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Can Mobile Blended Teaching Promote College Freshmen's Participation in English Flipped Classroom with the Aid of Peer Effects?

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Abstract: This paper examines peer effects on students' English classroom performance under traditional teaching mode, online teaching mode and mobile blended teaching mode. The dataset is from two contrast experiments of 207 students from Bengbu University, Bengbu City, Anhui Province, China. A regression analysis method capable of processing dynamic panel data (system GMM model) is employed to control for the endogeneity of peer performance variables. Peer effects are found in all three teaching modes, especially in the mobile blended teaching mode. A one-point increase in peers' class participation can result in an increase of 0.426 points in individual class participation under the mobile blended teaching mode. Nevertheless, the effects are regulated by individual peer relations, information literacy and English ability. Thus, peer effects gradually present the inverted "U" shape in both experiments. The findings reveal that the teacher can improve freshmen's class participation and English input-output efficiency by using the mobile blended teaching mode, optimizing students' class allocation, and building virtual learning communities.

Keywords: college freshmen, class participation, peer effects, mobile blended teaching mode

1. Introduction

Peer effects are spillover effects in individual social interaction. Peer effects in the education show that individual student becomes more positive or negative in learning than before due to the influence of other students (Wang et al., 2020). Therefore, if a student's peers perform well in class, he/she may also actively participate in classroom activities. However, students' classroom performance may be different due to the influence of peer effects under different teaching modes.

According to different teaching environments, flipped classroom can adopt three teaching modes. Traditional teaching refers to teaching and learning in a setting where course implementation takes place with face-to-face interaction (Ngigi & Obura, 2019). The term online teaching implies that the tutor or instructor is at a distance from the learner, that the tutor or instructor uses some form of technology to post learning materials and the learner makes a presentation online (Anderson, 2008).

Mobile blended teaching is a variety of teaching which integrates both traditional F2F and online teaching, where the mobile component becomes a natural extension of traditional classroom (Feng, 2019). Especially, with the help of the mobile teaching platform, the teacher and students work together to build an online learning community, in which peer interactions extend from groups to the whole class and even the whole school.

This paper compares the influences of peer effects on students' class participation under three teaching modes. Accordingly, this paper raises the following questions: Among three teaching modes, the mobile blended teaching mode can best reduce information opacity in students' learning and decision-making process. Therefore, are the peer effects of mobile blended teaching much higher than that of traditional teaching and online teaching? Then, can mobile blended teaching promote college freshmen's participation in English classroom with the aid of peer effects?

2. Related Studies

The study of peer effects began in psychology, but it has drawn much attention from educationalists recently. Researchers suggest three explanations:

First, the friendship between classmates enables students to get support and help from their peers and obtain psychological or physical security. Emotional tranquility helps to promote and maintain learning motivation and enhance students' learning engagement (Datu, Valdez, King, 2018). Second, peer rejection or peer bullying interferes with the learning engagement of marginalized students by limiting class participation, distorting social cognition, and causing neurobiological effects (Vaillancourt et al., 2010). Third, excellent students set an example, and their behaviors will be intentionally or unintentionally imitated by other students (Ladd, 2007). Therefore, learning resources provided by teachers and families for excellent students will also be absorbed by other students in the class through the spillover effect of knowledge (Hoxby, 2000).

In the field of language teaching, researchers pay much attention to the influence of peer interaction on learners' language development. Studies have shown that high-level foreign language learners can provide rich language input, generate more effective feedback and request strategies, and therefore increase language processing time, which can let students feel less anxious and more comfortable in class (Hai, 2014).

The existing literature has laid the foundation for our study, but it is believed that further discussion is needed. First, impact paths of peer effects on students have not been established, especially whether class participation is the key factor is unknown. Second, there may be differences in the performance of peer effects in different teaching modes. Third, due to the limited technical means, existing studies are difficult to investigate the trend of peer effects in the time dimension. This paper attempts to make a study from the above aspects to deepen the academic understanding of peer effects.

3. Methodology

3.1 Experiment Design and Setting

3.1.1 Subjects

The subjects were freshmen in Bengbu University, Bengbu City, Anhui Province, China. Class A was the experimental group, and the mobile blended teaching mode was used; class B was the control group, and the traditional teaching mode was used. There were 107 students in class A (73 male students and 34 female students). There were 100 students in class B (69 male students and 31 female students).

3.1.2 Instruments

The research tools used in this experiment were Fanya teaching system and Superstar learning APP. The former ran on the PC terminal and served as the teaching platform for the traditional classroom of class B, while the latter was mobile application and was used in the mobile blended teaching of class A. The difference lies in the group discussion function added to the Superstar learning APP, which supports teachers to build online learning communities and facilitates students to communicate online.

