An Empirical Study on the Effectiveness of College English Reading Classroom Teaching in the Flipped Classroom Paradigm

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Abstract
This paper applies self-constructed four-stage teaching model of flip classroom, conducts empirical research on the effectiveness of classroom teaching in college English reading through parallel grouping teaching experiments, and comprehensively considers the experimental results by comprehensively using research methods such as quizzes, surveys and interviews. The results show that learners' acceptance of flipped classroom is higher and flipping has a certain positive effect on reading ability, which proves that flipped classroom can indeed help to improve the effectiveness of classroom teaching. In this paper, the content and frequency of flipped classroom, the use and construction of teaching resources, and the reform of teaching evaluation methods are discussed in depth and suggestions for improvement are put forward. At the same time, the negative effect of students' own negative factors on the implementation of flipped classroom is suppressed, and this can help the follow-up study find out its direction.

Keywords: Flipped Classroom, English Reading, Teaching Effectiveness

1. INTRODUCTION

MOOCs have posed major challenges to the teaching content, teaching quality, teaching mode and evaluation methods of college English since it thrived in 2012. Thus the teaching mode of flipped classroom has become a hot spot for empirical research at home and abroad. At present, the effectiveness of college English classroom teaching is seriously restricted by the traditional English teaching methods. Due to the single and backward teaching forms, there is a general lack of context and the low participation of students in the classroom. However, college students' learning has both initiative and exploration, at the same time, college students have more extra-curricular learning time and the ability of web-based technical operation, so the emergence of classroom theory becomes a new way to improve the effectiveness of college English classroom teaching. Based on the teaching experiment and the teaching reform of English reading teaching at home and abroad, this study attempts to reform the English reading teaching from passive teaching to active inquiry classroom and explore ways and strategies to improve the effectiveness of English reading classroom teaching through multiple channels.

Flipped classroom is a kind of teaching mode advocating the concept of "learning first and teaching second". Now more than ten representative teaching models have been evolved, which can be broadly divided into: two types of genre represented by Taubert, the three-stage genre represented by Muqi, the four-ring genre represented by Godin et al. (Mo Jun, 2017). From the application point of view, the flipped classroom has been widely recognized by college English learners. The effect of watching videos before class and interacting with teachers and students in the classroom is relatively high (Wang and Zhang, 2014). Relevant studies have verified the learning achievements and acceptance of flipped classroom in improving college English curriculum (Wang and Zhang, 2013). Relevant studies have also verified the improvement of learners' learning beliefs, learning strategies (Zhu, 2017), and English writing level and interest (Xu, 2017), and these studies proved that learners' evaluation of flip classroom satisfaction is influenced by three common factors: learner's expectation, perceived value and perceived quality Cedar (Lin, 2014).

Relevant research is still in its infancy in the field of applied research combining college English reading teaching with flipped classroom. Some scholars try to use "flipped classroom" to stimulate students' interest in independently reading and enhance students' reading ability (Yu, 2015), and they also discuss the application strategy of flipped classroom in college English reading teaching (Zhang, 2015), but all of these lack evidence of empirical research. The more representative is the quantitative study conducted by (Wang, 2015) of Harbin Medical University and concludes that "flipped classroom" plays an important role in cultivating students' ability to describe their own thoughts with the correct and flexible words and grammar and improving their

reading ability. Whether the experience gained from the research of the above research universities is suitable for the reform of college English reading teaching pattern in higher vocational colleges is yet to be verified by practice. Therefore, this study applies the flipped classroom model to English reading courses in higher vocational colleges, and uses the parallel grouping test method to carry out teaching experiments, so as to analyze and compare the obtained experimental data to verify the flipped classroom's validity and reliability in improving teaching effectiveness of college English reading course.

