



Research on the construction and practice of blended teaching model based on flipped classroom

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Abstract

Background/Objectives: In the background of the information age, the blended teaching mode is more suitable for students at this stage, but for college students, the simple blended teaching can not guarantee the students' learning enthusiasm, and there are still cases of mixed credits and improper learning attitude. **Methods/Statistical analysis:** This study introduces the concept of flipped classroom, combines it with blended teaching, and builds a blended teaching mode based on flipped classroom, and takes the elective course of "Modern Education Technology" as an example to practice teaching. **Findings:** The teaching mode can improve the teaching effect and The teaching mode can improve teaching effectiveness and enhance students' interest in learning. **Improvements/Applications:** In implementing the flipped classroom-based blended teaching model, universities should pay attention to the combination of students' main role and teachers' guidance, ensure the communication channels between teachers and students, and pay attention to the diversity of evaluation methods.

Index Terms

Flipped classroom; Blended learning; Online and offline; Teaching mode; Model construction

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- Manuscript received May 12, 2022.
- Revised June 13, 2022 ; Accepted June 21, 2022.
- Date of publication June 30, 2022.

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I. PROBLEM FORMULATION

The National Medium and Long-term Education Reform and Development Plan (2010-2020) emphasizes the importance of education informatization, and also puts forward a sustainable development strategy for education informatization construction [1], which lays the policy foundation support for the development of informatization teaching in colleges and universities. In 2019, the Central Committee of the Communist Party of China and the State Council issued the China Education Modernization 2035, which requires strengthening students' practical hands-on ability, cooperation ability, and innovation ability of students, and at the same time to make full use of modern information technology to enrich and innovate curriculum forms [2]. The flipped classroom is a new "blended learning approach" [3]. Blended learning is integrated, flexible, independent and cooperative, and flipped classroom can amplify its advantages and complement it, avoiding disadvantages such as neglecting teachers' guidance, reducing communication time with students, decreasing the relevance of teaching, and reducing students' learning effectiveness [4]. At the same time, students do not pay enough attention to elective courses, and in the actual teaching process, there is often a lack of class time. Students can use the flipped classroom format to learn the basics as independent learning content before class, and ask questions and learn in a targeted manner during class, which can greatly increase learning efficiency. Therefore, how to integrate flipped classroom with blended learning? What kind of teaching model can be built? This is the question that needs to be addressed by .

II. THE CONCEPT OF FLIPPED CLASSROOM

The concept of flipped classroom was first proposed by two teachers at Woodland Park High School in Colorado, U.S.A. The basic idea is that the traditional learning process is flipped so that learners can complete independent learning of knowledge and concepts outside of class time, and the classroom becomes a place for interaction between teachers and students, mainly for answering questions and debriefing discussions, so as to achieve better teaching and learning results [5]. The flipped classroom, also known as the upside-down classroom, differs from the traditional classroom in that the transfer of knowledge occurs before class through the support of modern technology and the internalization of knowledge occurs in the classroom through the support of the learning environment, which is the flipped classroom model [6]. Since the

teaching process is different from the traditional classroom, the teaching and learning process has changed. Traditional blended teaching still has disadvantages such as "full of teaching", "lecture but not practice", and "lack of communication between teachers and students" [7], while flipped classroom can be well integrated with it. The flipped classroom can be well integrated with it and complement it. The application of flipped classroom in online and offline hybrid teaching can effectively enhance students' participation and cultivate students' awareness of independent learning through online learning before class; at the same time, the hybrid teaching divides all aspects of flipped classroom into online and offline, which not only improves the efficiency of learning and communication with teachers, but also enhances students' information technology application ability to a certain extent and cultivates students' learning initiative and ability to acquire information. The ability to acquire information.

III. BUILDING A BLENDED TEACHING MODEL BASED ON FLIPPED CLASSROOM

Based on the concept of flipped classroom, this study introduces it into blended teaching, divides teaching into three stages: before class, during class and after class, and implements online, offline + online and online blended teaching respectively, flips the role of teachers as well as students' learning styles, starting from online task release before class and ending with online Q&A after class, and constructs a blended teaching model based on flipped classroom, as shown in Fig.1.

