Research on the Multidimensional Influencing Factors of Information Literacy Education of Foreign Students

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Abstract: The continuous impact of COVID-19 pandemic has a great impact on the traditional offline teaching mode, especially the courses for foreign students. We measure and estimate dynamically the multidimensional factors that impact the effect and mechanism of online and offline blend teaching mode about information literacy of foreign students based on the empirical data, reveal the key problems existing in the current about the blend teaching mode, and provide quantitative reference and suggestions for teaching reform. At the same time, the empirical research based on the individual heterogeneity of foreign students has positive significance for the targeted expansion of online teaching resources, optimization of online teaching content, improvement of teaching quality, and improvement of after-school evaluation mechanism.

1. Introduction

The continuous impact of the COVID-19 pandemic broke the traditional teaching mode for foreign students. Under the impact of the COVID-19 pandemic, the traditional offline teaching wouldn't adapt to the actual situation if the COVID-19 pandemic continues for a long period of time. Nowdays, the teaching mode of foreign students has been changed from offline to blend teaching mode, This brings opportunities and challenges to the teaching effect of foreign students with the normalization of the COVID-19 pandemic: on the one hand, the online and offline blend teaching mode has been in the ascendant in recent years, especially under the impact of the COVID-19 pandemic, the flexible online and online blend teaching mode meets the particular need of the teaching work of foreign students, and provides space for the mixed teaching reform to be explored and improved. On the other hand, the unique characteristics of foreign students' individual behavior pose new challenges to the teaching methods, teaching contents and evaluation methods in the process of teaching that has been carried out at present, so it has become the focus of many literatures: firstly, is the impact of online and offline blend teaching mode have a substitution effect or a compensation effect contrast to the traditional offline teaching? Zeng Q , Zhong X(2012) believed that online teaching mode has many advantages of students' learning , such as free from space-time constraints, high flexibility of autonomous learning, outstanding learning personalization and so on.[1] Therefore, because the online teaching method meets the different needs of students, it is more popular with foreign students and could replace offline teaching. However, through the research on the implementation status of online teaching carried out by Mingyue, Michelle Gu Corey, Fanglei Huang (2022), they found that the current online teaching in universities still urgently needs to build a stable and unified teaching platform, much more efficient interaction between teachers and students.[2] Therefore, For the teaching mode of foreign students, online teaching can only be used as a means of compensation for offline teaching. Secondly, the specific implementation means of online and offline mixed teaching. Luyten H (2022) concluded through the qualitative research on the online broadcast mode that foreign students prefer to support the online live broadcast mode.[3] Josef Guggemos (2022) believed that the small-scale restricted online course (SPOC) based on "MOOC" is more targeted for courses with small class sizes, with rich content and strong timeliness.[4] Leanna Lawter, Petra Garnjost (2021) concluded that the flipped classroom is conducive to stimulate students' interest in active learning and improve their

innovative scientific research ability.[5] Thirdly, the multidimensional factors that affect the teaching effect of online and offline blend teaching mode. Cecilia Obi Nja, et al (2022) found that the lack of students' autonomous learning ability is an adverse factor affecting the online teaching mode.[6] Jiang Zhiyue (2012) believed that the instability of teaching facilities is the main reason for affecting the learning effect.[7]

In summary, we found that research mainly focuses on the following points in the previous work: (i) There are two views about the impact of blend teaching mode. One view holded that the online and offline blend teaching mode had a substitution effect on the traditional teaching mode. The other view was that the online and offline blend teaching mode had a compensation effect on the traditional teaching mode. (ii) In terms of specific teaching means. In the face of the COVID-19 pandemic, there are various means to realize online and offline teaching process. MOOC, SPOC and flipped classroom have all played a good role in improving the blend teaching mode. (iii) Other factors that impact the foreign students' learning effect under the blend teaching mode. Students' autonomous learning ability and smooth teaching facilities are important factors that affect the learning effect of foreign students under the online and offline blend teaching mode.

Therefore, based on the above problems, we plans to take the course "research methods and thesis writing" of foreign students as the research object, with the goal of deepening teaching reform, improving teaching quality and optimizing teaching effect, to find the multi-dimensional factors that affect the learning effect of foreign students in the course, so as to improve and enhance the depth and breadth of existing research, and provide references and suggestions for subsequent research. In terms of research methods, we intends to dynamically measure and estimate the multi-dimensional effect and mechanism of online and offline teaching mode about the learning effect of foreign students from the empirical level, which is conducive to revealing the key problems existing in the current teaching mode and providing quantitative index reference for teaching reform. At the same time, the empirical research based on the individual heterogeneity of foreign students has positive significance for the targeted expansion of online teaching resources, optimization of online teaching content, improvement of teaching quality and after-school evaluation mechanism.

