

A Study on the Application of Flipped Classroom Teaching Model in College English Based on the Mobile Learning

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Abstract—Mobile learning is rapidly popularized among college students as an indispensable learning approach. How to apply mobile learning into college English teaching has become the focus of educational research domain. This paper analyzes the current situation of mobile learning in Chinese universities and introduces an innovative college English Flipped Classroom teaching model in combination with mobile learning. After one semester of experimental study, it testifies the validity of the new teaching model through students' evaluation for it and the students' progress in their English study based on the analysis of the data collected in the questionnaires, interview, and tests. The purpose of the new teaching model is not only to develop students' autonomous learning ability and academic achievements, but also to improve the teaching quality of our university widely.

Index Terms—flipped classroom, mobile learning, college English teaching model

I. INTRODUCTION

With the development of internet technology and the wide use of mobile devices, mobile learning, as a new learning method, is rapidly popularized in universities with its advantages of flexibility, convenience and personalization. It allows students to learn anytime and anywhere, which brings them a new learning experience and realizes the efficient allocation of teaching resources. Flipped classroom, also known as reverse classroom, is widely adopted in the teaching of different subjects in universities. It can be defined as a teaching form in which students obtain the digital materials (audio, video, electronic textbooks, etc.) distributed by teachers to independently study courses before class, and then participate in interactive activities that will clear up doubts and complete exercises in class. Mobile learning fits well with the demand of ubiquitous learning in the flipped classroom. Thus, how to introduce mobile learning into the flipped classroom and improve students' learning efficiency has become the focus of educational research.

At present, there exist many problems in college English teaching in China, mainly reflected in the following aspects: 1) In class, teachers only focus on the input of language knowledge, without paying more attention to interaction between teachers and students, resulting in low enthusiasm and interest of students in learning English. 2) Even though the flipped classroom model is generally introduced to the conventional teaching process, the teaching effect is not ideal for certain reasons. 3) The integration degree between information technology and English teaching is not high and network learning resources are not fully utilized. There are limited network teaching equipments, such as computers, language laboratory, which can't meet the learning needs of all of college students. Therefore, teachers cannot carry out the teaching reform on a large scale. 4) Nowadays, mobile devices have been popularized among college students. Students often search for all kinds of information and consult learning resources through mobile phones, tablets, etc. However, the problems existing in mobile learning are also apparent. Students have no definite learning plan, which results in disorder and randomness of mobile learning and cannot reach the expected learning effect; Students have not strong sense of cooperation and communicative skills in the process of mobile learning. Because of the loneliness or physical fatigue, many students abandon the learning plan easily; Students cannot regulate their time reasonably and keep mobile learning for quite a long time. As a result of weak immunity and self-control ability, they are frequently interrupted by many other information or news about games, entertainment, and cannot adjust themselves by rewarding or self-motivation to make learning continue; According to statistics, owing to lack of teachers' supervision and monitoring, few of the students can evaluate their mobile learning process and learning effect by themselves.

Based on the above problems, we can make a conclusion that it is of great significance for teachers to apply mobile learning into college English teaching and explore effective mobile learning strategies inside and outside the classroom, turning students' passive acceptance of knowledge into active exploration of knowledge, thus promoting the improvement of students' learning efficiency and the teaching quality of universities.

II. LITERATURE REVIEW

A. Mobile Learning

Mobile learning is a digital learning mode based on relatively mature wireless mobile network, multimedia

technology. An Irish educator named Desmond Keegan first put forward the concept of “mobile learning” in his book “From Distance Learning to E-Learning to Mobile Learning” in 2000. After that, mobile learning began to be applied in education departments, enterprises and other industries. In his article “Mobile Education-A Glance at the Future”, Alexzander Dye (2001) defined mobile learning as a kind of learning that took mobile devices as tools and can happen anytime and anywhere. Meanwhile, mobile learning devices can not only help to achieve good interaction between teachers and students, but also present learning content effectively. The foreign studies on mobile learning can be traced back to the “Wireless Andrew” project carried out in Carnegie Mellon University in 1994, which aimed to establish the wireless network connection covering the campus. Later, the professors in Stanford University designed a mobile learning module, which enabled learners to learn vocabulary, do phrase translation, even do quiz successfully, and accomplishing the integration of mobile learning and English courses. There are also many studies which mainly focus on the effectiveness of the application of mobile devices into English learning. Wang and Smith (2013) conducted a three-year study on whether mobile learning could improve students' grammar and reading skills. The results showed that although students had positive attitudes towards mobile learning, the effect was limited due to the small screen size of mobile phones. Ducate & Lomicka (2014) made a research on foreign language learning environment from the perspective of ecological structure and mobile learning. In South America, Jimenez (2020) conducted a survey on mobile device-assisted English oral classes among college students and found that students could participate in more classroom activities by using mobile technology.

