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Flipped Classroom Mode of College English Listening and Speaking Teaching Based on POA Theory

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Abstract: *With the advancement of college education reform, the traditional College English listening and speaking class is facing many challenges, and most college students' English listening and speaking ability is gradually declining. Therefore, it is urgent to improve the effect of College English listening and speaking teaching, and relevant research has become the focus of education. Based on the theory of production oriented approach (POA), this paper makes a new design of classroom teaching of College English listening and speaking, and presents it in the form of flipped classroom. Then, a pre-test is conducted on the listening and speaking ability of economics students in a university, and then the comparative teaching is carried out. The experimental class (n = 29) was given flipped classroom teaching based on POA theory, while the control class (n = 29) was given traditional teaching. After a semester, the two classes' English listening and speaking ability was tested again, and the results before and after the two classes were compared. Finally, a questionnaire survey was conducted among the students in the experimental class and an interview with the English teachers. The experimental data show that the listening and speaking scores of the experimental class are improved by 13.75% and 17.02% respectively before and after the experiment. The results of listening and speaking in the control class were improved by 4.78% and 7.16% respectively. The minimum value of adaptability factor is selective learning, which is 1.55, and the maximum value is learning attitude, which is 4.95. 76% of the total number of students like and prefer this teaching mode. 48% and 31% of the students think that the teaching mode in this paper is very beneficial to the development of their own learning habits. Under this teaching mode, the average time of lesson preparation in each unit is about 52.6 minutes, and the difficulty of lesson preparation and teaching is also within the acceptable range. 50% and 33% of the teachers think that this teaching mode is very beneficial to improve their professional skills. This shows that flipped classroom teaching based on POA theory can improve students' English listening and speaking ability and teachers' professional skills, and its adaptability is good, which is worth promoting.*

Keywords: *POA Theory, Flipped Classroom, College English, Autonomous Learning, Listening and Speaking Teaching*

1. Introduction

1.1. Background Significance

At present, College English listening and speaking teaching is faced with many problems, such as limited practice time, students' interest is not so good, and many college students' listening and speaking ability is poor, and the ability of active learning and speculation is insufficient. The theory of production oriented approach is based on the output driven hypothesis [1]. The personalized learning before class and interactive teaching mode in flipped classroom can strengthen students' autonomous learning ability [2]. Therefore, in view of the current situation of College Students' English listening and speaking, this paper studies the flipped classroom mode under the production oriented method theory, which is helpful to improve the learning effect.

1.2. Related Work

Production oriented approach (POA) has been the focus of foreign language teaching research since it was proposed. Li S has made a detailed study on the production oriented approach to measure its impact on College Students' oral English [3]. First of all, he chose two groups of students to use POA

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or PPP (demonstration, practice, output) teaching in oral class, and then tested the level of these two groups of students before and after the beginning and end of the teaching plan, and their oral English scores were statistically analyzed by SPSS17.0. Shufang L applies the production oriented method to the teaching of foreign trade English document making course [4]. Her research fills in the blank of production oriented teaching in ESP teaching, but in the comparative teaching, there is no control over the variables of teaching time and teaching resources.

Flipped classroom subverts the traditional teaching process, which is of great significance to the contemporary teaching reform. Blair E aims to explore whether flipped teaching mode can improve students' learning experience. Through the analysis of course performance and student evaluation questionnaire, Blair E collected data. He also reviewed teachers' reflective comments before and after the research [5]. Lo C K provides an overview of the research on flipped classroom in K-12 education, emphasizing on revealing and solving the potential challenges of flipped classroom teaching method [6]. He analyzed 15 kinds of journal publications of K-12 flipped classroom from the aspects of flipped learning activities, students' scores, students' attitudes and challenges.

1.3. Innovative Points in this Paper

The innovation points of this study are as follows: (1) according to the actual content of College English listening and speaking teaching, we use POA theory to carry out a new teaching design and present it in the form of flipped classroom. (2) Through the test, it is found that the flipped classroom teaching based on POA theory can improve students' listening and speaking ability. (3) After a questionnaire survey of students, it is found that the students have better adaptability and satisfaction with the flipped classroom teaching based on POA theory. After interviewing the teachers, we found that the flipped classroom teaching based on POA theory can save the preparation time, moderate difficulty and improve professional ability.

2. POA Theory and Flipped Classroom Teaching

2.1. Theoretical System of Production Oriented Method

(1) The teaching idea of production oriented method

The production oriented approach (POA) emphasizes the learning center theory and advocates that all teaching activities of teachers serve the participation and effectiveness of students' learning in the limited teaching classroom [7]. Teaching should be a tool to achieve teaching objectives and promote effective learning. This idea can directly reflect the essential characteristics of school education. Teachers can choose teaching methods suitable for teaching objectives and organize different forms of teaching activities in the classroom.

The theory of POA emphasizes the integration of learning and application, and promotes the actual output through learning texts. The theory of integration of learning and application does not deny the role of text teaching in the cultivation of students' comprehensive ability. Its focus is to maximize the teaching effect and change the current situation of input oriented teaching [8]. It is advocated that learning and application should be integrated so that students can learn to apply what they have learned.

The POA theory emphasizes the whole person education. Therefore, teaching should realize the teaching goal of instrumental and humanistic, and pay attention to students' emotion, morality and comprehensive quality. Teachers can sublimate their emotions in the selection and processing of teaching materials to promote students to form correct three views; when designing teaching activities, teachers can choose topics and materials to spread positive energy, and promote cooperation between students.