2. METHODS

2.1.Sample Selection

In this study, 51 students from 2 classes of 2015, who are English Business majors in Wuxi Vocational College of Science and Technology, were chosen as research objects in which includes 7 boys and 44 girls. According to the results of the parallel placement classes, the two classes of students have no significant difference in gender, age, origin, college entrance examination scores, etc. This study is based on the "English Reading" course, which covers 16 weeks for 32 class hours in a semester and 32 weeks for a total of 64 class hours in a single academic year. During the research, Class B (27 students) with a large number of students was selected as the experimental group. Class A (24 students) with relatively smaller number was used as the control group.

2.2.Dependent Variables: The Effectiveness of College English Reading Classroom Teaching

Improving the effectiveness of classroom teaching is an enduring proposition for teaching-oriented colleges and universities at all levels. The main influencing factor is that it is difficult to completely change the traditional teaching mode. Whether the flipped classroom theory and model which is initiated in Khan Academy can be used as foreign things to serve China, and whether it can find another way to answer the above proposition need to be verified in the localization of teaching experiments.

2.3. Intermediary Variables: The Teaching Resources in the Flipped Classroom

The smooth implementation of flipped classroom requires the construction and use of supporting informational instructional resources. In this research, we implement the concept of "auxiliary teaching with auxiliary learning" in the construction of teaching resources, including but not limited to the resources of micro-class in video form, covering three stages: before class-during class-after class. An example of the organizational structure of teaching resources is as follows:

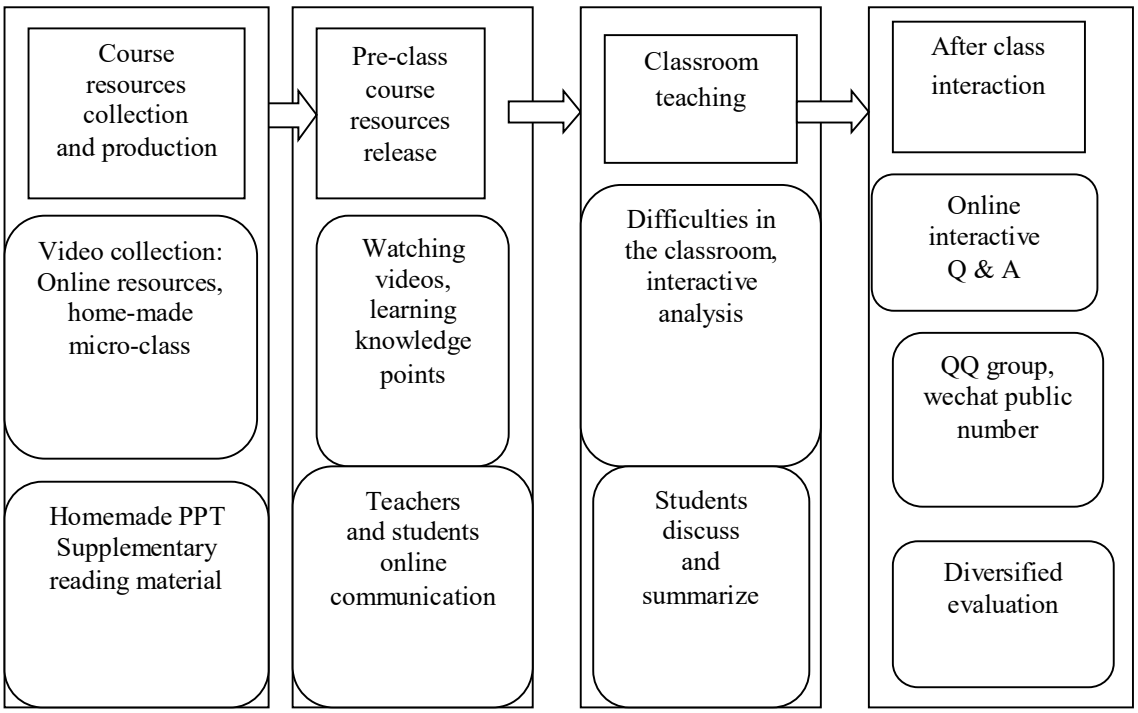

Figure 1. The organizational structure of flipped teaching

(1) Pre - class resources: curriculum standard, teaching design, self - study video;
(2) Resources in class: learning objectives, teaching courseware, micro-video, video;
(3) After-school resources: practice test, sentence cool network platform, teaching case;
(4) Online platform: QQ group, WeChat group, public number.