The research on mobile learning in China is later than that of other countries, which started from the introduction of the concept of mobile learning by Keegan in his academic report on the 40th anniversary of Shanghai TV University in 2000. It can be divided into three stages. The initial stage was from 2000 to 2008, during which very few papers had been published. The second stage was from 2009 to 2016, during which a large numbers of studies were conducted on mobile learning. The third stage was from 2017 till now, which was a very stable research period. Generally speaking, the previous studies on mobile learning have been carried out from the aspects of the effectiveness of applying mobile learning into teaching, the real effects of using mobile devices, the survey of student' attitudes towards mobile learning, and influencing factors of mobile learning. For example, Luo (2017) conducted a research on the application of mobile learning into English writing. He found that students have made significant progress in self-perception in writing skills, gained positive emotional experience and reduced writing anxiety. Chen (2019) carried out a smartphone-based classroom activity design in the college English listening and speaking class. The experiment results indicated that college students' behavioral, cognitive and emotional involvements were greatly improved with the help of smart phones. Cao and Deng (2019) studied the influence of “BaCiZhan”, a mobile learning app, on college students' English word learning and found that it can be regarded as an effective tool to increase students' vocabulary.

B. Flipped Classroom

Nowadays, flipped classroom has become a popular instructional mode, in which students watch lectures or learn digital materials before class to prepare in advance. In class, teachers and students work together to complete the activities, which may be in the form of group discussions, collaborative inquiry and interactive communication. Flipped classroom was first applied by Bergmann and Sams, two chemistry teachers at Woodland Park High School in the United States in 2007. Later, Salman Khan founded Khan Academy, where a collection of short teaching videos were uploaded to the internet to help students learn courses, which made flipped classroom known all over the world. Since then, flipped classroom had gained considerable attention by more and more educators and researchers. They began to implement flipped classroom in their teaching and research. Researches on flipped classroom mainly focused on its definition, characteristics and theoretical basis, and a lot of flipped classroom teaching practice had also been carried out. For example, Strayer (2012) made a comparative study on the flipped classroom and the traditional classroom, which confirmed that the flipped classroom played a more positive impact on the cultivation of learners' collaborative ability and innovation ability. Hung (2017) conducted a quasi-experiment to investigate students' perception and attitudes towards flipped classroom. The results indicated the students were highly satisfied with this teaching model and the model greatly enhanced their willingness to communicate with their partners. Oraif (2018) applied a flipped method by video in an English writing course and found that the flipped method could stimulate the students' learning interest, improve their learning efficiency and better satisfy their psychological requirements.

With the introduction of flipped classroom into China, the research first focused on its theory and its application in small scale. Later, an increasing number of scholars and teachers began to apply flipped classroom into teaching practice widely and explored its advantages and feasibility by combining the characteristics of different courses. For example, Lu (2014) conducted a research on the effectiveness of a flipped classroom teaching model based on micro class and held that it is feasible to apply this model into college English classes because the students could demonstrate much stronger initiative and self-discipline in the teaching and learning process. Jin (2015) constructed a flipped classroom teaching model in English pronunciation course, which included three parts: pre-class learning, in-class internalization and after-class feedback. Lv (2016) built an autonomous learning mode based on flipped classroom. The experimental results revealed that the new mode not only stimulated the college students' learning motivation, but also exceedingly improved the students' autonomous learning ability.

Therefore, numerous research at home and abroad shows that compared the traditional teaching mode, flipped classroom indeed has a great influence on students' learning ability and academic achievements with apparent

advantages. However, at present, the studies on the effective integration of flipped classroom and mobile learning in China are still in the primary stage and have not achieved a breakthrough. These studies only stay at the theoretical levels and lack in-depth empirical research. Furthermore, the research on the impact of effective mobile learning strategies on college Students' autonomous learning ability is even scarce. Therefore, it is of great significance for college teachers to apply mobile learning into college English flipped classroom and explore effective mobile learning strategies inside and outside the classroom, turning students' passive acceptance of knowledge into active exploration of knowledge and promoting the improvement of their language ability and learning efficiency.