(2) Teaching hypothesis of production oriented method

Output driven hypothesis holds that foreign language learning should meet the needs of workplace use [9]. The output driven hypothesis claims to take output as the starting point and destination. This hypothesis can better stimulate students' enthusiasm and subjective initiative, so as to improve the learning effect.

However, the output driven hypothesis does not mention the positive role of input. The hypothesis affirms the facilitating role of input in the completion of output tasks, and believes that input can

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provide relevant language knowledge for output, enrich students' knowledge system, and improve students' productive ability, so as to obtain better learning results [10].

The hypothesis of selective learning is based on the hypothesis of input facilitation. According to the actual situation and needs of output tasks, teachers provide learning materials that meet most academic needs. If students want to make progress and improve their learning effect, they can choose more suitable materials from the materials provided by teachers and refine them. Because students' energy and attention are always limited, so targeted selective learning can optimize the learning effect.

(3) Teaching process of production oriented method

The teaching of Poa theory is composed of three stages: driving, promoting and evaluating, which is teacher-centered. In the driving link, teachers describe the communicative scenes related to teaching objectives in class, let students carry out output activities, and then make clear the teaching objectives and output tasks of this class after the activity. Let students find their own defects in the output activities and the gap between them and their goals, thus stimulating the students' learning motivation.

In the process of promoting, teachers need to explain the type and content of output tasks in detail, and provide sufficient input materials for students. Students choose to learn input materials and practice output. In this stage, teachers play an intermediary role of supervision and guidance.

In the evaluation process, the evaluation standard is jointly formulated by students and teachers. After the students give the results within the specified time, the evaluation criteria are used to evaluate the cooperation between teachers and students in time. The evaluation made on the spot in the classroom is immediate evaluation, and the evaluation outside the classroom is delayed evaluation. The design purpose of this link is to evaluate the output results of students, let students see their own progress, encourage students, and improve teaching effect.

2.2. Flipped Classroom Teaching Mode

(1) Theoretical basis of flipped classroom

In order to effectively improve students' learning adaptability in flipped classroom, we must consider the learning characteristics of traditional classroom and flipped classroom, fully understand the relevant theoretical basis, and make a good transition from traditional classroom to flipped classroom. The first is the theory of instructional design, because a good instructional design can greatly improve the teaching effect of teachers and the learning effect of students [13].

Next is the expectation theory. People will strive to achieve a certain goal, before the goal is completed, they will have corresponding expectations. If you want to achieve higher expectations, it will stimulate a stronger motivation [14]. Therefore, in the flipped classroom, we should pay attention to help students make clear their learning objectives and praise them appropriately, so as to stimulate stronger learning motivation.

The last is Piaget's cognitive development theory, which holds that the individual's psychological response is an adaptation to the changes of the external environment. The forms of adaptation include assimilation and adaptation. Individuals maintain a dynamic balance with the external environment through assimilation or adaptation [15]. After losing balance, individuals can reach a higher level of balance through automatic adjustment.

(2) Influencing factors of flipped classroom

Students have not done a good job in the role transition from traditional classroom to flipped classroom, and are not used to fully autonomous learning mode. Flipped classroom has a high demand for learning resources. Many online learning platforms cannot meet the requirements. Students may encounter problems that can not be solved in time. In addition, flipped classroom has higher requirements for teachers in curriculum design and content production. Many teachers are lack of skills and technology, and it is difficult to convert their own course content into video [16].

The first is the adaptability of students to the autonomous network learning mode, the stronger the adaptability, the better the teaching effect. The second is the improvement of curriculum resources and the ease of use of online learning platform. The more perfect the teaching resources and the easier the platform operation, the better the students' learning effect [17]. The third point is teachers' teaching ideas and professional and technical ability. If teachers can change their teaching ideas, quickly adapt to the flipped classroom mode, and improve their professional and technical ability, they can achieve

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better teaching results. Finally, we should also consider the practicality of the discipline and the perfection of the evaluation mechanism. There are differences in flipped classroom of different disciplines, so we cannot mechanically copy them mechanically. Therefore, we need to adopt corresponding standards in the evaluation of teaching effect, rather than one size fits all [18].

(3) Characteristics of flipped classroom

In terms of teaching methods, flipped classroom focuses on autonomous learning before class, exploring internalized knowledge in class, while traditional teaching explains knowledge in class and arranges homework after class.

In classroom activities, flipped classroom mainly focuses on Problem Inquiry and display and exchange, and after class, students consolidate their thinking and sort out classroom harvest; traditional teaching focuses on imparting and explaining knowledge, and students only need to complete the homework assigned by teachers after class, which is difficult to exercise students' ability of summary and independent review [19]. In terms of evaluation methods, the flipped classroom mainly focuses on formative evaluation, while traditional teaching focuses on comprehensive evaluation.

2.3. Application of Data Mining in Teaching Materials Collection

(1) Teaching system based on Data Mining

Whether it is POA theory or flipped classroom teaching mode, the collection of relevant teaching materials and materials is very important, which is a very time-consuming work for teachers. Therefore, the application of data mining with powerful search ability in the collection of teaching materials can save the time of teachers. Data mining can quickly and efficiently mine information data with potential value from random data, help teachers find the content matching the output task and students' learning situation in the massive learning materials and materials [20].

