



Online and Offline Blending Teaching Effect Evaluation Method – An Empirical Study on E-Commerce Logistics

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Abstract. In recent years, O2O blended teaching has been a teaching innovation model recommended by colleges and universities. However, how to improve the teaching effectiveness of this model is a problem worth thinking about. The object of this paper is to investigate the evaluation factors of the blended teaching effect. Further, improve the classroom teaching system. This paper evaluates the teaching effect from three aspects: Online learning, Implementation of teaching, and After-school survey. In addition, we have carried out a detailed analysis of each factor and determined the secondary indicators. We choose chromatography analysis as the calculation method of evaluation factors. The course “E-commerce Logistics” is the course of our teaching effect evaluation. The survey objects are all teachers of this course. Based on the empirical analysis, we determined the weights of the three indicators, which were respectively 0.24, 0.55, and 0.21. Teaching implementation is an important aspect of teaching effect evaluation. And we calculate the weight of the secondary index. The results showed that Classroom activity was regarded as the biggest influence on the teaching effect, with a weight of 0.251. Of course, the weight of other indicators is also explained in this paper.

Keywords: Blending teaching · online and offline · evaluation method

1 Introduction

In the era of “Internet Plus”, the traditional teaching model of face-to-face teaching, teaching by teachers, and listening by students can no longer meet the needs of students. An increasing number of students are beginning to access online learning. Several online learning platforms have developed rapidly. Examples include Moocs, Chaoxing, and Zhi-huishu. In particular, with the impact of the COVID-19 pandemic, the state has launched a “non-stop class suspension” policy, which has accelerated the penetration rate of online education. By June 2020, the number of online education users in China had reached 381 million, a decrease of 42.36 million compared with March 2020, accounting for 40.5% of online users. More and more learning keeps up with the pace of development of The Times, to carry out the O2O hybrid teaching model. Blended Learning, which blends the advantages of traditional on-site classroom learning and online learning, will become the main way of a school teaching organization. Compared with traditional

teaching methods, Blended Learning can greatly stimulate students' interest in learning, which will significantly improve their academic performance and self-learning ability [1]. Some scholars also believe that blended learning can improve students' [2] information literacy. However, students may be affected by many factors when they are engaged in blended learning. For teachers, how to evaluate students' learning effects is a troublesome problem. To achieve teaching objectives, we need to establish diverse and comprehensive assessment systems to monitor student learning [3].

Blended teaching has been studied by some scholars. For example, classroom conversation teaching [4], teaching aid systems [5], social media [6], team games [7], and so on are considered to be effective blended teaching methods. In addition, how to motivate teachers to use innovative technologies to assist in the use of blended teaching is also a concern [8] of scholars. There is no doubt about the positive impact of O2O blended teaching on academic performance and learning attitude.

Based on this, this paper mainly does the following work. First, we choose O2O blended teaching as the research objects, and put forward the indicators that can be used to analyze the evaluation of the teaching effect. Secondly, we analyze the influence weight of each index through the analytic hierarchy process. Our research enriches the literature on teaching effectiveness evaluation. Moreover, in practice, we put forward corresponding countermeasures according to the weight of influencing factors, hoping to provide relevant suggestions for teachers implementing blended teaching.

2 Methods and Results

2.1 Research Methods

In the early 1970s, the American University of Pittsburgh operations research scientist Thomas Saaty (T.L. Saaty) proposed an analytic hierarchy process, the beginning, to complete the project of the United States Department of Defense. This project was based on the distribution of electricity according to the contribution of each industrial sector to the national welfare. Later, the analytic hierarchy Process (AHP) was considered to be an effective tool for selecting decision schemes. It determines the weight of different schemes by inviting experts to score them.

To sum up, we choose the analytic hierarchy process (AHP) as the main research tool. Further, we decide to use the hierarchical structure model in the blended teaching effect evaluation of the E-commerce Logistics course. We believe that AHP can help us choose the items we should focus on in teaching. In this way, we hope to improve teachers' focus on teaching methods, teaching content, and teaching process. In addition, students' ability to absorb knowledge can be supervised through a comprehensive evaluation of the teaching effectiveness.

2.2 Research Model

Online, E-commerce Logistics has a complete online teaching system, including teaching videos, course resources, and teacher-student interaction. Offline, in the teaching implementation stage, teachers conduct teaching effect analysis through formative evaluation. At the end of the course, the teacher adjusts the follow-up course arrangement

Table 1. Evaluation Index

Evaluation Index	Online learning	Online teacher-student interaction
		Resources utilization
		System access frequency
	Implementation of teaching	Classroom activity
		The correct rate of answer
		class attendance
	After-school survey	homework
		Q&A

according to the feedback of the students. Based on this, we determined that the evaluation indicators of the blended teaching effect of the E-commerce Logistics course as shown in Table 1.

Online teacher-student interaction includes online questions, topic discussions, video barrage, questionnaires, and more.

Resources utilization includes courseware, reference literature, and reference textbooks.

System access frequency includes system residence time, number of system visits, and completion degree of chapter learning.

Classroom activity includes the number of hands raised, the number of speeches, the time spent in class, etc.

The correct rate of answer refers to the number of times to answer questions asked by teachers in class.

Class attendance refers to whether students should arrive at the classroom on time without leaving early, being late, being absent from class or asking for leave.

homework is used to test the mastery of a course. It includes time, degree of completion, and score.

Q&A mainly tests students' questions about classroom knowledge, or discussions about classroom knowledge after the course.