In the use of resources of flipped classroom, this study clarified that the experimental group should make full use of the resources and platforms. However, the control group should inform and provide resources and platforms but not make any mandatory requirements and requests.

2.4. Argument: Independent Construction of Flipped Classroom Mode

This study firstly criticizes and inherits the various teaching schools of the flipped classroom. Based on the four-stage genre of the Justin ring, this study constructs the flipped classroom model suitable for the higher vocational liberal arts curriculum. It breaks down the flipped classroom into "Study guideline - Pre-learning - Collaborative Competition - Exchange Application" (Mo Jun, 2017), trying to overcome the practical obstacles of the students with limited ability to take the initiative to learn. At the same time, this study uses the theory of bisection classroom, taking two weeks (4 hours)as a flipped cycle. During the 2015-2016 academic year, the experimental group implemented five turnover cycles with typical tasks as independent units each semester, with a total of 10 flipped cycles in a school year and 40 school hours. The control group adopted the traditional "combination of teaching and learning" mode to teach.

2.5. The Internal Logic and Block Diagram Model of the Research

This research evaluates the effect of teaching experiment through three dimensions. In the first dimension, at the initial stage of the experiment, a preliminary test of English reading ability of the two classes is conducted first. In the implementation of flipped teaching process, at the end of each semester, there will be a post-test, and then it will evaluate the learning outcomes by comparing the results of three tests. In the second dimension, a questionnaire survey is conducted on two classes during the final stage of the teaching of flipped course in one academic year to understand the experimental class's recognition of the teaching mode of flipped classrooms and the utilization and acceptability of flipped teaching resources in each class, and to verify the classroom teaching effectiveness. The third dimension, according to the results of the study and the questionnaire, will select representative figures to conduct in-depth interviews to find out the true beliefs and attitudes of the respondents in terms of flipped teaching modes, flipped resource types and flipped barriers in order to provide evidence for teaching effectiveness.

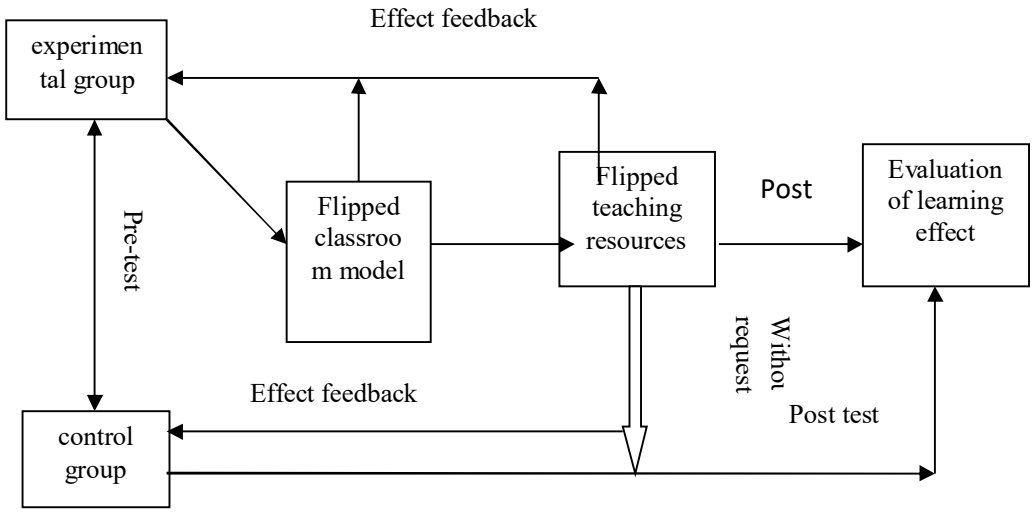

Figure 2. Logical block diagram model of research

2.6. Interval Valued Fuzzy Evaluation Method

The interval valued fuzzy average method is to evaluate the teaching evaluation system by replacing the average value of the traditional evaluation scheme with the effective interval score.