2. Data and Descriptive Statistics

2.1. Data Source

The data in this paper is based on the learning behavior data collected by foreign students' courses online. The data in this paper are from the course of "Research methods and Thesis writing" of foreign students in a University from the first semester of 2020 to 2022, forming mixed cross-sectional data. The sample data is 109, including 69 boys and 40 girls, The research focuses on the dynamic measurement and analysis of data at the empirical level by Using Stata statistical analysis software, so as to find the multi-dimensional factors that impact the learning effect of foreign students, which is conducive to revealing the key problems existing in the current online and offline blend teaching mode, and providing quantitative index references and suggestions for teaching reform.

In order to facilitate analysis and comparison, this study cleaned up the original data as follows: clean up the index of students' active answer frequency in the class, and set whether students have active interaction behavior as a dummy variable. If they have active behavior, it is 1, otherwise it is 0. Next, clear up students' review behavior indicators of after-school, and set the learning behavior of students who review through the review function to 1, otherwise it is 0.Last, convert the length of students' attendance about the course from hours to minutes.

2.2. Econometric Model

In order to study the multi-dimensional influencing factors effect and mechanism of online and offline teaching model on the learning effect of foreign students, reveal the key problems existing in the current online and offline blend teaching mode, eventually provide quantitative index reference

for teaching reform, this paper uses econometric equations to build a multiple regression model about teaching effect, the specific model is as follows:

$$score = \beta_0 + \beta_1 minutes_{it} + \beta_2 male_i + \beta_3 answer_{it} + \beta_4 review_{it} + \beta_5 eresource_{it} + \varepsilon_{it} \quad (1)$$

In this model (1), $minutes_{it}$ refers to the total length of time that the ith student attends the course in the year t; $male_i$ refers to the gender of the ith student, where male=1 is male, otherwise 0; $answer_{it}$ refers to whether the ith student can actively interact with the teacher. If they have active behavior, it is 1, otherwise 0. $review_{it}$ refers to whether the ith student has used the online review function to review after class in year t. $eresource_{it}$ refers to whether the ith student can obtain the electronic literature resources from university's library in the year t, If they can, it is 1, otherwise 0. ε_{it} refers to other measures that may affect the ith student's learning effect, namely the disturbance item.

2.3. Descriptive Statistics

Dependent variable is the final score of foreign students who participated the course of research methods and thesis writing. The final score is often used as an effective quantitative index to evaluate the learning effect of students. To estimate equation, we use least square analysis method (OLS) in order to empirically analyze the multi-dimensional factors that affect the learning effect of foreign students, and provide quantitative index support for the design and formulation of teaching reform optimization plan.

Next, we take multi-dimensional factors that may affect students' learning effect as independent variables: Firstly, the length of students' class attendance as an important indicator of students' participation in online courses; Secondly, in order to avoid the phenomenon that the virtual identity of students may still be online but not in the course after signing in actually, we also take whether there is active interaction between students and the teacher as an independent variable; Thirdly, due to the impact of the COVID-19 pandemic, some foreign students stayed in home of their countries. Considering the time difference between foreign students and China, teachers allowed foreign students to supplement online courses through the review function. At the same time, the review function can also be used as an index for students' resumption of classes (Jinchi Guo, Jie Huang, 2021).[1] It has a strong evaluability for the evaluation of students' learning effect, so it is also included in the model (1) as an independent variable. Fourth, whether to obtain the university's electronic database and document resources may also have an important impact on the learning results of foreign students. The electronic resources of university can greatly save the time for foreign students when they need to retrieve and study related resources, especially for senior foreign students who facing graduation thesis writing, having the school's electronic document resources will effectively improve the efficiency, Therefore, whether to obtain the school electronic database and literature resources is an important independent variable of this research problem.

Last, descriptive statistics. After excluding the missing values, a total of 109 samples were obtained for the three periods of 2020, 2021 and 2022. In terms of the distribution of samples, the samples accounted for 20.18% of the total sample size in 2020, 52.29% in 2021 and 27.52% in 2022. The definitions and descriptive statistical results of each variable are shown in Table 1:

Table 1 Variable description and descriptive statistics.