At present, many teaching system models based on data mining technology have been put into use in reality. Teachers can use such platforms to organize relevant teaching resources and share them with students through teaching platforms. This kind of technology is more mature, and is the tool used in this study, but not the focus of this paper.

(2) Related technologies of data mining

Naive Bayes method is one of the most common and simplest data mining methods [21]. In order to use naive Bayes classification, the assumption of independence must be satisfied. The expression of naive Bayes classifier is shown in Formula 1:

$$C = \arg\max_{C_a \in C} P(C_b) \cdot \prod_{a=1}^{n} P(t_a | C_b) \tag{1}$$

Where C, C_b represent the category set and category b respectively, $P(C_b)$ represents the probability of category b, and $P(t_a|C_b)$ represents the probability of occurrence of C_b in category t_a .Therefore, if a new document needs to be analyzed, $P(C_b)$ and $P(t_a|C_b)$ must be calculated from the training set.

Support vector machine (SVM) is widely used in data mining classification, and its decision boundary is represented by a subset of training examples [22]. In order to estimate the parameters of decision boundary in the training process of linear separable SVM, the parameters w, b need to meet the preconditions as shown in Formula 2:

$$\begin{aligned} w * x_n + b \geq 1, if\ y_n = 1 \\ w * x_m + b \leq -1, if\ y_m = -1 \end{aligned} \tag{2}$$

Where $x_n = (x_{n1}, x_{n2}, \cdots, x_{nd})^T$ is the attribute of the n th sample and $y_n \in \{-1,1\}$ is the category of the sample. In addition, SVM requires maximizing the edge of decision boundary [23]. As shown in Formula 3:

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$$L_P = \frac{1}{2}\|w\|^2 - \sum_{n=1}^{R}\lambda_n\left(y_n\left(w*x_n+b\right)-1\right) \tag{3}$$

Where R is the number of training samples? If the partial derivative of Formula 3 is obtained and equal to zero, the decision boundary is shown in Formula 4:

$$\left(\sum_{n=1}^{R}\lambda_n y_n x_n * x\right)+b=0 \tag{4}$$

In practical application, the mean value of b is generally used as the parameter of decision boundary. A positive relaxation variable δ is introduced into the constraints of the optimization problem. In this case, the parameters w, b need to satisfy the preconditions shown in Formula 5:

$$\begin{aligned} &w*x_n+b\geq 1-\delta, if\ y_n=1\\ &w*x_m+b\leq -1+\delta, if\ y_m=-1 \end{aligned} \tag{5}$$

$$L_P = \frac{1}{2}\|w\|^2 + C*\sum_{n=1}^{R}\delta_n - \sum_{n=1}^{R}\lambda_n\left[y_n\left(w*x_n+b\right)-1+\delta_n\right]-\sum_{n=1}^{R}\mu_n\delta_n \tag{6}$$

Among them, C is the parameter pointed by the user, which represents the punishment for misclassifying the training instance. The dual Lagrange function is shown in Formula 7:

$$\begin{aligned} &L_D = \sum_{n=1}^{R}\lambda_n - \frac{1}{2}\sum_{n,m}\lambda_n\lambda_m x_n x_m y_n y_m\\ &0\leq\lambda_n\leq C \end{aligned} \tag{7}$$

The learning problem of nonlinear SVM is represented by optimization problem, as shown in Formula 8:

$$\begin{cases} \min\limits_{w}\dfrac{1}{2}\|w\|^2\\ y_n\left(w*\Phi\left(x_n\right)+b\right)\geq 1, n=1,2,\cdots,R \end{cases} \tag{8}$$

The dual Lagrange function of Formula 8 is as follows:

$$L_D = \sum_{n=1}^{R}\lambda_n - \frac{1}{2}\sum_{n,m}\lambda_n\lambda_m y_n y_m \Phi\left(x_n\right)\Phi\left(x_m\right) \tag{9}$$

The quadratic programming technique is used to calculate the λ_n, parameters w, b, which are shown in Formula 10 and Formula 11:

$$w = \sum_{n}\lambda_n y_n \Phi\left(x_n\right) \tag{10}$$

$$\lambda_n\left\{y_n\sum_{m}\lambda_m y_m\Phi\left(x_m\right)*\Phi\left(x_n\right)+b-1\right\}=0 \tag{11}$$

The neural network algorithm needs to construct a threshold object. If the sum of a group of logical unit variables is not less than a given threshold value, a value will be output [24]. Suppose that the input value is $x_1, x_2, \cdots, x_n$ and the weighted coefficient of the input value is $j_1, j_2, \cdots, j_n$, the variable summation is shown in Formula 12:

$$M = \sum_{i=1}^{n}\left(x_i * j_i\right) \tag{12}$$

The decision tree algorithm adopts probability statistical method to reflect the mapping relationship between attribute values and attributes. ID3 algorithm calculates and analyzes information entropy and

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information gain [25]. The calculation of information gain is shown in Formula 13:

$$Z(A)=N(t_1,t_2,\cdots t_m)-R(A) \tag{13}$$

Where $N(t_1,t_2,\cdots t_m)$, $R(A)$ the expected value and information entropy respectively, and their calculation are is shown in formula 14 and formula 15 respectively.

$$N(t_1,t_2,\cdots t_m)=-\sum_{i=1}^{m}K_i\log_2(K_i) \tag{14}$$

$$R(A)=\sum_{i=1,j=1}^{m,n}t_{ij}N(t_{ij})/t \tag{15}$$

The decision rule of K-nearest neighbor algorithm score is shown in Formula 16:

$$P(\bar{c}_t,l_j)=\sum_{u_j\in KNN}sim(\bar{c}_t,\bar{u}_j)y(\bar{u}_j,l_j)-a \tag{16}$$