The arithmetic of interval number can be show by the following formula

$$[\mathrm{R}]=\left\{\left[a^{-},a^{+}\right]:a^{-}\le a^{+},a^{-},a^{+}\in R\right\} \tag{1}$$

where $[\mathrm{R}]$ is the set of all closed intervals formed on the real number set R.

$\forall[a^-,a^+],[b^-,b^+]\in[R],a^->0,b^->0,\forall k\in Q$,

$$[a^-,a^+]+[b^-,b^+]=[a^-+b^-,a^++b^+] \tag{2}$$

$$k[a^-,a^+]=[ka^-,ka^+] \tag{3}$$

$\forall k_i\in Q,[a_i^-,a_i^+]\in[R]$, then

$$(k_1,k_2,\cdots k_n)\begin{pmatrix}[a_1^-,a_1^+]\\ \vdots\\ [a_n^-,a_n^+]\end{pmatrix}=k_1[a_1^-,a_1^+]+\cdots k_n[a_n^-,a_n^+] \tag{4}$$

when $[a,b],[c,d]\in[R]$, then

$[a,b]<[c,d]$, $b<c$

$$[a,b]\prec[c,d],\ \frac{a+b}{2}<\frac{c+d}{2},\ b\geq c \tag{5}$$

$[a,b]=[c,d]$, $a=c$, $b=d$

$[a,b]\approx[c,d]$, $a\neq c$, $\frac{a+b}{2}=\frac{c+d}{2}$

First, the score of the three indicators of teaching evaluation system is evaluated by the evaluation of the main, statistical frequency of each level falls in the distribution, which can get the A in the original score interval using the formula of effective interval score

$$F_{ij}=\begin{Bmatrix}[f_{ij1}^-,f_{ij1}^+]\\ \vdots\\ [f_{ijm}^-,f_{ijm}^+]\end{Bmatrix} \tag{6}$$

where m is the number of three level indexes under the two level index u_{ij} .The weight can be calculated,

$$R_{ij}=[r_{ij}^-,r_{ij}^+]=q_{ij}\times F_{ij}=\sum_{k=1}^{m}q_{ijk}[f_{ijk}^-,f_{ijk}^+]=[\sum_{k=1}^{m}q_{ijk}f_{ijk}^-,\sum_{k=1}^{m}q_{ijk}f_{ijk}^+] \tag{7}$$

R_{ij} is the number of two level indexes under the first level index u_{ij} .

In the same way, the effective interval score of the first level index can be obtained

$$R_i=[r_i^-,r_i^+]=[\sum_{j=1}^{m}q_{ij}r_{ij}^-,\sum_{j=1}^{m}q_{ij}r_{ij}^+] \tag{8}$$

where m is the number of two level indexes under the first level index u_i

Effective interval score is

$$R=[r^-,r^+]=[\sum_{i=1}^{m}q_ir_i^-,\sum_{i=1}^{m}q_ir_i^+] \tag{9}$$

where m is the number of primary indicators in the evaluation system.

The effective interval scores of the four evaluation subjects are as follows

$$Z=[z^-,z^+]=[\sum_{i=1}^{4}W_iz_i^-,\sum_{i=1}^{4}W_iz_i^+] \tag{10}$$

where $[z_i^-,z_i^+]$ is the last valid interval of the i evaluation subject, that is, W_i is the weight of the i evaluation subject in the comprehensive scoring system. Then $[z^-,z^+]$ is substituted into the rank membership function

$y_1(t) \sim y_4(t)$ in turn and determine its level. The ranking of design factors in comprehensive evaluation can be obtained by ranking the maximum membership degree in the same grade.

