

THE IMPACT OF DIGITAL TEACHING ON STUDENT ACHIEVEMENT

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ABSTRACT

The epidemic in the summer of 2022 has caused universities in Hainan Province of China to postpone the time for students to return to their campuses. All universities have adopted online teaching and adopted online and offline teaching after returning to schools, which has also prompted university teachers to turn to the application of digital teaching. Taking the "Auditing" course in the first semester of the 2022-2023 academic year as an example, this study is carried out on the 1-2 class of 2020 financial management program of Haikou University of Economics, with 93 students, and the empirical results show that digital platforms can promote students' participation in effective study, and there is a significant positive correlation between students' classroom attendance, online classroom activity frequency and final grades. The time factor of students' online self-study was not significantly correlated with the final grade, mainly because the proportion of online self-learning assessment set by teachers on the digital teaching platform was not enough to attract students to participate in online self-learning study. This study can promote the application of digital teaching practice by teachers.

Keywords: Digital teaching, Digital platforms, Student achievement

INTRODUCTION

The importance of the digital environment to learning is increasing. In the context of new information technologies, digital teaching has become an integral feature of societies and their education systems around the world. Digital teaching is a broad term that refers primarily to teaching and learning through the model of digital environment. Two important components of digital teaching are digital technology equipment and digital platform [1]. Digital technology equipment refers to specific devices that can be used for learning, such as smartphones and tablets, while digital platforms refer to specific learning tools used to influence learning, including online videos, audio recordings, online discussion

groups, and spaces where information is stored and accessed, such as smartphones and tablets, using these technologies for access and learning through digital platforms [2]. Therefore, the main research question raised in this study is whether digital pedagogy is related to student achievement [3], and if so, how. The pandemic has wreaked havoc on the way traditional higher education institutions are taught [4]. Unlike the shift from face-to-face teaching to hybrid or flipped classrooms in the past, emergency remote learning was the result of a temporary shift from traditional to alternative remote learning due to the crisis situation [5]. During the summer vacation of 2022, the epidemic caused universities in Hainan Province to postpone the return of students to their own schools, and all schools adopted online teaching before students returned to school and adopted online and offline teaching after returning to school. The "Auditing" course is a digital teaching method, online teaching and online and offline combined teaching mode mainly use teaching platform, and the classroom adopts live broadcast and synchronous sessions (i.e. a variety of classroom activities).

METHODOLOGY

Research sample.

This study took the course "Auditing" in the first semester of the 2022-2023 semester as an example to study the influencing factors of students' performance under the digital teaching method, and the research sample is the 1-2 class of financial management in Haikou University of Economics in 2020, with 93 students.

Preparation before the study

In order to ensure the smooth implementation of the digital delivery mode, the course of this study was taught using the Xue Xi tong system, and the students were informed of the teaching mode in advance before the formal teaching, and asked the students to give feedback on whether the Xue Xi digital platform is working correctly on their devices. Since the system had been running smoothly in the university for many years, no students had reported to this study that the system cannot operate smoothly. The digital environment is understood as the various digital environments in which the learner is active, such as electronics, interactive digital collaboration, and digital research [6]. Although it is easy to set up content for learners to learn on their own on digital platforms, the effect of online self-learning is not the same as that of offline learning in the classroom [7]. Digital environmental impact learning experiences that offer new opportunities but also challenge existing potential [8]. Therefore, this study uploaded relevant electronic notes, learning tasks, learning videos, knowledge point summaries, effect tests and other related content of the course by chapter, so that students can pre-learn and review the relevant content by themselves outside the classroom.

Data acquisition

In order to motivate students to actively participate in the digital teaching platform, students were informed of the usual score ratio of this course, which is, 10% of the usual score for online extracurricular self-learning materials, 70% of the usual score for online and activities with teachers, and 20% for participating in classroom teaching. The values of the variables are tailed by the natural logarithm. In this study, the Stata 17 software was used to conduct an empirical study and analysis of the data.