Where $y(\bar{u}_j,l_j)$ is 1 or 0; $sim(\bar{c}_t,\bar{u}_j)$ is the similarity between test document $\bar{c}_t$ and training document $\bar{u}_j$; a is the threshold of binary decision. The similarity between the test text vector and the training text vector is as follows:

$$sim(\bar{c}_t,\bar{u}_j)=\frac{\sum_{k=1}^{v}w_{tk}\times w_{jk}}{\sqrt{\sum_{k=1}^{v}(w_{tk})^2}\sqrt{\sum_{k=1}^{v}(w_{jk})^2}} \tag{17}$$

Where v is the dimension of the eigenvector and w_k is the k-th dimension of the vector.

3. Experiments of Flipped Classroom Model Based on POA Theory

3.1 Experimental Object and Arrangement

Taking sophomores majoring in economics as the experimental subjects, 58 students were divided into two classes, 29 in the experimental class and 29 in the control class. Before the teaching experiment, the listening and speaking abilities of the students in the two classes were tested, including listening and speaking. The test results are composed of actual examination results and teachers' scores. The examination results account for 60% of the total score, and the teacher's score accounts for 40% of the total score.

Then, the flipped classroom teaching mode based on POA theory is used in the experimental class, and the traditional classroom teaching mode is used in the control class. A one semester teaching comparative experiment (February 2019 to July 2019) was conducted. The class hours of the two classes were the same, and the teaching materials were the same.

After the teaching experiment, the listening and speaking ability of the two classes is tested again, and the results of the two classes are compared and analyzed vertically and horizontally. Then, a questionnaire survey was conducted among 29 students in the experimental class and 6 English teachers in the university. The experimental design of this study is shown in Figure 1.

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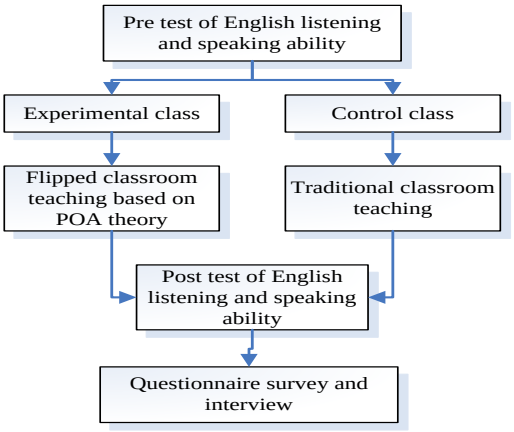

Figure 1: Experimental design process

3.2 Flipped Classroom Teaching Design Based on POA Theory

(1) Driving link

In the driving stage, combined with the flipped classroom teaching mode, teachers use data mining technology and online learning platform to provide students with relevant learning video materials and create corresponding communication situations. The main content is the theme of each class, and the corresponding teaching objectives are completed in one semester. Flipped classroom can also greatly guarantee students' autonomous learning time.

(2) Facilitating link

In the facilitation process, teachers should first clarify the specific content of the output task, mainly in the form of reading aloud, situational dialogue and speech. Students can consolidate their knowledge and improve their English listening and speaking ability through different forms of output tasks.

Then, the students cooperate in groups to selectively study the teaching materials provided by teachers. At the end of the group, the students trained independently on the output task to achieve the output task. In this process, teachers need to play the role of promoter, director and inspector.

(3) Evaluation link

Due to the diversity of output tasks, it is difficult for teachers to give feedback in time, which may lead to the loss of students' enthusiasm. Therefore, this study adopts the form of teacher-student cooperative evaluation to realize the evaluation link and to evaluate the teaching effect in a timely and accurate way.

3.3 Questionnaire Survey and Interview

The questionnaire mainly consists of single-choice questions and multiple topics, including the adaptability, attitude and self-learning habits of flipped classroom based on POA theory.

Teacher interview starts with the time of preparing lessons, the difficulty and the improvement of professional skills.

4. Discussion on Flipped Classroom Model Based on POA Theory in College English Teaching

4.1 Test Results

(1) Results of two classes before the experiment

The final score is equal to 60% of the actual test score plus 40% of the teacher's score. The listening and speaking scores of the two classes are as follows:

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Table 1: Listening and speaking scores of the two classes before the experiment

Performance composition		Experimental class	Control class
Listening performance	Examination results	68.54	69.25
	Teacher rating	65.23	65.18
	Total score	67.22	67.62
Oral performance	Examination results	64.37	63.86
	Teacher rating	62.38	61.79
	Total score	63.57	63.03

As shown in Table 1, the listening scores of the experimental class and the control class were 67.22 and 67.67, and the oral scores were 63.57 and 63.03, respectively.