3. RESULTS

3.1. The Evaluation on Learning Effect

During the teaching process throughout the school year of 2015-2016, this study conducted a reading ability test (pre-test) for both classes in the initial stage and takes their pre-test scores as the benchmark. Experimental group took typical tasks as an independent unit to implement five flipped cycles each semester, however, the control group used the traditional "combination of explaining and practising" teaching mode. The first post-test was conducted at the end of the first semester. The test was as flat as the previous test (Grade A). The second post-test was carried out at the end of the second semester which was more difficult (Level 4).

Table 1. The English reading ability test comparison of two groups of students for one school year

Group	The first post-test (compared with pre-test)				The second post-test (compared with pre-test)			
	rising	unchanged	falling	averaged	rising	unchanged	falling	averaged
Test group (27 persons)	77.8%	7.4%	14.8%	+10.04	48.1%	3.8%	48.1%	-0.48
Control group (24 persons)	58.3%	8.3%	33.4%	+2.88	29.2%	4.2%	66.6%	-3

3.2. A Survey on Experimental Results

In the final stage of the flipped classroom teaching in the first academic year, this study adopts a self-compiled questionnaire to comprehensively investigate the acceptability of self-constructed "four levels of tutoring classroom learning mode: learning guideline - collaborative competition - exchange and application". It also investigates the situation of each process and the effect of teaching experiment. The design of the questionnaire uses dichotomy to investigate the student's true beliefs.

Table 2. Experimental Group Students' Evaluation and Feedback on Flip-Class Teaching Modes

Items	Yes	No
	Cases number (%)	Cases number(%)
Do the students accept flipped classroom teaching mode?	25（92.59）	2（7.41）
Do the students accept the video form of flipped teaching resources?	16（59.26）	11（40.74）
Do students think teaching resources help improve their English reading ability?	14（51.85）	13（48.15）
Do students think "Learning Guide" link is necessary?	27（100.00）	0（0.00）
Do students think "Pre-learning" link is completed?	17（62.96）	10（37.04）
Do students think "Pre-learning" session is completed?	13（48.15）	14（51.85）
Do the students like grouping "collaborative competition" link?	23（85.18）	4（14.82）
Do students fully participate in the group "collaborative competition"?	10（37.04）	17（62.96）
Do students take the initiative to participate in the group "collaborative competition"?	8（29.63）	19（70.37）
Do students like the class "communication application" link?	21（77.78）	6（22.22）
Are students involved in the class "communication application" all the time?	24（88.89）	3（11.11）
Do students take the initiative to participate in the classroom "communication application"?	16（59.26）	11（40.74）

In this study, we set the informative teaching resources used in the process of the flipped classroom as mediating variables in the "pre-learning" session. In the experimental group, we clarified the purpose of the use of the resources and the correlation between each flipped period (4 class hours in 2 weeks) A total of 10 flipping cycles are required for a school year.

Table 3. Average usage of teaching resources of students during each flipped cycle in experimental group

Group	Whether used all the time		Using times			Using time		
	Yes	No	zero	once	twice or more	zero	within an hour	more than an hour
Experimental group (27 persons)	92.59%	7.41%	7.41%	66.67%	25.92%	7.41%	81.48%	11.11%

Correspondingly, the control group was informed and provided with the teaching information and platform used in the turnover, and simultaneously released the teaching resources and the usage requirements in the experimental group flipped teaching implementation, but the control group did not make any mandatory provisions on the use of resources. The control group was similarly surveyed at the end of the experiment to understand the acceptance and utilization of flip-over teaching resources. Questionnaire design also uses dichotomy.