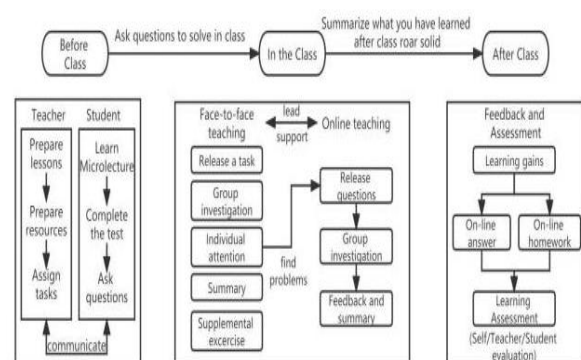


Figure1 Framework of the flipped classroom-based blended teaching model

The teaching practice is carried out using the above model. Before the lesson, the teacher prepares the lesson, prepares online learning resources (including micro-lessons, PPT, online test questions, practical videos, etc.), and assigns online learning tasks for students. The students learn the micro-

lessons, practical videos, etc. and complete the online quizzes after the learning, so as to test the learning results in time and raise the problems in learning according to the online independent learning and the content of the quizzes in groups, and communicate with the teacher in time.

The class is led by face-to-face teaching and supported by online teaching. The teacher first assigns tasks according to the problems of independent learning before the class, and students conduct group inquiry learning. The teacher gives personalized guidance to the problems encountered by each group and releases the problems found in real time to the online learning platform, then students discuss and explore solutions to the problems released online, and provide timely feedback and summary online. The teacher then summarizes the problems encountered online and offline, and finally carries out consolidation exercises in class again to consolidate the absorption of knowledge.

After class, students post online to discuss what they have gained, and the instructor will answer questions and post online assignments. The overall grade will consist of a final grade and a regular grade. The usual grade includes attendance, practical training work, online tests and class discussions. The online grade is based on students' self-evaluation + teacher evaluation + student evaluation, of which 20% is self-evaluation, 50% is teacher evaluation, and 30% is student evaluation, and the teacher needs to design the evaluation scale to complete the online evaluation. Offline, students are judged by their final exam results and their usual classroom performance.

IV. IMPLEMENTATION EFFECT

In this study, students taking modern education technology courses were selected as the subjects, and two classes with approximately the same basic level were chosen as the experimental class and the control class, which were recorded as Class A and Class B, respectively. The experimental class (Class A) was subjected to a one-semester teaching experiment using a flipped classroom-based hybrid teaching model, while the control class (Class B) was subjected to a traditional teaching model. A questionnaire was used to measure three dimensions: knowledge, ability, and emotion. The following results were obtained by using SPSS to test the reliability of the pre- and post-test questionnaires. As shown in the figure, the alpha coefficient was greater than 0.9, indicating that the two questionnaires had high reliability levels and could be used.

Table 1. RELIABILITY STATISTICS

	Cronbach Alpha	Number of items
Pre-test questionnaire	.937	28
Post-test questionnaire	.980	41

First, to test the effectiveness of the teaching model, the data from Class A before and after the experiment were analyzed using a paired-samples t-test, and the following results were obtained.

Table 2. COMPARISON OF CLASS A MEANS

	Average value	Number of cases	Standard deviation	Standard error mean
Pairing 1	Knowledge pre-test	4.0786	.43825	.04962
	Knowledge post-test	4.5077	.51474	.05828
Pairing 2	Proficiency pre-test	4.1590	.47384	.05365
	Proficiency post-test	4.4416	.59687	.06758
Pairing 3	Emotional pre-test	4.1462	.49901	.05650
	Emotional post-test	4.4231	.67216	.07611

Table 3. COMPARISON BEFORE AND AFTER THE EXPERIMENT IN CLASS A

		Pairing Difference				t	Degree of freedom	Significance (two-tailed)	
		Average value	Standard deviation	Standard error mean	Difference 95% confidence interval				
					Lower limit				Upper limit
Pairing 1	Knowledge pre-test - Knowledge post-test	-.4290	.7533	.0853	-.5989	-.2592	-5.030	.000	
Pairing 2	Pre-competency test - Post-competency test	-.2826	.8106	.0917	-.4654	-.0998	-3.079	.003	
Pairing 3	Emotional pre-test - Emotional post-test	-.2769	.8672	.0981	-.4724	-.0814	-2.820	.006	

