



An Experimental Study on Online and Offline Blended Teaching Model Based on Factor Analysis

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Abstract. As a new, effective and multi-dimensional teaching model, blended teaching model combines offline teaching of traditional classroom with online teaching of the Internet, which is the mainstream of information-based blended teaching. This paper is intended to conduct an experimental study on task-based online and offline blended police English teaching model. SPSS software is used to conduct independent sample T-test on test data. Factor analysis is used to analyze the collected five types of score data. The scoring formula of comprehensive ability level is obtained, and the corresponding score of 41 units is calculated. After forward indexing and sequencing, the score data of the two groups are compared and visualized finally. The teaching experiment shows that blended teaching model is helpful to stimulate students' interest in learning and improve students' comprehensive ability level of police English.

Keywords: online and offline blended teaching model · experiment · factor analysis · independent sample T-test · SPSS software

1 Introduction

The main purpose of police English teaching in police universities is to cultivate and improve students' comprehensive application ability of police English, including their comprehensive skills of listening, speaking, reading, writing and translating. By means of test, questionnaire survey and model construction, this paper is intended to make an experimental study on the learning effect of task-based online and offline blended police English teaching model, specifically, the influence of the teaching model on police English acquisition of police college students.

2 Blended Teaching Model and Task-Based Teaching Method

2.1 Blended Teaching Model

Blended teaching model is an effective, customized and multi-dimensional teaching strategy based on the Internet. It effectively combines the advantages of online and offline learning to complement each other so as to help students acquire basic knowledge and

improve learning efficiency. As an inevitable result of education modernization, blended teaching model is gradually developing and maturing, and has been widely applied in teaching research in different fields in China and abroad.

In the field of higher education, Sharpe (2006) concluded that the rationale for blended teaching is to provide flexibility, support diversity, enhance campus experience, and operate efficiently on a global scale [1]. Dolores (2019) explored how traditional face-to-face teaching can be transformed into a blended one allowing students to participate in both classroom and online teaching [2]. Baelo (2010) combined classroom teaching tasks with inquiry-based learning to explore the changes in students' learning effects and abilities [3]. The concept of "blended teaching" was introduced to China and first formally proposed by He Kekang in 2003. He pointed out that teachers should fully mobilize students' learning initiative and enthusiasm in blended teaching practice. Meanwhile, teachers should be the leaders, organizers and supervisors of classroom in teaching [4]. Since then, profound changes have taken place in the thoughts of domestic educational technology circles, and many researchers have conducted teaching reform. Lu Youxia (2016) conducted the reform of teaching practice based on the application of online micro-courses and offline classes [5]. Liu Xueqing (2019) analyzed the application and characteristics of flipped classroom based on blended teaching model in police English teaching [6]. Ma Jing (2020) conducted a survey among more than 600 college students to explore the impact of blended teaching model on students [7]. It can be seen from the above literature review that foreign scholars have conducted more in-depth and detailed research on the concept and pattern design of blended teaching. Not simply copying foreign research, domestic researchers have conducted relevant research based on foreign theories, combined with our specific and academic conditions.

2.2 Task-Based Teaching Method

David Nunan (1989) distinguished between two types of tasks. One is called a real-world task or a target task; the other is called pedagogical task. Real world tasks are what people do in their daily lives, work and play. Pedagogical tasks are those that take place in the classroom [8]. Skehan (1998) defined tasks as follow. 1) The task focuses on meaning; 2) There should be problems in the task that need to be solved through language communication; 3) The task resembles real world activities; 4) Get the task done first; 5) Evaluate the task according to the results [9]. David Nunan (1991) objectively summarized the main characteristics of task-based teaching: 1) the principle of interactivity, which emphasizes the learning of communication through the interaction of target language; 2) the principle of authenticity of language materials, that is, introducing real texts into the learning environment; 3) the principle of process, which provides learners with the opportunity to focus on language and language learning process; 4) the principle of attaching importance to the effect of learners' personal experience on learning, which takes the improvement of learners' personal experience as an important factor to promote classroom learning; 5) the principle of relevance, that is, trying to connect classroom language learning with extracurricular language activation [10].

Willis (1987) proposed the most practical and influential basic framework for teaching—basic stages of pre-task, task cycle and language focus, as is shown in Fig. 1 [11].