Table 4. The flipped teaching resources' usage and feedback of students in control group

Items	Yes	No
	Cases number (%)	Cases number (%)
Did students use flipped teaching resources?	22 (91.67)	2 (8.33)
Do students accept video teaching resources?	17 (70.83)	7 (29.17)
Do students think teaching resources can help improve their English reading ability?	19 (79.17)	5 (20.83)
Do students accept the use of teaching resources to flipped teaching?	23(95.83)	1(4.17)
Are students insisting on using teaching resources to assist their learning?	1(4.17)	23(95.83)

3.3. An Interview on Experimental Results

Limited by the enrollment of Business English major in higher vocational colleges, the experimental population in this study is a small sample. In order to further analyze the experimental results of flipped classrooms, this study selected the typical persons in the experimental group and the control group in order to further implement the in-depth interview and aimed at grasping the true beliefs and attitudes of the respondents in turning over the teaching mode, reversing the use of resources and reversing the implementation obstacles. In the selection of interviewees, this study first consulted two post-test results of English reading ability, and then traced the extremum options presented in the questionnaire survey. On this basis, semi-structured interviewing skills were used to design the content and order of interview questions according to the actual situation of interview subjects, and the questions should be asked appropriately (Brinkmann and Kvale, 2015; Bryman, 2015) . The basic information of the interviewees are summarized in Table 5, and the interview results are presented and discussed together in the conclusion of the study.

Table 5. Interviewee information

Objects	Gender	Group	The first post-test	The second post-test	Education resources	Flipped mode	Class participation
1	female	test group	+23	+21	use	accept	Active participation
2	female	test group	+2	-7	Use all the time	accept	Full participation
3	male	test group	-1	-23	Not use	accept	Passive participation
4	female	test group	+1	-5	Not use	Not accept	Passive participation
5	female	control group	+7	+20	Use all the time	accept	/
6	female	control group	+8	-11	use	accept	/
7	male	control group	+3	-12	Not use	accept	/
8	male	control group	+4	-8	Not use	Not accept	/

According to the survey data of all stages, all students considered that it is necessary to carry out the necessary "study guide" at the initial stage of overturning to clarify the tasks. 62.96% of the students completed the "pre-study" at the teacher's request and the "collaborative competition" and class "exchange and application" two stages of acceptance and participation are more than 70%. Relatively speaking, the control group received 95.83% acceptance rate (expected degree) when they contacted and tried to turn over the teaching resources and listened to the teacher's brief introduction of the flip teaching mode. For the No.5 and the No.6 interviewees, they both expressed pity and questioned the teachers why they did not carry out overturning teaching in their class. Visibly, flipped classroom teaching model has higher acceptance in experimental groups, and it is more attractive to the non-experienced groups. According to the survey, although the experimental group students' acceptance and participation in the flipped classroom remained at a high level, the active participation rate was below 60%. The deep interview found that the problem was too frequent turnover (No.3) and the lack of learning interests (No. 4). Therefore, teachers should focus on choosing the content that has a large discussion space and can cultivate students' high-level thinking and involves the core concepts and important principles (Jiang, 2017). For the declarative basic knowledge that is neither suitable for turning over nor has the necessity to turn over, the traditional teaching mode is still appropriate.

The resource utilization, acceptance and utilization effect of flipped teaching are general, and resource construction should focus on the diversification of forms and content. In terms of the utilization of teaching resources, experimental group students should have a clear requirement of teachers that the utilization rate of the whole process is high (92.59%), and the number of times of use and duration are also unsatisfactory. For the control group of students, in the absence of explicit requirements of teachers, only a few students adhere to the full use. The survey revealed a noteworthy contrast in the acceptance of flipped teaching resources. Students in the control group have a high level of acceptance and recognition (over 70%) after initially using the flipped teaching resources, while those in the experimental group, after the use of resources, acceptance and recognition are less than 60%. After further interviews with test scores, it is found that students who do not accept the flip pattern and did not use teaching resources (No.4 and No.8) do not show any significant increase or decrease in post-test scores. The students in experimental group who use teaching resources (No.2), its results are basically the same. The score of student (No.5) who make use of teaching resources throughout the control group increases significantly. This result confirms that watching video before class does not necessarily bring about good learning outcomes (Davies RS et al., 2013; Conway SE et al., 2010). The interview also reveals the reasons why students reject the use of flip teaching resources, including that the form is too single (No. 7), the content is not interesting (No.4, No.8), and there is no computer (No.3), etc, which puts forward higher requirements for the construction of teaching resources.