Data on the three dimensions of knowledge, ability, and affect in Class A (the experimental class) were analyzed using paired samples t-test at the alpha level of 0.05 for the pre- and post-experiment. As shown in Table 2, there was a significant difference between pre-test knowledge (M=4.08, SD=0.44) and post-test knowledge (M=4.51, SD=0.51), $t(77)=-5.030$, $p=0.000<0.05$ (two-tailed test), and between pre-test ability (M=4.15, SD=0.47) and post-test ability (M=4.44, SD=0.59) were significantly different, $t(77)=-3.079$, $p=0.003<0.05$ (two-tailed test), between pre-test affect (M=4.15, SD=0.50) and post-test affect (M=4.42, SD=0.67) were significantly different, $t(77)=-2.82$, $p=0.006<0.05$ (two-tailed test), and post-test values of all three dimensions were higher than the pre-test values, which shows that the flipped classroom-

based blended teaching model can enhance teaching effectiveness.

An independent samples t-test was also conducted on Class A (experimental class), which implemented the flipped classroom-based blended teaching model, and Class B (control class), which did not implement the model, to test whether there were differences between the two classes, and the results were as follows.

Table 4. COMPARISON OF THE MEAN VALUES OF THE EXPERIMENTAL CLASS AND THE CONTROL CLASS

	Classes	Number of cases	Average value	Standard deviation	Standard error mean
Knowledge	Experimental Classes	78	4.5077	.51474	.05828
	Control class	101	4.2706	.52821	.05256
Capabilities	Experimental Classes	78	4.4416	.59687	.06758
	Control class	101	4.2002	.58077	.05779
Emotion	Experimental Classes	78	4.4231	.67216	.07611
	Control class	101	4.3342	.55933	.05566

Table 5. COMPARISON OF VARIABILITY BETWEEN EXPERIMENTAL AND CONTROL CLASSES

		Levene's test for equivalence of variances		Equivalence of means t-test						
		F	Significance	t	Degree of freedom	Significance (bilateral)	Average value Difference	Standard Error Difference	Difference 95% confidence interval	
									Lower limit	Upper limit
Knowledge	Assuming equal variance	.003	.959	3.011	177	.003	.23707	.07874	.08167	.39246
	Does not assume equal variance			3.021	167.740	.003	.23707	.07848	.08213	.39200
Capabilities	Assuming equal variance	.054	.816	2.724	177	.007	.24138	.08861	.06651	.41624
	Does not assume equal variance			2.715	163.472	.007	.24138	.08892	.06579	.41696
Emotion	Assuming equal variance	3.393	.067	.965	177	.336	.08892	.09210	-.09283	.27067
	Does not assume equal variance			.943	148.642	.347	.08892	.09429	-.09739	.27523

Data on the three dimensions of knowledge, ability, and affect in Class A (experimental class) and Class B (control class) after the experiment were analyzed using an independent samples t-test at the alpha level of 0.05. As shown in Tables 4 and 5, there was a significant difference between the experimental class knowledge (M=4.51, SD=0.51) and the control class knowledge (M=4.27, SD=0.52), $t(177)=3.011$, $p=0.003<0.05$ (two-tailed test), and between the experimental class ability (M=4.44, SD=0.59) and the control class ability (M=4.20, SD=0.58) were significantly different from each other, $t(177)=2.724$, $p=0.007<0.05$ (two-tailed test),

however, there was no significant difference between experimental class affect (M=4.42, SD=0.67) and control class affect (M=4.33, SD=0.55) although they differed in mean, $t(177)=0.965$, $p=0.336>0.05$ (two-tailed test), it can be seen that there is a significant difference between the experimental class and the control class in the two dimensions of knowledge and ability, and the values of the experimental class are higher than the values of the control class, but there is no difference between the two classes in the emotional dimension, I guess this may be related to the degree of interest of the students in the course itself, the students in the face of modern educational technology teaching content, the students are more interested in the course. The interest generated by the students was stronger in all of them. This is not contradictory to the experimental results, which shows that the flipped classroom-based blended teaching mode has a certain effect on the improvement of teaching effectiveness.