Variable	Size	mean	Std.	max	min
score	109	78.73	17.76	0	97
minutes	109	187.71	111.21	0	381
answer	109	0.62	0.48	0	1
review	109	0.21	0.41	0	1
eresource	109	0.28	0.45	0	1
year	109	2021.07	0.69	2020	2022
male	109	0.633	0.48	0	1

3. Results

We adopt the method of stepwise regression and use the mode (1) to carry out empirical research. As shown in Table 2: through the correlation coefficient matrix, the correlation between students' final score and each independent variable is obtained: there is a strong correlation between final score and answer, review, minutes of class participation, and the acquisition of electronic resources, and there is no correlation between final score and male.

Table 2 Correlation coefficient matrix of students' learning behavior.

	answer	review	minutes	scores	eresource	male
answer	1					
review	0.0860	1				
minutes	0.201**	-0.181*	1			
scores	0.273***	0.218**	0.358***	1		
eresource	0.165*	0.172*	0.0120	0.255***	1	
male	-0.446***	-0.0260	-0.197**	-0.131	-0.153	1

Therefore, in order to further study the multidimensional factors that impact students' final score, the least square regression (OLS) and considering the robust standard error are used to estimate the model (1) of table 3.

First, model (1) reports the results of the benchmark model. It is obvious that the length of course participation of foreign students, namely minutes, has a positive impact on students' final scores. For each additional minute of course attendance, the examination score increases by 3.94%. Then, on this basis, model (2) adds control variables under the assumption of homoscedasticity. The results show that the positive impact of course participation on students is still robust, and the impact of gender on students' scores is not significant, whether students and teachers can interact for each other in class, namely answer, and has a positive impact on students' final score at the 10% significance level. Compared with the final score of students who interact less with teachers, students who interact more with teachers tend to get higher scores; whether review has a very significant positive impact on students' final score at the significance level of 1%. Students who have the habit of reviewing after class can consolidate their knowledge points more effectively, so they are easier to obtain higher score; Access to electronic resources of library is also a favorable condition for students to obtain higher score. Compared with students who cannot obtain electronic resources, students who obtain electronic resources have more effective information resources, so they can obtain higher score.

4. Robustness

Considering the factors of heteroscedasticity, we carries out BP test on all independent variables, and the results reject the hypothesis of covariance at the significance level of 1%. At the same time, we also carries out White test, and the test results also reject the hypothesis of covariance at the significance level of 1%. Furthermore, model (3) of table 3 adopts the standard error of robust heteroscedasticity. The empirical results show that the positive impact of the minutes of the course that students' attendance is still robust and the impact of gender on student performance is not significant. Whether students and teachers can interact in class has a positive impact on students' final score at the 10% significance level, compared with the final score of students who interact less with teachers, Students who interact more with teachers tend to get higher grades; Whether review has a very significant positive impact on students' final score at the significance level of 1%. Students who have the habit of reviewing after class can consolidate their knowledge points more effectively, so they are easier to obtain higher scores; Access to electronic resources is also a favorable condition for students to obtain higher final score. Compared with students who cannot obtain electronic resources, students who obtain electronic resources have more effective information resources, so they can obtain higher final score.

Table 3 Influencing factors of international students' final score.

	(1) ols_no_c	(2) ols_control	(3) ols_robust
minutes	0.0394***	0.0414***	0.0414***
	(0.00994)	(0.00971)	(0.0103)
male		1.317	1.317
		(2.320)	(1.911)
answer1		4.111*	4.111*
		(2.314)	(2.280)
review		6.939***	6.939**
		(2.517)	(2.750)
eresource		4.941**	4.941**
		(2.262)	(1.989)
_cons	73.26***	66.65***	66.65***
	(2.209)	(3.341)	(3.685)
N	109	109	109
R^2	0.128	0.275	0.275

5. Conclusions

In a word, through the empirical econometric analysis model, we concludes that the minutes of students' course participation, the interaction between students and teachers, the habit of reviewing after class, and the access to electronic resources of library have a positive impact on students' final score, while gender has no significant impact on students' performance. Based on the above conclusions, combined with the continue of the current COVID-19 pandemic, the suggestions to achieve the goal of improving students' final score are as follows:

Firstly, supervision mechanism of the course online should be strengthened. For example, remind students to enter the nailing online classroom on time through wechat, nailing, etc. before course. Secondly, Multi-dimensional dynamic investigation of the learning should be implemented during the course online. Third, expanding the access to electronic resources and documents to ensure the quality of teaching

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