The smooth implementation and participation in all stages of flipped classroom are affected to a greater extent by the negative factors of the students themselves, which should be complemented by necessary process evaluation measures. This study validates the positive influence of flipped classroom mode on improving the effectiveness of English reading course, but its negative learning habits, motivation, initiative and other factors have a significant inhibitory effect on them. At the same time, the degree of initiative participation and self-utilization rate of teaching resources are not high, especially the pre-class "pre-study" and "collaborative competition". These are difficult to be monitored by teachers, so that the degree of completion is not satisfactory, and the participants are solidified in a particular small group. The investigation and interview on the utilization of flipped teaching resources also prove this point. Under the teachers' explicit request, experimental students still refuse to use flipped teaching resources to assist learning. The reason of No. 4 interviewee (not interested) still has its rationality, but the reason of No.3 interviewee who has severe mobile phone dependence (no computer) is basically not established. For the only student in the control group who insists on using teaching resources to assist its study (No.5) during the whole process, most teachers and students acknowledge that his learning initiative and self-discipline are high. The results show that the guidance and assessment requirements of teachers can greatly improve the turnover rate of classroom participation and the utilization of teaching resources. Therefore, the teaching evaluation of overturning classroom should change the situation of larger proportion of the previous summative assessment, and strengthen the application of measures such as procedural evaluation and peer assessment. The teaching evaluation program should be completely reformed, and carry out a full range of assessment about students' motivation, behavior, initiative, and ability.

4. CONCLUSIONS

Flipped classroom teaching mode can be accepted by most students, but the flipped frequency depending on the teaching content and teaching needs should be reasonably controlled. After one year of flipped classroom teaching, the acceptability of experimental group for the teaching mode is 92.59%. Flipped classroom teaching experiments help to improve the effectiveness of English reading classroom teaching, and to a certain extent, affect students' English reading ability and achievement. In this study, two evaluation indicators to measure the effectiveness of classroom teaching are: classroom participation rate and reading ability test. First of all, from

the analysis of the survey interview, we can see that the students' learning initiative in the higher vocational colleges is generally poor, and the active participation rate of the students in the experimental group at each stage of "pre-study", "collaborative competition" and "communication application" is about 50%. The preparation of the pre-class group stage "collaborative competition" has a large amount of work, and it is also difficult for teachers to effectively regulate, so that a large number of students choose passive avoidance (2), and the full participation rate is only 37%. We can see that the realization of the flipped classroom guidance gives teachers a severe test. Under the guidance and supervision of teachers, the full participation rate of the "exchange application" is 88.89%. Compared with the negative class which is mainly conducted by teachers, the effectiveness of teaching is obvious. Under the guidance and supervision of teachers, the full participation rate of the "Exchange Application" is 88.89%. Compared with the negative class which is mainly conducted by teachers, the effectiveness of teaching is obvious. Second, the scores of reading proficiency test are explicit indicators of teaching effectiveness. From the test results, the experimental group who has flipped classrooms is significantly better than the control group in terms of the number of rising grades (+ 19.5%) and the average growth of points (+7.16) in the case of a quiz test. As the test difficulty increases, there is still some advantages in the experimental group who continues to flip the class in terms of the number of rising grades (+ 18.9%) and the average growth of points (+2.52) in the case of a quiz test. From the theoretical perspective of SLA, turning over the classroom teaching mode increases the input of language and facilitates the internalization of language, which inevitably optimizes the output efficiency and application ability of language.

ACKNOWLEDGEMENTS

Fund projects: Philosophy and social science research project of Jiangsu universities in 2015: "Research on the Effectiveness of Vocational College English Classroom Teaching under the Flipped Classroom Paradigm"(2015SJD377); Research project of school level teaching reform in 2015: "Innovative Research on Foreign Language Reading Course Construction from the Perspective of MOOCs"(JG2015109); Committee project of Educational Informationizaition major in 2016: "Research on the Application of Higher Vocational English in Teaching Resources under the Mobile Internet Environment"(EMIC201620-078).

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