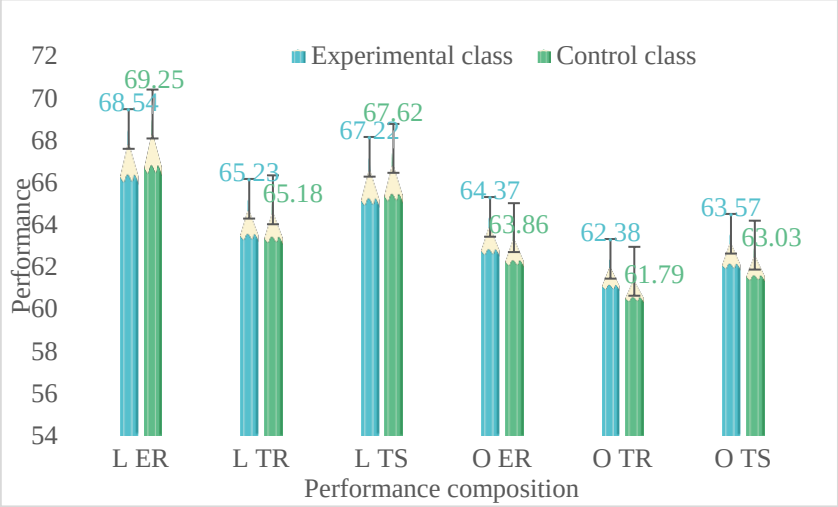

Figure 2: Composition of listening and speaking scores of the two classes before the experiment

As shown in Figure 2, the listening test scores of the experimental class are 0.71 points lower than those of the control class, and the scores of the listening teachers are 0.05 points higher than those of the control class. The oral test scores and teacher scores of the experimental class were slightly higher than those of the control class, 0.51 and 0.59 points higher respectively. This shows that the pre-test scores of the two classes are similar, which is conducive to the comparison of the later experiments.

(2) Results of two classes after the experiment

The composition of the score was consistent with the pre-test. The listening and speaking scores of the two classes are as follows:

Table 2: Listening and speaking scores of the two classes after the experiment

Performance composition		Experimental class	Control class
Listening performance	Examination results	77.32	71.53
	Teacher rating	75.18	69.82
	Total score	76.46	70.85
Oral performance	Examination results	75.66	68.61
	Teacher rating	72.48	65.94
	Total score	74.39	67.54

As shown in Table 2, after a semester of comparative teaching, the listening and speaking scores of the experimental class were 76.46 and 74.39, and those of the control class were 70.85 and 67.54, respectively. There is a big gap between the two classes in English listening and speaking ability.

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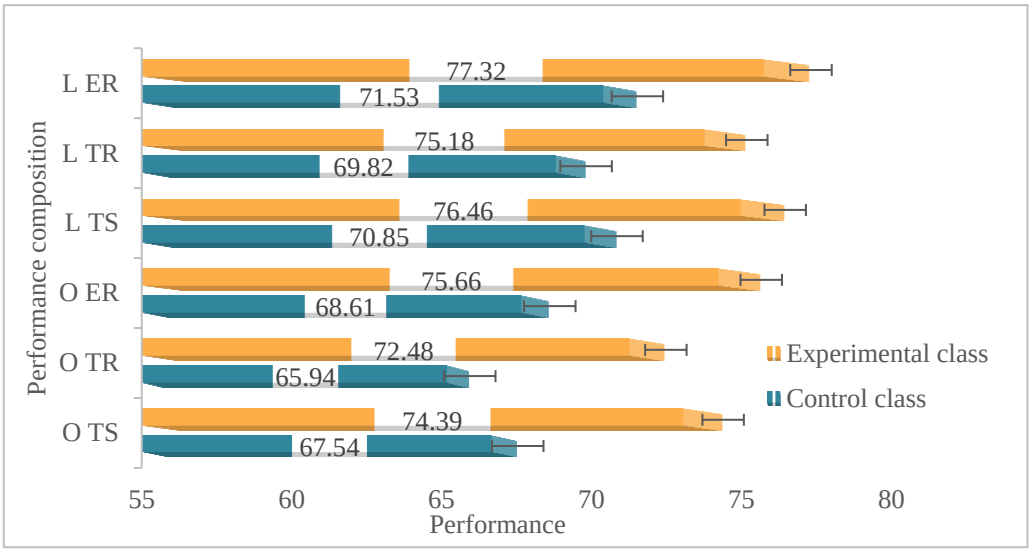

Figure 3: Composition of listening and speaking scores of the two classes after the experiment

As shown in Figure 3, the listening test scores and teacher scores of the experimental class are 5.79 and 5.36 points higher than those of the control class, respectively. The oral test scores and teacher scores of the experimental class were 7.05 and 6.54 points higher than those of the control class.

(3) Comparison before and after the experiment

Then, the two classes' English listening and speaking abilities before and after the experiment are compared longitudinally, and the improvement level of the two classes is analyzed.

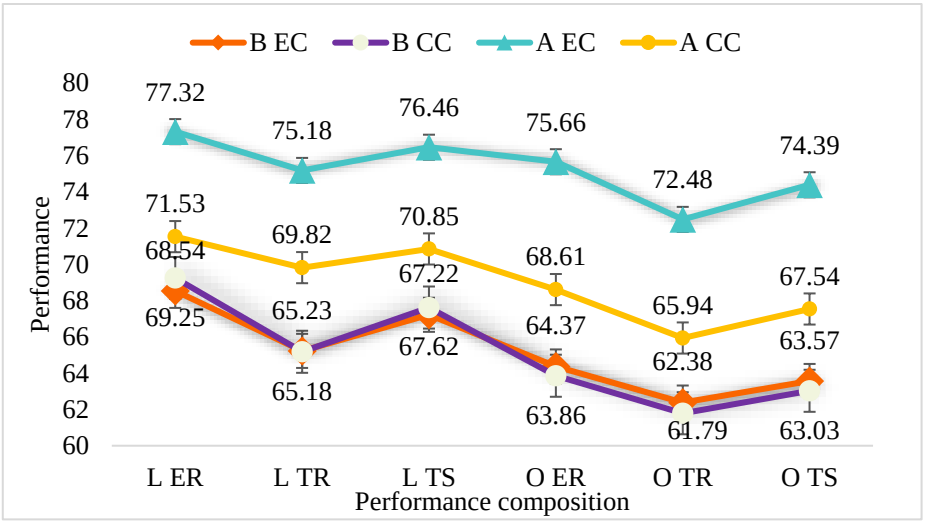

Figure 4: Comparison of the results of the two classes before and after the experiment