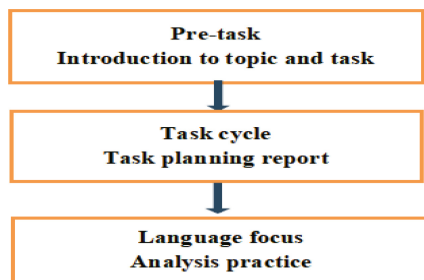


Fig. 1. Framework of Task-based Teaching

In pre-task stage, teachers introduce relevant background knowledge to help students familiarize themselves with the topic or task. Task cycle stage is the most important link in the basic framework of task teaching, and also a stage for students to actually use language. It mainly includes three parts, namely task link, planning link and reporting link. In language focus stage, teachers shift task focus to language form itself, systematically explaining to students vocabulary, phrase collocation and syntax required in the process of task completion.

3 An Overview of Teaching Experiment

3.1 Experiment Subjects

The subjects participating in the experiment are sophomores from Department of Criminal Investigation. They are from two parallel classes, each of which is composed of 41 students. Class 1 is selected as the control group and Class 3 is selected as the experimental group at random.

3.2 Experiment Time

After completing three semesters of college English courses, the students in the experimental group and the control group began to study police English courses in the fourth semester. The teaching experiment was conducted at the beginning of the fourth semester, lasting for 14 teaching weeks. Both groups had the same amount of police English lessons every week—two hours per week.

3.3 Experiment Materials

Practical Police English is a professional English textbook closely combined with police work, which is used in the teaching experiment. Both groups are taught by the same teacher by use of the same textbook. The task-based online and offline blended police English teaching model and the traditional PPP English teaching model (including presentation, practice and production) are used to teach the two groups respectively. It should be pointed out in particular that students do not know the teaching experiment, which can avoid the “Hawthorne Effect” on the one hand, and enable police English teaching to be conducted in a natural and orderly state on the other hand.

3.4 Experimental Investigation Tools

1) Pre-test

The purpose of pre-test is to try to understand whether there is a significant difference in English learning performance between the two groups.

2) Pre-experiment Questionnaire

The purpose of pre-experiment questionnaire is to understand the current situation of English learning and the learning needs for police English.

3) Post-test

The purpose of post-test is to measure students' English level after the experiment.

4) Post-experiment questionnaire

The purpose of post-experiment questionnaire is to track students' motivation and attitude towards police English learning and their overall understanding of police English courses after experiment.

5) Model Construction

Factor analysis is a commonly used statistical analysis method based on correlation. Its main purpose is to explore a certain structure hidden behind a large number of observational data, to find the common factor of a group of variable changes, to classify variables of the same feature into a factor, to reduce the number of variables, but also to test the hypothesis of the relationship between variables. The factor analysis model is introduced to compare observation data of the experimental group and the control group, quantitatively analyzing and visualizing the effect of teaching experiment.

4 Experiment Implementation and Result Analysis

4.1 Pre-test

According to the English exam scores of the experimental group and the control in the third semester, the data are obtained and analyzed as follows.

Independent sample T-test results in Table 1 show that there is no significant difference in English test scores between the two groups ($t = 0.437$, $df = 80$, $p > 0.05$). The English level of the students in the experimental group and the control group is almost similar, and the two groups are homogeneous classes.

Table 1. Homogeneity Analysis of Final exam

	N	Mean	Std.Deviation	MD	t(80)
The Experimental Group	41	77.9512	9.25189	0.87805	0.437*
The Control Group	41	77.0732	8.95095		

* $p > 0.05$

4.2 Pre-experiment Questionnaire

In the early stage of police English course, in order to have a deeper understanding of the actual situation of students' English learning, teachers conducted a questionnaire on students from two classes who participated in the teaching experiment.

4.3 Experimental Teaching Procedures and Examples

1) Teaching Procedures and Examples of the Experimental Group

In pre-task stage, teachers mainly mobilize students' enthusiasm for independent learning and initiative to participate in tasks by providing real language materials and introducing teaching tasks. In task cycle stage, teachers mainly play the role of supervisor and encourager, and assign tasks focusing on meaning, such as role-play, topic debate, group discussion and report, etc. Teachers do not need to pay too much attention to accuracy and complexity of students' language use, but can give suggestions on students' language use. In language focus stage, teachers focus to language form itself, including vocabulary, phrase collocation and syntax, etc.