Variables

Students' attitudes towards engaging in the digital environment, using online platforms for self-learning, and cooperating with teachers in online learning and activities play an important role in the evaluation of research results. There are three independent variables to be studied in this study, online self-study time, frequency of online classroom activities, class attendance, and the dependent variable is the final grade. The independent variable data is taken from the statistics of the system. The final grade data is taken from the results of the final closed-book exam.

Table 1 Variables

Variable type	Variable symbol	The name of the variable	Variable metering
Independent Variable (IV)	FS	Final Grade 1	The natural logarithm of the final closed-book exam results
	FST	Final Grade 2	The natural logarithm of grades in the system
Dependent variables (DV)	AT	Class attendance	The natural logarithm of class attendance
	HE	Online self-study time	The natural logarithm of online self-study time
	CL	Frequency of online classroom activities	The natural logarithm of the frequency of online activities in the classroom

Research hypotheses.

The pandemic has wreaked havoc on the way traditional higher education institutions are taught. Unlike the shift from face-to-face teaching to hybrid, online or flipped classrooms in the past, the change in emergency remote teaching – the temporary shift in instructional delivery to an alternative remote delivery model due to the crisis situation – occurred suddenly and unplanned. The study analyzed the impact of emergency distance learning, teaching-related variables (class size, synchronous/asynchronous delivery) and organizational aspects related to the use of digital support technologies on student achievement in the Faculty of Telecommunications Engineering and its findings showed an improvement in students' performance in emergency remote digital teaching [9]. Therefore, this paper argues that under other conditions, classroom attendance, online self-study time, and frequency of online classroom activities positively affect students' final grades, and hypotheses 1, 2 and 3 are proposed as follows.

Hypothesis 1: There is a positive correlation between class attendance and final grades.

Hypothesis 2: There is a positive correlation between online self-study time and final grades.

Hypothesis 3: There is a positive correlation between the frequency of online activities in the classroom and the final grade.

Empirical results and analysis

Descriptive statistical analysis of variables

It can be seen from Table 2 that the maximum values of the explanatory variables FS and FST are 4.595 and 4.615, respectively, while the minimum values are 1.792 and 3.036, and the difference between the maximum and minimum values of the final closed-book examination results is very large, indicating that the difference between students' scores in the closed-book examination is large, and there is also a difference in the maximum and minimum values of the academic scores in the system, but the difference values are not as large as the differences in the scores in the closed-book examination. The mean values of the explanatory variables were 4.086 and 4.411, the mean value of the closed-book examination score is lower than the score of the academic statistics, and this result is consistent with the analysis of the maximum and minimum values. Among the explanatory variables, there is a large difference between the maximum and minimum values of online self-study time, mainly because the online self-study time is driven by students' self-control, and the proportion of online learning Xi time assessment set in this course is only 10% of the usual grades, which may lead to students' lack of motivation for online self-learning because the proportion of ordinary sub-assessment settings is lower than that of other items. Among the explanatory variables, the difference between the maximum and minimum values of attendance was the smallest, mainly because the Daxing Zhihua School of Accounting of Haikou University of Economics attaches great importance to the management of student attendance. In general, the overall attendance rate of students is better.

Table 2 Descriptive statistics of explanatory variables and explanatory variables

Variable	Note	Mean	Std. Dev.	Min	Max
AT	93	4.579	.091	3.932	4.615
HE	93	2.658	1.438	0	4.615
CL	93	4.436	.359	2.59	4.615
FST	93	4.411	.255	3.036	4.615
FS	93	4.086	.587	1.792	4.595

Correlation results and analysis between variables

It can be seen from Table 3 that the correlation coefficients of the explanatory variable classroom attendance, class online activity frequency and the explanatory variable final grade 1 were 0.264 and

0.271, respectively, and the results showed a significant positive correlation, and hypothesis 1 and hypothesis 3 passed the significance test. The results of the explanatory variable online self-study time and the final grade 1 of the explanatory variable are non-significant positive correlation, and hypothesis 2 does not pass the significance test, mainly because the online self-study time is driven by the students' self-control, and the proportion of online self-study time assessment set in this course is only 10% of the usual grades, because the proportion of the usual score assessment is lower than that of other items, it may lead to the lack of motivation for students to learn online independently.