III. METHODOLOGY

A. *Research Aims and Questions*

The aims of the study are threefold. Firstly, it tries to change the traditional teaching model and construct an innovative teaching model combining online learning with offline teaching, mobile learning with flipped classroom so as to promote the comprehensive integration of modern information technology and college English teaching. Secondly, it tries to break the limitations of English learning in time and space and build a ubiquitous, personalized learning mode, giving full play to students' subjective initiative and enhancing their autonomous learning ability. Most important of all, the study aims to deepen the reform of college English teaching and improve the quality of College English teaching, striving to realize the three requirements of interactive teaching, in-depth learning and personalized education in the information age.

Therefore, the research focuses on the three questions:

1. What are the students' perceptions for the flipped classroom teaching model based on mobile learning?
2. What influence does the flipped classroom model based on mobile learning have on college students' autonomous learning ability?
3. What impact does the flipped classroom model based on mobile learning have on college students' English academic performance?

B. *Research Subjects*

In the study, 191 undergraduate students from the School of History in Taishan University were selected as subjects according to their examination scores. They were non-English majors from four classes. Among them, 50 students in class 1 belonged to the experimental class, 49 students in class 2, 47 students in class 3 and 45 students in class 4 were in the control classes. They had similar English proficiency before the experimental treatments. They used the same textbook and were taught by the same English teacher. During the experiment, the innovative flipped classroom teaching model based on mobile learning was applied in the experimental class while the traditional teaching method was adopted in the control classes.

C. *Research Procedure*

The study lasted for one semester, including three stages:

1. *Pre-Research Stage*

The author made some preparations before conducting the study. Firstly, a wide range of literature materials were consulted and collected to learn about current status and development trend of the research. Furthermore, the research subjects were chosen carefully and given a pre-test to ensure that they are at the same level of English proficiency.

2. *Mid-Research Stage*

During the teaching experiment, the author integrated mobile learning into the college English teaching and designed an innovative flipped classroom teaching model, as shown in the following figure 1.

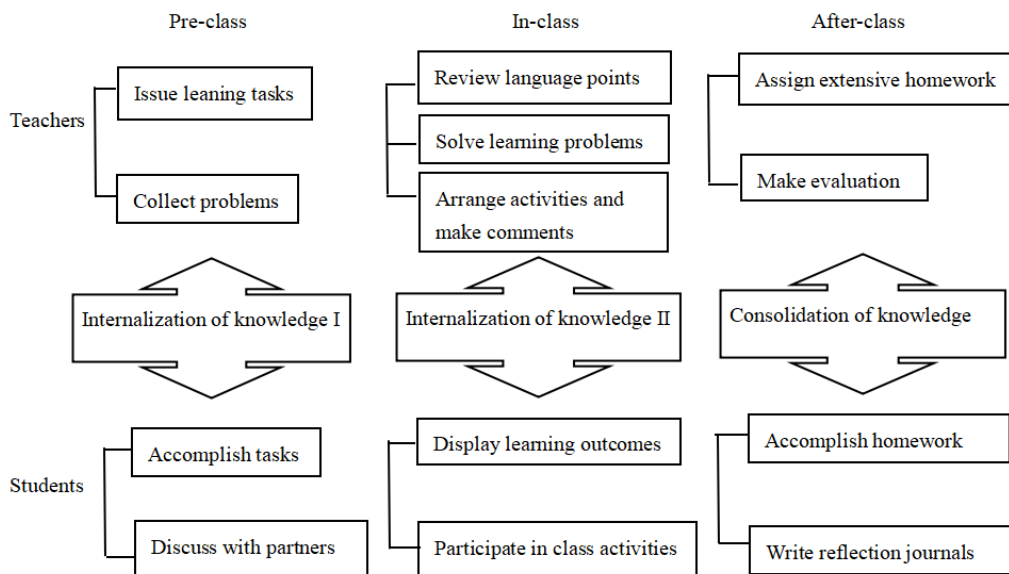


Figure 1 Teaching Model of Flipped Classroom Based On Mobile Learning

After that, the new model was introduced and applied in the experimental class and the teaching process was arranged as follows:

Mobile Learning before class for the first internalization of knowledge:

1) Teachers issued learning materials and learning tasks including videos, PPT, learning task list through social software (WeChat, QQ group), mobile learning app (Rain classroom, Superstar Learning Link), and school network learning platform. They established an electronic file for each student to record the students' learning performance through the statistical function of the mobile learning app.

2) Students obtained the learning materials through mobile devices and accomplished the learning tasks within the specified time.

