bound
Traditional	Online	-8.98*	2.94	.009	-16.03	-1.93
	Hybrid	-1.74	2.87	.818	-8.58	5.10
Online	Traditional	8.98*	2.94	.009	1.93	16.03
	Hybrid	7.24*	2.65	.022	.87	13.62
Hybrid	Traditional	1.74	2.87	.818	-5.10	8.58
	Online	-7.24*	2.65	.022	-13.62	-.87

*. The mean difference is significant at the 0.05 level.

Study 2 - Questionnaire

Methods

Participants. Participants in the second section of the current study were university college students, from three different university colleges, N =89: University College Roosevelt (UCR), University College Utrecht (UCU) and University College Maastricht (UCM), N =70, N =10, N =9, respectively. The ages of the participants ranged from 18-26, with M=20.43. The participants were in different years of their bachelor's degree, with N =14 being in their

first year, N =27 in their second year and N =48 in their third year. Out of the participants, N =75 identified as female, N =10 as male, and N =4 as neither male nor female. The majority had the Dutch nationality (N=47), the other participants reported 22 other nationalities. 65 Of the participants reported that they were currently residing in the city where they study, and 24 reported that they did not. All participants reported using a laptop or computer most frequently when following online classes.

Materials

Instruments. To analyse the students' motivation, satisfaction, time spent on studies and participation in online classes compared to traditional classes, students filled in a questionnaire (see Appendix) using Google Forms. The questionnaire was developed by Meeter et al. (2020) [6] and adapted to fit the educational format used at University College Roosevelt.

Procedure. The questionnaire items were presented in a Google Forms document, the link for the questionnaire was distributed in the student Facebook groups of University College Roosevelt, University College Utrecht, and University College Maastricht, as well as in a general Facebook group for university colleges in the Netherlands. Prior to the data collection participants were asked to sign an informed consent item.

Analysis. Bivariate correlation analyses and frequency analyses were conducted to both explore the relationship between variables in the current online educational format as well as to analyze how variables have changed since switching to the online format.

Results

Frequency analyses show that the frequency of reported interaction and active participation in class (7-point Likert-scale items 15 to 18) are lower in the online class format (M=3.92, SD=1.37; M=4.24, SD=1.73) as compared to the traditional class format (M=6.22, SD=.77; M=5.60, SD=1.57). Bivariate correlation analyses showed that the interaction and active participation in class were both significantly correlated with student satisfaction in the online class format in both lectures and meetings ($r(87) = .260$, $p < .05$; $r(87) = .456$, $p < .01$ for lectures and $r(87) = .427$, $p < .001$; $r(87) = .336$, $p < .001$ for meetings) and motivation in the online class format ($r(87) = .308$, $p < .01$; $r(87) = .541$, $p < .01$). Moreover, the level of student satisfaction in online lectures and meetings (M=4.13, SD=1.44; M=4.54, SD=1.34) was also lower than that in traditional lectures and meetings (M=5.68, SD=.93; M=5.69, SD=1.03). The student satisfaction in online lectures was also significantly correlated to motivation ($r(87) = .513$, $p < .01$). Student motivation for their studies declined, from M=5.82, SD=1.11 before COVID to M=3.79, SD=1.72 after COVID. The motivation in the online format was significantly correlated with interaction and active participation and satisfaction which were all mentioned above, as well as hours per week spent on studies ($r(82) = .264$, $p < .05$). The reported attendance rate went down for both lectures and meetings after the classes switched to the online format during COVID-19. The participants reported attending 94% of all lectures and 93% of all meetings on average before the pandemic and attending 90% of both after the switch to online education occurred. In both scenarios, attendance was required.

For the two qualitative items in the questionnaire (40 and 41) the replies were coded and then sorted into various topics based on their similar content (see Appendix).

Discussion

The results of Study 1 indicate that out of the three exams that are conducted in each semester, the performance of students based on their grades did not show a statistically significant difference in different class formats on the first two exams, but it did differ significantly on the third exam which means the hypothesis that students' performance would not differ between class formats was only partly rejected. On the third exam, students obtained a significantly higher score in the online format than in the traditional and hybrid format. It was hypothesized that there would be no difference in performance based on exam grades between traditional, online, and hybrid education, and this hypothesis was therefore rejected for the third exam but corroborated for the first two exams. The results concerning the first two exams are in line with previous research [5] which found no differences in performance of the students but rather a decreased satisfaction rate, which in Study 2 of the present study is also the case.

The results of the second study show that the hypotheses about motivation, interaction and satisfaction were all corroborated, and this suggest that the overall attendance has gone down since switching to the online format and that students' expectations of their performance this semester have also gone down. Students reported that the most demotivating elements of online education were related to the lack of interaction in class, the high workload, and the increased amount of screen time. Not only was the interaction in class rated lower in the online class format, but participants also rated their own level of active participation as being lower than it used to be in the traditional class format. This was reflected in the open questions, in which participants reported feeling disconnected from their peers as well as their instructors and finding the material more difficult to follow online. These replies are consisted with the theory of the three types of

interaction as defines by Moore (1989), [7] the interaction of students with each other, with their instructor and with the course content. Lowering these interactions could result in a decrease in motivation and student satisfaction [2, 8, 9] and this exact effect could be observed in the results of the second study. A lower amount of student satisfaction and motivation has been linked to a decrease in performance and this effect is even greater in online education. [1, 10] The results of both Study 1 and Study 2 are in line with previous research that reported that students performed equally well in a hybrid format and fully online format, but that they preferred the hybrid class format over a fully only class format which led to a higher level of reported satisfaction. [11, 12]