3.1.3 Period

The experiment was conducted in two phases, with the first phase beginning on October 14, 2019, and ending on January 3, 2020. The teaching time was arranged as two classes per week. The second phase started on February 17, 2020, and ended on May 8, 2020. In the second phase of the experiment, the students in two classes were taught online by using Superstar learning APP due to the COVID.

3.1.4 Procedure

3.1.4.1 Pre-class Preparations

Before class, the teacher tried to know students' needs through questionnaires. Then the teacher made courseware, recorded micro-lessons and assigned tasks. Students should complete the self-study tasks before class. The teacher further adjusted the teaching plan according to the report of pre-class test.

3.1.4.2 Class Activities

Since it was impossible to build an online learning community on Fanya teaching system, students could only participate in group discussions to solve problems in their pre-class learning. In the traditional classroom, the teacher should constantly raise questions to guide each group to report the pre-class learning results and make supplementary explanations to further improve the learning effect.

Compared with Fanya teaching system, the APP provided chat group (synchronous) and discussion zone (asynchronous) functions, which enabled the teacher to build virtual learning communities for students. Students could seek help from their peers in the chat group and exchange ideas with other classmates in the discussion zone. Therefore, under the mobile blended teaching mode and online teaching mode, the teacher should guide students to explore knowledge beyond the textbook to cultivate students' creativity, language expression and intercultural communication ability.

3.2 Regression Analysis

3.2.1 Selection of Estimation Method

The above experimental data constitute the balance panel data, and the system GMM empirical method was used for the analysis in this paper.

3.2.2 Establishment of Regression Equation

In order to empirically test the influence of peer performance on individual classroom performance under different teaching modes, the following dynamic panel data measurement equation is proposed:

$$Class_{i,t} = \alpha + \gamma_1 * Class_{i,t-1} + \gamma_2 * Class_{i,t-2} + \beta_1 * Peer_{i,t} + \beta_2 * Peer_{i,t-2} + \sum \beta_3 * H_i + \sum \beta_4 * P_i + \mu_i + \varepsilon_{i,t}$$

In the equation, subscript i is the subject, t is the data collection time, *Class* is the explained variable, *Peer* is the explanatory variable, H and P are control variables, H is the family characteristics, P is the individual characteristics. Both H and P affect student i's classroom performance. μ and ε are random error terms, μ is unobservable individual characteristics, and ε is the disturbance term.

3.2.3 Selection of Variables

The explained variable *Class* is the class performance of student *i*. In this paper, *Class* is represented by the number of speeches that student *i* participated in class discussion. The explanatory variable *Peer* refers to the classroom performance of student *i*'s group. This paper takes the student *i*'s sitting position in the classroom as the benchmark and takes the average number of speeches of 8 students around him as the representative of *Peer*. The control variables reflecting the family characteristics of student *i* and his/her learning characteristics are shown in table 1.

Table 1. *Description of Variables and Expected Effects*

Variable	Variable symbol	Variable meaning	Calculation basis	Expected effect
Explained variable	Class	Number of speeches		
Explanatory variable	Peer	Average number of peer speeches	$\sum_{i=1}^{8} Class_{p_i} / 8$	+
control variables: P	Gender	Gender	0:Female； 1:Male	-
	Residence	Household registration	0:Rural； 1:Urban	+
	PC	Time to own a computer		+

	APP	Number of learning apps on mobile phones		+
	Gaokao	Score rate	Score/Total score of all subjects	+
	English	Score rate of English	English score/Full marks of English	+
control variables: H	Learning	Study time per day		+
	Children	Number of children		-
	Parents	Parents' schooling years		+
	Income	Average annual income		+

4. Results

4.1 Students' Classroom Participation in the Experimental Group and the Control Group

In order to determine whether there are significant differences in students' classroom participation under different teaching modes, ANOVA was used to analyze the experimental data. The results of the first-stage experiment (F=38.055, P=0.002) show that the number of classroom speeches of students in the experimental group (Mean=15.55, SD=3.86) is much higher than that in the control group (Mean=8.61, SD=6.20). The results of the second stage experiment (F=371.85, P=0.028) also show that the frequency of classroom speech of the experimental group (Mean=16.70, SD=0.46) is higher than that of the control group (Mean=12.86, SD=0.80). This paper speculates that the differences of students' classroom participation may be related to peer effects under different teaching modes.

4.2 Peer Effects in Different Teaching Modes

The estimated results in table 2 show that both groups of contrast experiments confirm that the influence of peer class participation on individual student's class participation is significantly positive.

Compared with male students, female students are more gifted in language learning. In addition, according to the estimated results provided in table 2, the number of learning apps on mobile phones and the score rate of English have a significantly positive influence on students' class participation at the 1% significance level. Interestingly, the household registration category and Gaokao score rate have no obvious influence on students' class participation.