3) Unsolved problems were reported to teachers by students through network learning platform in time so that teachers can collect and solve them in class.

4) Students communicated with their partners in small groups, sharing views, discussing the difficult points and completing the first internalization of knowledge.

Offline teaching in class for the second internalization of knowledge:

1) Students displayed learning outcomes through oral presentation, group report, role plays, situational dialogues, question answering to further internalize the knowledge.

2) Teachers checked the completion of the learning tasks, emphasized language points and helped students to solve learning problems.

3) Students took part in various kinds of activities and completed the exercises assigned by teachers though mobile learning app to testify whether students mastered what they learned.

4) Teachers made comments according to students' performance in class.

Feedback and evaluation after class for the consolidation of knowledge:

1) Students wrote reflection journals after class on the mobile learning platform, including the main learning content, learning problems, teaching suggestions, etc.

2) Students finished homework and tests assigned by teachers on the mobile learning app on time.

3) Teachers monitored students' learning process through tracking and monitoring system of the network platform.

4) Teachers made a fair evaluation for students' learning effect by creating a pluralistic, dynamic evaluation system through three aspects of group self-evaluation, classmates' mutual evaluation and teacher evaluation.

3. Post-Research Stage

After one semester of teaching experiment, the subjects were given an English test. The test scores of the experimental class and the control classes were compared and analyzed to verify the effectiveness of the flipped classroom teaching model based on mobile learning. Then, a questionnaire was distributed to the students in the experimental class to learn about students' learning status and satisfaction with the teaching model. Finally, an interview was conducted to further understand students' perception for the new model and the positive influence of the model in improving their autonomous learning ability and academic achievements. The data was collected and analyzed. The experimental results were discussed and research report was completed in time.

D. Instruments

Three research instruments, including questionnaire, interview and test were used to make a research on the

application of flipped classroom teaching model based on mobile learning.

1. Test

Pre-test and post-test were given to all the participants to make a comparison of score changes between the experimental class and the control classes before and after the teaching experimental. In order to ensure the authenticity and reliability of the results, the papers of College English Test Band 4 were adopted, including listening comprehension, reading comprehension and translation. The total score of each paper was 100 points. The process, question type of papers, difficulty level of papers, reviewer and evaluation method of the pre-test were the same as that of the post-test. After the students completed the tests, the average score of each class was finally obtained and analyzed as the final evaluation criterion.

2. Questionnaire

For the questionnaire after the teaching experiment, it was designed on the basis of the questionnaire used by Zhao (2020) after making some minor modifications. A total of 25 items were set which assessed the four major parts below: students' course participation, students' perception and satisfaction with the new teaching model, students' learning effect, the effectiveness of the new teaching model. Each item in the questionnaire follows a 5-point Likert scale ranging from "strongly disagree", "disagree", "neutral", and "agree" to "strongly agree". The students from the experimental class were asked to make a selection among these five options according to their true feelings and learning experiences. After gathering enough data, SPSS version 26.0 was adopted for further statistical analysis.

3. Interview

In order to make up for the shortcomings of the questionnaire and learn more about the effectiveness of the flipped classroom teaching model based on mobile learning, an interview was conducted after questionnaire. The interview consisted of six open-ended questions, which were mainly about the interviewees' attitudes towards the new teaching model and its impact on their English learning. Some interview questions are related the questionnaire, while some questions are supplementary to those not covered in the questionnaire. Six students from the experimental class were randomly selected as interviewees and each interview lasted about 10 minutes.

E. Data Collection and Analysis

A professional survey platform named "Wenjuanxing" was chosen to collect all the data of the questionnaire. Then the survey data was input, processed and analyzed by SPSS version 26.0 for windows. Descriptive statistical analysis was mainly used to analyze the frequency and necessary correlation of each index.

The data from the pre-test and post-test were collected in the first week and the eighteenth week of the semester respectively. The average scores of students from the experimental class and the control classes were contrasted and analyzed through Independent Sample T-Test by SPSS26.0 to verify the effectiveness of the new teaching model.