An important element that plays a significant role in the interpretation of the results in the current study is the context in which the switch to online education was made. As Graham, Woodfield and Harrison (2013) [13] pointed out, the proper infrastructure for online education is an essential component in providing high quality classes. As universities were not fully prepared for the change to a fully online class format, this could have led to the quality of the education not being as optimal as it could have been with adequate preparation and training for both students and professors. [14] However, as classes get organized with adequate online interaction in mind and students learn to adapt their studying habits to an online setting, satisfaction could increase which in turn has a positive impact on the grades, which in Study 1 is demonstrated by the significantly higher grades on Exam 3 in the online format. [15]

Unfortunately, a more negative interpretation of the improved online results also exists. As students familiarized themselves with the online format, cheating efforts on online exams have also increased. [16] Even though precautions were taken by the instructors of the psychology course in Study 1 to minimize the possibility of cheating (by for example shortening the time limit on the exam), it still remains easier to cheat on an online exam than on an exam in the traditional format. Measures that have shown to be effective against cheating during online exams include proctoring [17] but as this was not implemented in the psychology course the possibility that the grades were significantly higher because students cheated on the exam exists.

Limitations

A limitation of the present study is that it analyses a hybrid and online class format in the midst of a pandemic, it is thus more difficult to generalize these results to a situation where the decision to switch to an online educational format was a deliberate and well-prepared one. The results of this study should therefore mostly be interpreted with the context in mind and not outside of the COVID-scenario [14].

Directions for future research

A follow up study could be conducted at a later time as students will most likely have had much more experience with online and hybrid teaching by then and might have developed new levels of efficiency, and institutions and their instructors might have had more time to set up a more permanent distance education system. In a different scenario, students and instructors might get more drained the longer online teaching goes on. Moreover, future studies should focus on improving the balance between the various sexes used in the study.

Conclusion

To conclude, when comparing a traditional, hybrid, and online university college curriculum, there was only a statistically significant difference in students' performance in the third exam, showing higher grades were obtained in the online format. When looking at student satisfaction, motivation, and interaction it became evident that the levels of all three dropped when students received online classes as opposed to traditional classes. These findings are important when studying the effects of the sudden transition from traditional to online education in university colleges during the COVID-19 pandemic, which continues to impact education worldwide.

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Appendix

Table 4

Replies to questionnaire item 40 "What are for you motivating and demotivating elements in online education?" were coded and sorted into topics. The table includes the number of replies per topic, whether the reply was motivating (+) or demotivating (-) and two sample replies.

Topic	N	Motivating	Sample replies
Interaction	41	-	"The lack of social interaction with other students and professors often contributes to me not wanting to work/missing out on advice or guidelines for the assignments." (29)
		-	"It can be hard to be put in the effort when the interaction with your peers is limited." (59)
Logistics/time management	29	+	"I can get so much more done than in pre-corona times. There is much more flexibility with scheduling." (35)
		+	"The reduced time and fuss spent on commuting to and from class so it feels like I actually have more time to spend on the actual homework or lectures." (58)
Passing/ graduating	17	+	"A motivating element is working towards my graduation and master programme." (60)
		+	"I am motivated by the need to do well in university so I can get into a good Master's programme/scholarship and learn as much as I can." (72)
Technology/ Screen time	25	-	"Lots of screen time makes you tired and your eyes hurt, less motivated." (7)
		-	"Stress factors such as poor WiFi during exams or presentations." (26)
Distractions	8	-	"You just watch and listen. So many distractions." (11)
		-	"It's really easy to lose focus and get distracted." (46)
Material/ workload	17	-	"Things are more difficult to understand online."(86)

		-	"The insane extra workload." (27)
Social life	14	-	"It feels extremely lonely and I don't have any group projects this semester so I don't ever see or talk to anyone." (13)
		-	"The most demotivating thing is my environment and not being able to have a human connection with others." (76)
Feeling of collectiveness	15	+	"It is motivating that everyone is in the same boat and trying to make the best of a bad situation." (90)
		+	"Professors seem to try hard." (32)
Other	17	-	"Physical back pain which makes following classes difficult." (26)
		+	"Giving presentations is a lot easier." (46)

Table 5

Replies to the questionnaire item 41 "What changes could the university make to make the online program work better for you?" were coded and sorted into topics. The table includes the number of replies per topic and two sample replies.

Topic	N	Sample replies
Workload	28	"They can't end covid but they could make us work a little less. It is much harder with no outlets other than work to focus. Especially when spending all day on our computers." (85)
		"A reduced workload. It's all very exhausting and having the same amount of workload does nothing." (61)
Interaction	16	"Have the professors adapt to online learning by teaching classes in a more interactive way." (59)
		"More interactive and less lectures, more engaging through having things to do instead of just listening to lectures." (6)
Class time	20	"I like the idea of smaller groups and 1-hour lectures, I get way more out of that than 2-hour lectures." (12)
		"Make the tutorials 1,5 hours instead of 2 hours." (78)
Hybrid system	8	"Bring back the hybrid system as soon as it's allowed." (39)
		"If they partially open to have maybe half of our meetings face to face, I would move to Maastricht and be more motivated." (72)
Technology	8	"Better wifi conditions on campus." (67)
		"Give professors more info/help on how to present online and use different technology to make the learning experience as interactive and fun as possible." (86)
Other	4	"If we go back leave online as an option. The hyperflex rules for attending online were ableist." (33)
		"Less (closed-book) exams, more focus on papers/essays." (64)