The following is an example of Unit 4 *Traffic Safety Administration* in textbook as explanation of teaching procedures of the experimental group.

Pre-task Stage

Step 1: According to the overall course objectives and unit content, the teacher publishes task list related to the topic through the digital campus network teaching platform or rain class, requiring students to work in groups and collect information related to traffic safety administration through the Internet, so as to effectively carry out independent learning. In class, the group representative is required to use PPT to report the information collected by the group to the whole class. In addition, teachers assign preview tasks online, including preview of relevant vocabulary, phrases and basic sentence patterns.

Step 2: The teacher shows students a picture of drunken driving check by traffic police officers. Let students get familiar with the scene and write down related words and phrases, such as penalty, intoxicate, blood alcohol concentration, etc. The teacher presents the content written by students online, asking students to classify these words and phrases according to the parts of speech.

Step 3: Play a video about checking drunken driving in class to stimulate students' interest to familiarize students with the situational dialogue and the use of target situational language, asking students to work in groups to discuss and record the process of checking drunken driving in preparation for the role-play task.

Task Cycle Stage

Step 1: Assign class task of role-play and present reference words and phrases needed in the situation.

Scenario: Suppose you are a police officer, and now you are patrolling in your responsible area. You find a foreign driver, John, driving a BMW and speeding. So you ride motorcycle to stop him and ask him why he was driving so fast. Finally you give him a warning and ticket.

Step 2: Let students do role-play in groups. (Teachers can make videos of students' situational dramas and upload to digital campus network teaching platform after class for students' mutual evaluation and discussion.) The teacher shows a video, telling students how traffic police should deal with foreigners who violate traffic laws in the real situation, reminding students of the problems they should pay more attention to in the simulated role. The teacher can make comments by comparing dramas performed by different group students, pointing out some mistakes in the dialogue, including words, phrases, sentence structure and grammar errors, etc. Then the teacher can help students sort out the procedures required by traffic police in accordance with traffic laws and regulations when they are in the same situation.

Step 3: Play the CD attached to the textbook and let students read Part 2 situational conversations to familiarize themselves with dialogue words and imitate pronunciation.

Language Focus Stage

Emphasize and expand vocabulary and statements that need to be mastered in this unit.

After-Class Task

- a) With the topic on how to solve traffic congestion in big cities, the teacher organizes students to have a group discussion and form a written report. Release report through rain class or the digital campus network teaching platform. After evaluation, the teacher chooses one or two reports as the typical ones and puts forward suggestions for improvement, so that students can focus on language points to standardize language use and further deepen understanding and application of language point.
- b) Students modify written report and present oral report in the form of PPT in class. Group members take turns to be presenter.
- c) Teachers recommend some relevant websites to provide students with extended reading materials, expanding their legal vision. For example, ask students to read the Law of the People's Republic of China on Road Traffic Safety after class.

2) Teaching Procedures and Examples of the Control Group

Different from the experimental group, teachers in the control group adopt the traditional PPP teaching model, including presentation, practice and production. The teaching model is teacher-centered. Teacher is the leader of classroom activities, deciding and implementing the procedures in teaching. In class activities, students passively accept knowledge instilled by teacher and do not participate in decision-making of teaching content, teaching method and teaching means.

The following is an example of Unit 4 *Traffic Safety Administration* in textbook to explain teaching procedures of the control group.

Presentation Stage

Step 1: The teacher briefly introduces the unit topic and then asks two questions as part of leading-in activities, such as How is our country's traffic condition? How should traffic police deal with traffic violations?

Step 2: The teacher explains the text word by word. Text structure, topic sentence of each paragraph, words, phrases and grammatical phenomena in the text are all the

Table 2. Analysis of Group Statistics

Class	N	Mean	Std Deviation	Std Error Mean
Score Control Group	41	82.0488	4.49973	0.70274
Experimental Group	41	79.4634	4.71221	0.73592

key points of explanation. Finally, the central idea and summary of the text are summarized. In the process of explanation, the teacher asks questions related to the content of text to determine whether students have mastered it. At presentation stage, by dominating teaching procedures and tempo, teachers focus on explanation of language points required by teaching syllabus, correction of students' pronunciation and grammatical mistakes in order to input correct language usage.