Table 2. *Impact of Class Participation of Peers on Individual Student's Classroom Performance*

	A	B	C	D
Peer	0.426***	0.319***	0.404***	0.399***
	(4.711)	(4.202)	(5.085)	(4.893)
Gender	-0.131***	-0.025***	-0.135***	-0.173***
	(1.764)	(0.452)	(1.891)	(1.976)
Residence	0.031	0.047	0.058	0.065
	(0.047)	(0.055)	(0.071)	(0.075)
PC	0.011	0.112**	0.020	0.035**
	(0.068)	(1.044)	(0.054)	(0.041)
APP	0.367***	0.285***	0.411***	0.399***
	(2.354)	(1.961)	(2.783)	(2.572)
Gaokao	-0.131	-0.067	0.050	0.070
	(1.063)	(0.032)	(0.010)	(0.038)
English	0.175***	0.163***	0.246***	0.228***
	(1.683)	(1.326)	(2.010)	(1.976)
Learning	0.027	0.028*	0.027	0.026
	(0.142)	(0.733)	(0.257)	(0.013)
Children	-0.061	-0.073*	0.022*	0.013
	(0.593)	(0.631)	(0.604)	(0.476)

Parents	0.236*** (3.527)	0.242*** (3.653)	0.221*** (3.446)	0.240*** (3.613)
Income	0.088** (0.899)	0.137** (1.392)	0.094** (0.935)	0.105** (0.991)
Parents*Income	0.159** (1.328)	0.136** (1.197)	0.168** (1.533)	0.157** (1.321)
AR(-1)	0.000	0.000	0.000	0.000
AR(-2)	0.9849	0.9099	0.9396	0.9394
Sargan(P-value)	0.381	0.228	0.423	0.311
No.of obs.	2503	2382	2337	2194

Note: ***, ** and * represent the significance level at 1%, 5%, and 10%, respectively; the cluster robust standard errors is reported in parentheses. A: Mobile blended teaching mode, B: Traditional teaching mode, C and D: Online teaching mode.

4.3 Peer Effects at Different Periods

The first-stage experimental data were divided into three groups at the same time interval. The estimated results of GMM model in table 3 show there is a significant inverted "U" relation between peer class participation and students' classroom performance. From the comparison among groups, the mobile blended teaching mode can effectively control the decrease of peer effects.

Table 3. *Estimation Results of the System GMM Regression on the Impact of Learning Peers on Individual Student's Class Performance*

	A			B		
	(1)	(2)	(3)	(4)	(5)	(6)
peer	0.294*** (3.837)	0.484*** (5.014)	0.433*** (4.883)	0.183*** (3.014)	0.394*** (4.637)	0.327*** (4.269)
Control variable: P	√	√	√	√	√	√
Control variable: H	√	√	√	√	√	√
No.of obs.	856	836	811	800	808	774

5. Discussion and Conclusion

Empirical studies on peer interaction in different circumstances show that peer effects have a significant impact on students' academic performance (Marotta, 2017). However, the influence of different teaching modes on peer effects has been ignored in previous studies. In this study, two groups of contrast experiments are used for the first time to compare the differences of peer effects among traditional teaching, online teaching and mobile blended teaching.

It is found that the peer effects of mobile blended teaching are strongest among three teaching modes. So, it may be more advantageous to carry out flipped learning on the mobile teaching platform.

In Delay's (2016) study, the gender proportion of peers also has an impact on students' academic performance. The higher the male proportion is, the better the individual performs. However, it may be this study focuses on students' performance in English classes and female students are more gifted in language learning, the study finds that the peer effects have a more significant impact on female students' class participation than male students'. Notably, the marginal effect of a female student's peers class participation on her participation is approximately 0.131. But this positive effect is influenced by the female students' computer skills. In addition, this study also finds that students' information literacy can positively predict their participation in English class. Therefore, this paper proposes that teachers should pay more attention to female students with low information literacy to help them overcome technical barriers in learning.

Consistent with previous research (Shi Min et al., 2019), this study also finds that family education plays an important role in the academic performance of freshmen. In China, well-educated and high-income parents mostly come from science and engineering backgrounds, which means that parents' information literacy also has a considerable influence on their children's academic performance. Therefore, this paper advocates that parents should also keep pace with the times and strive to learn new technology and new knowledge in the family education.

The positive peer effects suggest that English teachers could improve college freshmen's class participation by using the mobile blended teaching mode, optimizing students' class allocation and building virtual learning communities, further boosting the English input-output efficiency.

There are three major limitations of this study that will be addressed in future work. First, this paper studies the performance of freshmen in English flipped classroom in Bengbu University. Therefore, the research conclusions may not be widely representative. Second, as the research tools of Fanya teaching system and Superstar learning APP can only record the number of students' speeches in class, and cannot evaluate the quality of their speeches, the conclusion may overestimate the influence of peer effects on students' classroom performance. Third, the second phase of this study is conducted in the COVID period. This study has not considered the influence of some abnormal factors, so the effectiveness of its conclusion needs to be further improved.

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