IV. RESULTS AND DISCUSSION

A. Analysis of the Questionnaire

After the teaching experiment, the questionnaire was issued to the students in the experimental class and then was conducted at the same time and place in order to learn about the implementation effect of the flipped classroom teaching model based on mobile learning. The questionnaire consisted of a total of 24 questions. Questions 1-6 mainly investigated students' course participation. According to statistics, 95% of the students surveyed could adapt to the new teaching model quickly and participated in the whole teaching and learning process actively. Before class, they watched videos, downloaded the teaching materials released by teachers in the learning software, acquired new knowledge and finished the learning tasks in time. In class, as the main body of learning, they devoted themselves to various kinds of class activities and communicated with their teachers and classmates. After class, they took the initiative to review the lessons and complete the assignments under the supervision of teachers. Questions 7-10 mainly investigated students' perception and satisfaction with the new teaching model. The results showed that compared with the traditional teaching model, 97% of the students were in favor of the new teaching model, and believed that this mode could achieve a good teaching effect in the future. Questions 11-16 investigated students' learning effect after one semester of teaching experiment. According to data analysis, 93% of the students confirmed that the new teaching model had a positive influence on their English learning. They set a definite learning plan and regulated their learning time reasonably in the mobile learning process under the guidance of teachers. More opportunities for teacher-student communication could be created in class. All these greatly stimulated their learning motivation and interest, gave full play to their subjective initiative, improved their communicative ability and maximized their learning efficiency. Thus, good learning habits were formed gradually and learning autonomous learning ability was enhanced. Furthermore, the teaching resources in the mobile learning app were rich in content, adding more "language input", which were very helpful to their autonomous learning. Questions 17-24 investigated the effectiveness of the new teaching model. 87% of the students confirmed that they made great progress in their English learning and their English scores improved a lot after the new teaching model was carried out for a period of time. Under the new teaching model, students can easily get assistance

and feedback from teachers in the mobile learning process. Plenty of knowledge points which were too complicated for students to understand on their own could be explained and emphasized by teachers in class. Their learning problems could also be solved on time.

In short, the new flipped classroom teaching model based on mobile learning was widely accepted by the students from the experimental class. It broke through the limitations of time and space of learning, realizing the internalization of knowledge. Besides, it completely changed the situation of traditional teaching model and embodied the student-centered teaching concept.

B. Analysis of the Interview

In order to learn more about students' perceptions for the flipped classroom teaching model based on mobile learning and fully understand the influence of this new model on students' learning motivation, their autonomous learning ability and their academic achievement, six students from the experimental class were chosen to be interviewees and asked five questions related to the new teaching model. The analysis of the interview content is as follows: 1) Compared with the traditional teaching model, all the interviewees preferred the flipped classroom teaching model based on mobile learning, from which they benefit a lot. It changed the students' way of learning and overcame the shortcomings of the traditional teaching model, in which teachers dominated the whole class, students just listened passively and cannot have any opportunities to practice English; 2) The interviewees agreed that the new teaching model significantly improved their autonomous learning ability. Under the traditional teaching model, they mainly acquired knowledge from their teachers in class and seldom took the initiative to learn before class. But in this semester of teaching experiment, they got access to various learning materials in the form of audios, videos, courseware, etc. distributed by teachers in the learning software and learned them at anytime, anywhere through mobile devices. This greatly enhanced their learning enthusiasm and motivation. Group cooperative learning helped them to exchange learning experience, solve learning difficulties and share learning outcomes, which cultivated their ability of solving problems by themselves; 3) The interviewees confirmed that the new teaching model improved their English level and academic achievements. In class, they became the main body of learning and no longer kept silent as usual. By participating in various classroom activities such as, class report, group discussion, role plays, class presentation, etc., they got more opportunities to express their opinions, thus their oral English ability was promoted. Even two students with weak foundation in English said that this innovative teaching model created a harmonious and relaxed learning atmosphere, providing them equal communicative chances with their classmates. It alleviated their learning pressure, reduced their learning anxiety and increased their self-confidence so that they can learn consciously and actively. Therefore, they made great progress in learning and their English scores improved a lot; 4) The interviewees held that it was necessary to apply the new teaching model into English courses widely and believed this teaching model can achieve more effective results in the future, although there were still some problems, such as the lack of self-discipline in students' mobile learning, the pressure coming from students' academic work, etc.

C. Comparison Analysis of English Test Results between the Experimental Class and the Control Classes

All the subjects in the experiment class and the control classes were given a test before the teaching experiment. The collected data was analyzed through Independent Sample T Test by SPSS26.0. The results are shown in Table 2.