Practice Stage

Step 1: After explanation of the text, teachers encourage students to do a series of exercises including questions concerning the text, words and translation exercises, etc.

Step 2: Teachers teach basic sentence patterns and situational dialogue about traffic violation, requiring students to practice and imitate expressions and sentence structures.

At practice stage, teachers need to design types of exercises, and students consolidate language points under the guidance of teachers.

Production Stage

Step 1: Students retell the text by use of own words and teachers correct pronunciation and grammatical mistakes.

Step 2: Students do dialogue exercise by use of basic sentence patterns of traffic violation and teachers correct pronunciation and grammatical mistakes.

At production stage, teachers focus on whether students can put what they have learned into practice to realize communicative task.

4.4 Implementation of Post-test

After the teaching experiment was over, the students from two groups took the final exam. The scores were collected and analyzed as follows.

In Table 2 and Table 3, the result of Independent sample T-test shows, there is a significant difference of police English proficiency between the two groups ($t = 2.541$, $df = 80$, $p < 0.05$); The scores of students from the experimental class are obviously higher than those of students from the control class ($MD = 2.58537$), as is shown in Table 4. This demonstrates that task-based online and offline blended police English teaching model can help to improve students' comprehensive application ability of police English.

4.5 Post-experiment Questionnaire

After the teaching experiment was finished, two classes took part in the online questionnaire. Data analysis in Fig. 2 shows that students from the experimental group are more motivated to learn police English than ones from the control group.

Table 3. Analysis of Independent Sample T-test

	Levene's Test For Equality Of Variances		T-test For Equality Of Means						
								95% Confidence Interval Of The Difference	
	F	Sig.	t	df	Sig (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score Equal Variances Assumed	.217	.642	2.541	80	.013	2.58537	1.01756	.56036	4.61037
Equal Variances Not Assumed			2.541	79.830	.013	2.58537	1.01756	.56029	4.61044

Table 4. Analysis of Mean and MD Value

	N	Mean	Std. Deviation	MD	t(80)
The Experimental Group	41	82.0488	4.49973	2.58537	2.541*
The Control Group	41	79.4634	4.71221		

* p < 0.05

4.6 Model Analysis

Scores of fives aspects of listening, speaking, reading, writing and translating of both groups are collected and used for factor analysis.

By means of SPSS software, as is shown in Table 5, the KMO test results show that the KMO value is 0.715, which is between 0.7 and 0.9. The Bartlett's test shows that P = 0.005 (P < 0.05), indicating that the factor analysis model is applicable for this case.

The variance interpretation table and the lithotriptic diagram show that it is reasonable to keep 12 factors and the contribution rate of variable interpretation reaches 82.417%, with low information loss and reliable results.

The formula of factor 1–12 can be obtained through the component matrix table, and the score formula of comprehensive ability level of listening, speaking, reading, writing and translating can be summarized as below.

The Experimental Group:

$$F = (0.09/0.824) \times F1 + (0.078/0.824) \times F2 + (0.077/0.824) \times F3 + (0.075/0.824) \times F4 + (0.072/0.824) \times F5 + (0.07/0.824) \times F6 + (0.066/0.824) \times F7 + (0.061/0.824)$$

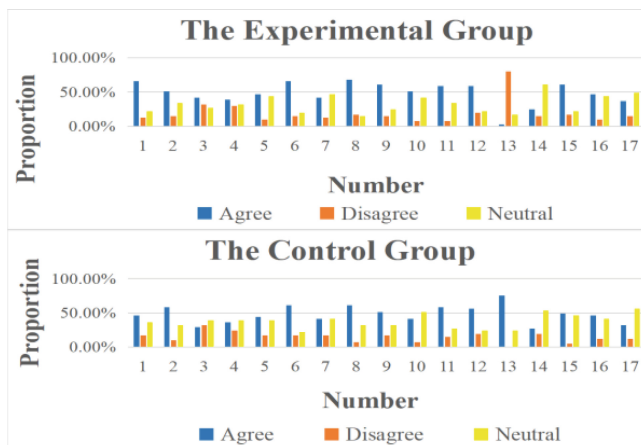


Fig. 2. Questionnaire Analysis

Table 5. Analysis of KMO Test and Bartlett's Test

KMO test and Bartlett's test		
KMO VALUE		0.715
Bartlett sphericity test	Approximate chi-square	372.903
	df	300
	P	0.005***