As shown in Figure 4, before and after the experiment, the listening and speaking scores of the experimental class improved by 13.75% and 17.02% respectively. The results of listening and speaking in the control class were improved by 4.78% and 7.16% respectively.

4.2 Student Questionnaire Survey Results

(1) Adaptability of flipped classroom based on POA theory

According to the adaptability level, the adaptability can be divided into five grades: the average adaptability of grade I is between 1 and 1.5, indicating that the adaptability is very poor; the average adaptability of level II is between 1.6 and 2.5, indicating that the adaptability is weak; the average adaptability of grade III is between 2.6 and 3.5, indicating moderate adaptability; that of grade IV is between 3.6 and 4.5, indicating strong adaptability; and that of grade V is between 2 and 3, indicating

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strong adaptability.

The adaptive factors in this study include output task orientation (A), learning attitude (B), selective learning (C), knowledge application (D), environment creation (E) and average score of adaptability (F). The learning adaptability of 29 experimental class students in flipped classroom based on POA theory is as follows:

Table 3: Analysis of students' learning adaptability

Factor	N	Minimum	Maximum	Mean value
A	29	1.85	4.15	2.78
B	29	2.10	4.95	3.51
C	29	1.55	4.10	3.07
D	29	1.95	4.55	3.49
E	29	1.60	4.05	3.02
F	29	2.05	3.95	3.12

As shown in Table 3, the average score of adaptability (F) of the students in the experimental class to the flipped classroom based on POA theory is 3.12, which is at level III indicating moderate adaptability according to the standard.

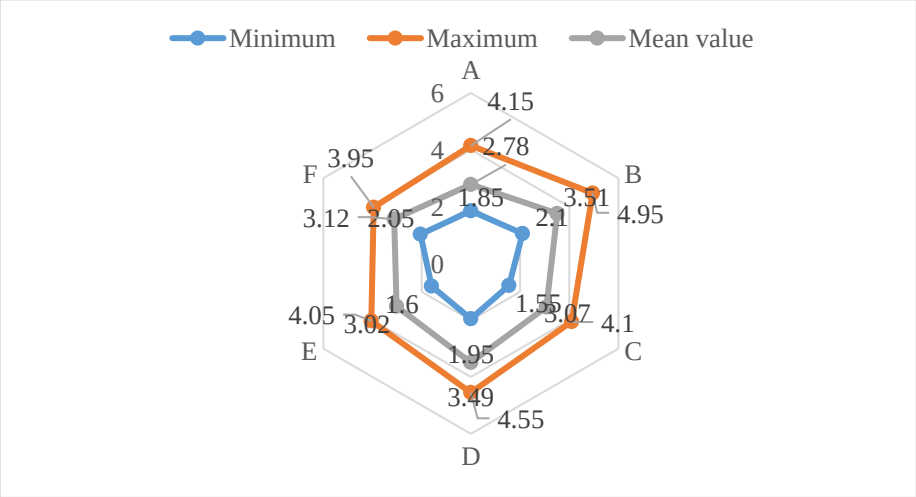

Figure 5: Specific score of adaptability factor

As shown in Figure 5, selective learning (C) is the smallest among the minimum adaptive factors, which is 1.55, and the maximum value is learning attitude (B), which is 4.95. Among the factors of learning adaptability, output task orientation (A), selective learning (C) and environment creation (E) were lower than the average score of adaptability (F). Therefore, in order to improve the adaptability, we should start from these three aspects.

(2) Attitude towards flipped classroom based on POA theory

After the flipped classroom teaching practice based on POA theory, the learning attitude of 29 students in the experimental class was investigated and analyzed. The liking degree of flipped classroom teaching method is divided into 1-5 grades, which are divided into very like, relatively like, general, indifferent and dislike. The results are as follows:

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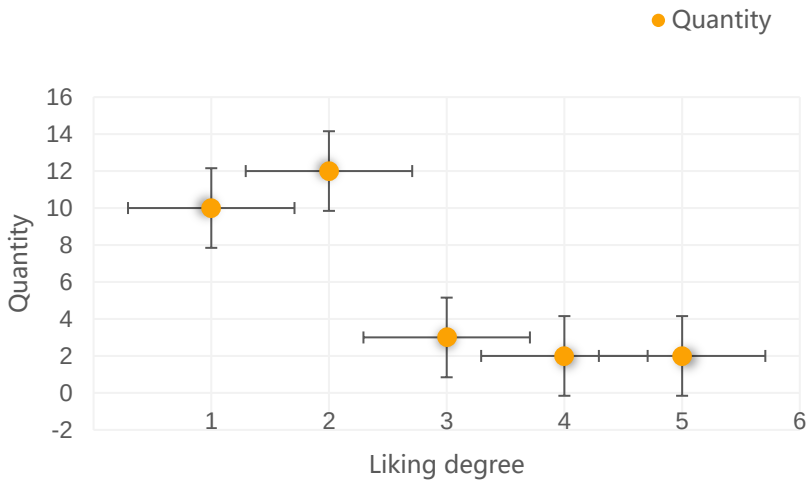

Figure 6: Students' attitude towards flipped classroom based on POA theory

As shown in Figure 6, 76% of the students like and prefer the flipped classroom based on POA theory, 10% generally like it, 7% don't care and 7% don't like it. Although most of the students are not interested in the flipped classroom teaching mode, most of them are not interested in it.