Table 3 Variable relevance table

Variables	FS	FST	AT	HE	CL
FS	1.000				
FST	0.305*	1.000			
AT	0.264*	0.760*	1.000		
HE		0.229*		1.000	
CL	0.271*	0.980*	0.721*		1.000

*p < 0.01, ** p < 0.05, * p < 0.1 (only significant results are reflected in the table).*

Analysis of regression results

The P value in Table 4 is .011, which shows a significant positive correlation between the explanatory variable classroom attendance and the explanatory variable final grade 1, which verifies hypothesis 1.

Table 4 Regression results of class attendance and final grade1

FS	Coef.	St. Err.	t-value	p-value	95% Conf	Interval	Sig
AT	1.705	.654	2.61	.011	.406	3.003	**
Constant	-3.719	2.993	-1.24	.217	-9.665	2.227	
Mean dependent var		4.086	SD dependent var			0.587	
R-squared		0.070	Number of orbs			93	
F-test		6.800	Prob > F			0.011	
Akaike crit. (AIC)		161.048	Bayesian crit. (BIC)			166.113	

*p < .01, ** p < .05, * p < .1*

The P value in Table 5 is .008, which shows a significant positive correlation between the frequency of online classroom activities of the explanatory variable and the final grade 1 of the explanatory variable, which verifies the null hypothesis 3.

Table 5 Regression results of the frequency of online activities in class and final grade 1

FS	Coef.	St. Err.	t-value	p-value	95% Conf	Interval	Sig
CL	.444	.165	2.69	.008	.116	.771	***
Constant	2.118	.734	2.89	.005	.661	3.576	***
Mean dependent var		4.086	SD dependent var		0.587		
R-squared		0.074	Number of orbs		93		
F-test		7.240	Prob > F		0.008		
Akaike crit. (AIC)		160.630	Bayesian crit. (BIC)		165.696		

$p < .01$, ** $p < .05$, * $p < .1$

Robustness test

In this study, the final grade 1 was replaced with the final grade 2, the explanatory variable was replaced, and the robustness test was carried out according to the original hypothesis 1 and hypothesis 3. The P-value result in Table 6 is 0, which shows a significant positive correlation between the explanatory variable class attendance and final grade 1, which validates the null hypothesis 1. The P value in Table 7 is 0, which shows a significant positive correlation between the explanatory variable online activity frequency and final grade 1, which verifies the null hypothesis 3.

Table 6 Regression results of class attendance and final grade2

FST	Coef.	St. Err.	t-value	p-value	95% Conf	Interval	Say
AT	2.138	.192	11.16	0	1.757	2.518	***
Constant	-5.377	.878	-6.13	0	-7.12	-3.634	***
Mean dependent var		4.411	SD dependent var		0.255		
R-squared		0.578	Number of orbs		93		
F-test		124.441	Prob > F		0.000		
Akaike crit. (AIC)		-67.180	Bayesian crit. (BIC)		-62.115		

$p < .01$, ** $p < .05$, * $p < .1$

Table 7 Regression results of the frequency of online activities and final grade 2

FST	Coef.	St. Err.	t-value	p-value	95% Conf	Interval	Say
CL	.697	.015	47.35	0	.668	.726	***

Constant	1.32	.065	20.15	0	1.19	1.45	***
Mean dependent var		4.411	SD dependent var			0.255	
R-squared		0.961	Number of orbs			93	
F-test		2242.320	Prob > F			0.000	
Akaike crit. (AIC)		-288.740	Bayesian crit. (BIC)			-283.675	

$p < .01$, ** $p < .05$, * $p < .1$

Conclusions and recommendations

The empirical results of this paper show that the use of digital platforms to carry out the digitalization process can reduce the impact of students' classroom attendance, The frequency of online classroom activities is highly correlated with the final grades, and the time factor of students' online self-study is not significantly correlated with the final grades, mainly because the proportion of online self-learning assessment set by teachers on the digital teaching platform is not enough to attract students to engage in online learning, which also reminds teachers that when using the digital teaching platform to promote students' online learning, they need to consider the reasonable assessment ratio of various factors, so as to promote students' online learning and promote the improvement of academic performance.

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