Note: ***, ****, * represent the significance levels of 1%, 5% and 10%, respectively

× F8 + (0.06/0.824) × F9 + (0.06/0.824) × F10 + (0.059/0.824) × F11 + (0.057/0.824) × F12.

The Control Group:

F = (0.088/0.824) × F1 + (0.078/0.824) × F2 + (0.076/0.824) × F3 + (0.075/0.824) × F4 + (0.073/0.824) × F5 + (0.071/0.824) × F6 + (0.066/0.824) × F7 + (0.061/0.824) × F8 + (0.06/0.824) × F9 + (0.06/0.824) × F10 + (0.059/0.824) × F11 + (0.058/0.824) × F12.

Through the comprehensive ability level formula of listening, speaking, reading, writing and translating, we can get the comprehensive ability level scores of the experimental group and the control group with 41 unit samples. The scores of the two groups are uniformly indexed forward to get the score distribution within the interval of 0 to 1. The two groups of data correspond to the units respectively and are sorted in descending order to get Fig. 3.

The difference between the scores of the experimental group and the control group was used to show difference data of two groups, as is shown in Fig. 4.

It can be seen from Fig. 3 that the scores of the experimental group are much higher than those of the control group, and the scores of the two groups are evenly distributed

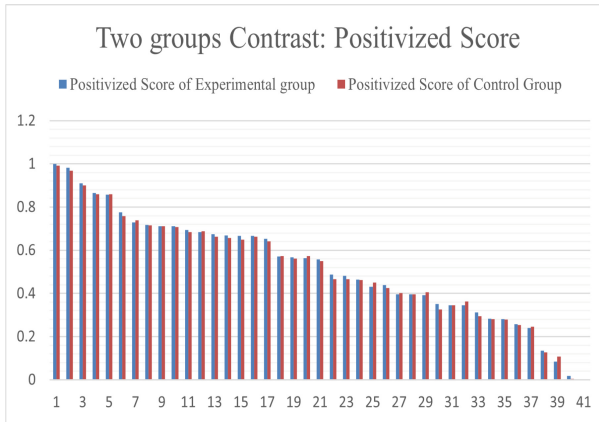


Fig. 3. Positized Score Analysis on the Experimental Group and the Control Group

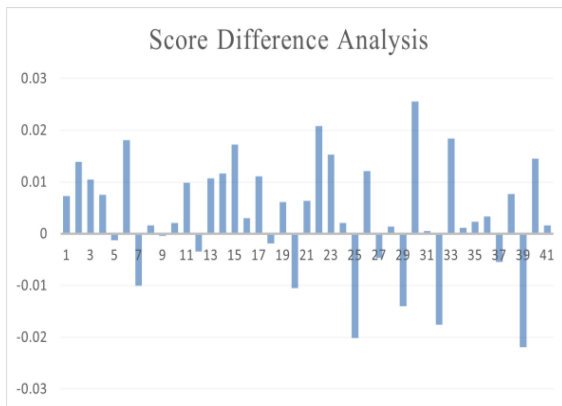


Fig. 4. Score Difference Analysis

within the interval of 0 to 1. As it can be seen from Fig. 4, the difference between the two groups is mostly positive, that is, the score of the experimental group is generally higher than that of the control group. In conclusion, the comprehensive ability of experimental group is better than that of the control group.

5 Conclusions

Task-based online and offline blended police English teaching model has played a positive role in optimizing and restructuring teaching content, integrating multiple learning means, improving learning efficiency, and promoting students' acquisition of police English. In the follow-up research, the evaluation mechanism and the assessment of effectiveness of students' independent learning will be further improved, so as to motivate students' participation in activities in and after class. In addition, with the continuous

development of information technology and education modernization, teachers can continue to integrate effective teaching resources and further explore the blended teaching model suitable for police English teaching in police universities.

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