TABLE 1
INDEPENDENT SAMPLE T-TEST OF ENGLISH PROFICIENCY PRE-TEST IN EXPERIMENTAL CLASS AND CONTROL CLASSES

the Experimental Class				the Controlling Class				T Value	P Value
Class 1		Class 2		Class 3		Class 4			
Average Score	Standard Deviation	Average Score	Standard Deviation	Average Score	Standard Deviation	Average Score	Standard Deviation	-.304	.762
63.35	10.786	63.64	10.791	64.48	11.050	63.32	11.046		

As can be clearly seen from the data of table 2, the average score of the experimental class was 63.35 and that of the control classes was 63.64, 64.48 and 63.32 respectively. There was a gap, but very little difference in average score between them. The standard deviation of the experimental class was 10.786, slightly lower than that of the control classes (10.791, 11.050 and 11.046 respectively). That means no significant difference in the dispersion of students' score distribution exists. Moreover, the t value obtained from the independent sample t test was -0.304. The p value obtained is 0.762, which is significantly larger than the normal significance level value of 0.05, indicating that the average score difference of the four classes is not statistically significant. In other words, the students in the experimental class and the control classes were at the same level of English proficiency before the study, which met the experimental conditions. Therefore, they can be selected as research subjects.

After one semester of teaching experiment, a post-test was conducted to investigate and compare the changes of students' scores between the experimental class and the control classes. All the data obtained was also statistically analyzed by an independent sample t-test. The results can be seen in Table 2.

TABLE 2
INDEPENDENT SAMPLE T-TEST OF ENGLISH PROFICIENCY POST-TEST IN EXPERIMENTAL CLASS AND CONTROL CLASSES

INDEPENDENT SAMPLE T-TEST OF ENGLISH PROFICIENCY TEST BY EXPERIMENTAL CLASS AND CONTROL CLASSES									
the Experimental Class		the Controlling Class						T Value	P Value
Class 1		Class 2		Class 3		Class 4			
Average Score	Standard Deviation	Average Score	Standard Deviation	Average Score	Standard Deviation	Average Score	Standard Deviation	3.65	.031
75.45	8.006	71.50	8.349	70.28	8.730	68.56	8.928		

According to the analysis of the differences in Table 2, the average score of the experimental class was 75.45, whereas the average scores of the control classes are 71.50, 70.28 and 68.56 respectively. This shows that after one semester of teaching experiment, the students' test scores in the four classes have improved a lot. However, the average score in the experiment class is much higher than that of the control classes. Furthermore, the t value has also changed from negative to positive. The p value is 0.031, which is less than 0.05. All these means there was a significant difference between the grades of the experimental class and the control classes. Therefore, it can be clearly seen that compared with the grades of the control classes, the students in the experimental class have made greater progress in their English learning, which in turn proves that the flipped classroom teaching model based on mobile learning could have a positive influence on students' academic achievements.

V. CONCLUSION

Nowadays, the wide popularization of mobile devices and the rapid development of internet enable college students to learn knowledge at anytime, anywhere. So it becomes increasingly essential for teachers to apply mobile learning into college English teaching. In this study, an innovative flipped classroom teaching model based on mobile learning and multiple interactive learning environments were constructed, which not only stimulated students' learning motivation, enhanced students' autonomous learning ability, but also improved their academic achievement. The combination of mobile learning and flipped classroom transformed the roles of teachers from knowledge imparters to facilitators, organizers, guides and monitors. Through autonomous and exploratory learning, students became the real learning subject. In the whole mobile learning process, students internalized the new knowledge in the learning community of sharing, mutual assistance, cooperation and competition, thus improving their interpersonal communication ability; It solved the problems of the shortage of fixed teaching resources and improved the utilization of learning resources, further promoting sufficient integration of information technology and College English teaching; Most important of all, it also advocated the diversified evaluation system in combination of teacher evaluation, group evaluation and self-evaluation, improving the College English teaching evaluation method.

However, there exist many limitations in the study. Firstly, the teaching experimental lasts only one semester. Due to the short period of time, the research cannot be carried out in large scale. So the experimental results will be less effective than long-term experiments. Secondly, the scope of the subjects is confined to 191 non-English major students from Taishan University, which is not a large sample. The new teaching model is only applied to one experimental class and has not been applied widely in our universities. So the gathering and analysis of the experimental data are not sufficient. The statistical results are not comprehensive.

To sum up, mobile learning has become an indispensable part of College English teaching reform. The combination of mobile learning strategy and flipped classroom in College English teaching will become a new research direction and trend in the future. On the one hand, college English teachers should constantly study and explore new theories related to mobile learning and flipped classroom; On the other hand, they should apply them more deeply into the practice of College English teaching to find out more effective learning strategies and teaching modes that are really suitable for college students, and finally achieve the goal of improving the teaching quality of College English.

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