(3) Cultivation of autonomous learning habit

In the driving link and the facilitating link, the students were investigated to analyze whether the pre class learning of flipped classroom based on POA theory was conducive to the formation of autonomous learning habits. The degree of advantage was divided into four grades: L1-L4, which indicated that it was very favorable, more favorable, general and not helpful. And the completion of students' autonomous learning before class, which can be divided into four categories: F1-F4, indicating good, good, average and poor.

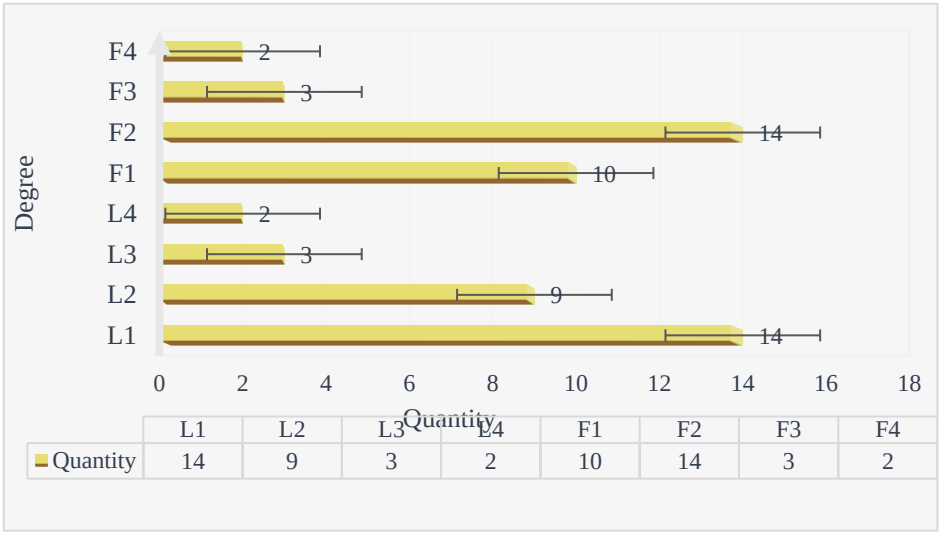

Figure 7: The development of autonomous learning habits

As shown in Figure 7, 48% and 31% of the students respectively think that the flipped classroom based on POA theory is very beneficial to the development of their autonomous learning habits. 34% and 48% of the students completed the learning task well and well in the autonomous learning before class. This shows that students can form a good habit of autonomous learning and complete the learning tasks accordingly through the pre class learning of flipped classroom based on POA theory.

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4.3 Teacher Interview Results

(1) Lesson preparation time

This paper analyzes the preparation time of traditional teaching and flipped classroom teaching based on POA theory. Three English teachers (TT1-TT3) prepare lessons on the premise of traditional teaching mode, and the other three English teachers (PF1-PF3) prepare lessons by using data mining technology and network platform under the premise of flipped classroom teaching mode based on POA theory. The time of preparing lessons for the six unit topics of College English is compared.

Table 4: Comparison of lesson preparation time (min)

Teacher	TT1	TT2	TT3	PF1	PF2	PF3
Unit 1	81.3	85.8	80.9	58.3	49.7	60.7
Unit 2	78.5	80.4	79.3	54.2	45.5	58.4
Unit 3	61.4	63.5	65.5	49.3	46.3	55.2
Unit 4	65.8	67.7	62.6	50.4	45.8	55.7
Unit 5	81.2	85.9	78.3	52.7	48.4	54.3
Unit 6	85.7	87.4	83.4	55.5	50.3	56.9
Total	453.9	470.7	450	320.4	286	341.2

As shown in Table 4, different teachers have different preparation time in the same unit. The total preparation time of the three teachers under the traditional teaching mode is 453.9min, 470.7min and 450min respectively, while the total time of the three teachers under the flipped classroom teaching mode based on POA theory is 320.4min, 286min and 341.2min respectively. The change trend of each teacher's preparation time in 6 units is as follows:

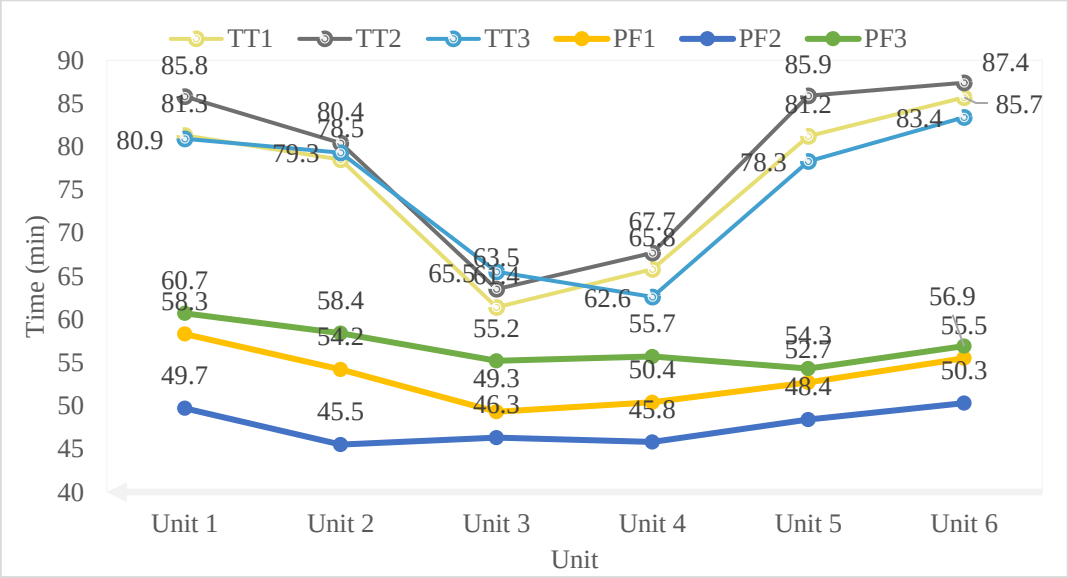

Figure 8: Change trend of lesson preparation time in different units

As shown in Figure 8, under the traditional teaching mode, the preparation time of six units fluctuates greatly, showing a U-shaped change trend. Among them, the average time of lesson preparation in unit 3 and unit 4 was the shortest, 63.5 min and 65.4 min, respectively. Based on POA theory, the change of lesson preparation time of each unit in flipped classroom teaching mode fluctuates slightly, with an average of 52.6 minutes. This shows that under the flipped classroom teaching mode based on POA theory, teachers' preparation time can be greatly shortened and controlled in a relatively stable state.

(2) Difficulty

Then, it analyzes the six teachers' views on the difficulty of lesson preparation and teaching.

Table 5: Difficulty of lesson preparation and teaching

Facility value	Lesson preparation difficult	Lesson preparation general	Lesson preparation simple

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Teaching difficult	1	2	0
Teaching general	0	2	0
Teaching simple	0	1	0

As shown in Table 5, one teacher thinks that the preparation and teaching are difficult and challenging. Two teachers think that the preparation of lessons is general, but teaching is difficult. Two teachers think that the preparation of lessons is general and the teaching is general, so they can do the corresponding work well. One teacher thinks that preparing lessons is general, teaching is simple, and he can fully adapt to the new teaching mode.

(3) Improvement of professional skills

This paper analyzes whether the flipped classroom teaching mode based on POA theory can improve their professional skills.

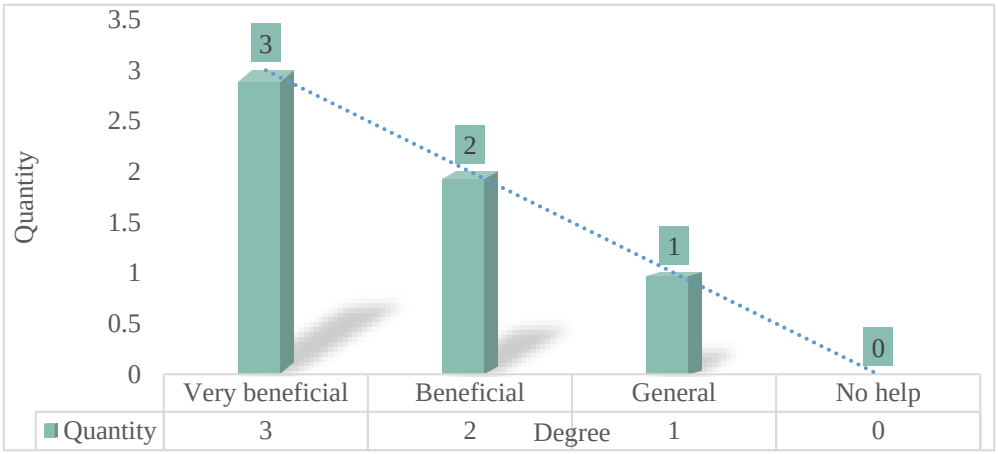

Figure 9: Improvement of teachers' professional skills

As shown in Figure 9, 50% and 33% of teachers think that flipped classroom teaching mode based on POA theory is very beneficial and beneficial to improve their professional skills. The remaining 17% of the teachers thought that the promotion effect was moderate.

5. Conclusions

The flipped classroom teaching mode based on POA theory can effectively improve students' English listening and speaking performance. Although some students do not like the flipped classroom based on POA theory, most students are interested in this new teaching mode. Students can form a good habit of autonomous learning and complete the learning task accordingly through the pre class learning of flipped classroom based on POA theory.

Under the flipped classroom teaching mode based on POA theory, teachers' preparation time can be shortened and controlled in a relatively stable state. The difficulty of lesson preparation and teaching under this mode is also acceptable. The application of this mode in teaching can effectively improve teachers' professional skills.

Due to the limited time and knowledge ability, this study has some shortcomings. The number of classes participating in the teaching experiment is small, and the number of students is limited. The data obtained can not fully represent all college students. Moreover, before teaching, there was no relevant training for the students in the experimental class, and the transition from traditional teaching to flipped classroom teaching based on POA theory was not done well. These problems need to be avoided as far as possible in the future research work, so as to provide more valuable data support for the application of POA theory in flipped classroom and practical teaching.

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