V. CONCLUSION

Based on the concept of flipped classroom, this study introduces it into blended teaching, divides teaching into three stages: before, during and after class, constructs a blended teaching mode based on flipped classroom, and applies it to practice with the course of Modern Education Technology in Y college in Yanji city as an example, and the results show that the blended teaching mode based on flipped classroom can improve the teaching effect. The model also enriches the teaching form and enhances students' learning interest. Meanwhile, the flipped classroom-based blended teaching mode achieves the integration with modern information technology and innovates the course in the form of flipping, so it can be concluded that the integration of flipped classroom and blended teaching is not a new path of innovative teaching.

This leads to several suggestions for the implementation of the flipped classroom-based blended teaching model in colleges and universities.

A. Insist on the combination of students' main status and teachers' guiding status

Students are always the main subject of the classroom and teachers are always the instructors of the classroom. It is necessary to insist on the combination of the subject and instructing status in order to improve the quality of the classroom. When implementing the blended teaching mode based on flipped classroom, although it advocates taking students as the main body and using technology and information technology to teach, we still cannot forget the guiding position of teachers. Teachers should make a set of lesson plans in the blended

teaching mode, reasonably allocate the time for students to use the computer and listen to their own lectures, always keep in mind to guide students to think and discuss, and guide them to solve problems. For example, after answering the questions raised by students in class, they should also explain the difficult knowledge points again, not relying entirely on what students have learned before class, but giving examples to help students understand the theoretical knowledge.

B. Ensure the communication channel between teachers and students is smooth at all times

Under the blended teaching mode, students are often in contact with computers instead of teachers, and students' independent learning is advocated. Teachers and students meet less often, teachers and students lack communication, teacher-student relationship becomes cold, and students are reluctant to ask teachers if they have questions. Therefore, whether before, during or after class, every link should focus on communication with students, not only need timely communication on the learning platform, should also use a variety of means, diversified ways, such as QQ, WeChat and other social software, but also face-to-face communication with individual students with problems, to always grasp the dynamics of student learning and learning, not limited to the classroom learning, to do before, during and We should have all-round communication before, during and after class to ensure that the communication channels between teachers and students are smooth at all times.

C. Diversified, multi-angle and multi-faceted evaluation methods

At present, colleges and universities, especially for technical courses, mostly use the evaluation of works as the standard for measuring students' learning effect, and pay little attention to students' performance in class, which to a certain extent will affect the assessment of students' learning performance. Therefore, the evaluation methods should be diversified, and this study uses self-assessment, teacher assessment and student mutual assessment, but the specific implementation should also pay attention to the proportion of the grasp, to ensure the authenticity and reliability of the evaluation. At the same time, the evaluation of students' works should not be neglected, but based on certain evaluation criteria, the completion of each item should be scored, and 2-3 scorers can be set for the evaluation of works, and then the final score should be evaluated comprehensively for the reliability of the evaluation.

However, the experimental time of this study is

relatively short, and the generalization and universality of the teaching model are still to be examined. Meanwhile, there are more students taking the course, and although the flipped classroom form can solve some students' problems, it has not fully covered every student, and there are still students who have problems that are not solved in time, which should be observed and recorded more in the subsequent teaching and practice. The integration of flipped classroom and blended teaching provides new ideas for teaching and a new form for implementing teaching. The application of blended teaching in the post-epidemic period continues, but new teaching modes should be explored and practiced continuously so as to better promote students' development.

ACKNOWLEDGMENT

Project: 2021 Jilin Higher Education Scientific Research Project "Practical Research on Hybrid Teaching Mode Based on Flipped Classroom - Modern Educational Technology Elective Course as an Example" Research Results (Project No.: JGJX2021D63; Host: Xin QI).

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