After determining the evaluation index of the O2O blended teaching effect of the E-commerce Logistics course, we constructed the following hierarchical structure model for the subsequent index weight calculation.

2.3 Data Collection and Consistency Test

YAAHP is a tool for index weights. We use the questionnaire automatically generated by the YAAHP system for data collection. In many colleges and universities, the course E-commerce Logistics is regarded as a compulsory course for e-commerce majors and logistics management majors. Therefore, we contacted the teachers of the "E-commerce Logistics" course through the platform of "University Alliance", and took them as the subjects of the questionnaire survey. It is worth mentioning that before selecting the

subjects for the questionnaire survey, we confirmed whether the course teachers adopted blended teaching.

In the end, 13 questionnaires were collected. Among them, we used the arithmetic average method to calculate each index collected. The judgment matrix is obtained, as shown in Tables 2, 3 4, and 5. Subsequently, we conducted a consistency test on the data and found that the index consistency test value was less than 0.1. Therefore, we believed that the consistency test passed and the questionnaire data was valid.

Evaluation of teaching effect: Consistency ratio: 0.0176; Weight of “evaluation of teaching quality”: 1.0000; λ_{max} : 3.0183.

After-school survey consistency ratio: 0.0000; The weight of “teaching quality evaluation”: 0.2409; λ_{max} : 2.0000.

Online learning consistency ratio: 0.0521; The weight of “teaching quality evaluation”: 0.2106; λ_{max} : 3.0541.

Consistency ratio of Implementation of teaching: 0.0089; The weight of “teaching quality evaluation”: 0.5485; λ_{max} : 3.0092.

Table 2. Teaching effect evaluation index layer

evaluation of teaching effect	After-school survey	Online learning	Implementation of teaching
After-school survey	1	1	0.5
Online learning	1	1	0.3333
Implementation of teaching	2	3	1

Table 3. After-school survey Indicator layer

After-school survey	Q&A	homework
Q&A	1	2
Homework	0.5	1

Table 4. Index layer of Online learning

Online learning	Resources utilization	System access frequency	Online teacher-student interaction
Resources utilization	1	3	0.25
System access frequency	0.3333	1	0.1667
Online teacher-student interaction	4	6	1

Table 5. Implementation of teaching index layer

Implementation of teaching	Classroom activity	The correct rate of answer	Class attendance
Classroom activity	1	1	4
The correct rate of answer	1	1	3
Class attendance	0.25	0.3333	1

Table 6. Data Analysis results

Mid-tier elements	Implementation of teaching	After-school survey	Online learning
Weights	0.5485	0.2409	0.2106
Alternatives	Classroom activity	Correct rate of answer	Q&A
Weights	0.251	0.2282	0.1606
Alternatives	homework	class attendance	Resources utilization
weight	0.0803	0.0693	0.0466

2.4 Data Analysis

After all indicator layers passed the consistency test, YAAHP software was used to calculate and determine the final weight. The results are shown in Table 6.

We can get the weight of THE evaluation index of THE O2O blended teaching effect from Table 6. Among them, Classroom activity is regarded as the biggest influence on the teaching effectiveness, and its weight reaches 0.251 of course, timely testing of students' classroom learning effect is also important, and the weight of the Correct rate of answer in teaching implementation is 0.2282. Furthermore, in the After-school survey, Q&A is more important than homework. It is worth noting that the effect of Online teacher-student interaction on teaching effect should not be ignored.

3 Discussion

3.1 Theoretical Implications

First, our study expands the literature on the effects of O2O hybrid teaching. In the Internet age, blended teaching is often seen as an innovative way to teach. Looking for the factors that affect the teaching effect and paying close attention to the important factors is an effective way to improve learning efficiency. This paper through the study of the O2O mixed teaching effect evaluation method is helpful to help teachers better adjust the teaching strategy.

Second, this paper introduces the analytic hierarchy process into the O2O mixed teaching effect evaluation research, and provides an O2O mixed teaching effect evaluation model for an E-commerce Logistics course. It is worth noting that we can quantitatively measure the specific impact degree of the three indicators of Online learning, Implementation of teaching, and After-school survey, and get the weight of the impact. Therefore, this paper expands the application of the analytic Hierarchy Process (AHP) in the hybrid teaching effect evaluation method.

3.2 Practical Enlightenment

First of all, teachers should attach great importance to establishing communication and contact with students in the teaching process. Such communication and connection include the interaction between teachers and students in online teaching and classroom activity in the teaching implementation process. Q&A of after-class feedback. The weight of these three indicators is up to 56%. Compared with exam-oriented education in high school, college students are more capable of independent thinking. Therefore, teachers should guide students to think no matter online or in online courses. In addition, formative evaluation should be carried out in time.

Secondly, the weight of class attendance and resources utilization is very low in the evaluation of the teaching effectiveness. This does not mean that these two are not important. First of all, in China, class attendance is regarded as a rule that students must obey. Therefore, many teachers exclude it from the evaluation of the teaching effectiveness. Secondly, through interviews with survey subjects, and students, it is known that teaching resources include too many textbooks, journals, and MOOC content, which makes it difficult for students to choose the learning content they are interested in. Therefore, for blended teaching, it is counterproductive to provide too many resources for learning in many cases. Teachers should simplify the resources and use more heuristic questions to guide students to explore on their own to improve the teaching effect. Homework has a very low weight, and this result is similar to Iringan (2021) [9], where blended teaching has no significant effect on students' attitudes toward homework.

4 Limitations

Admittedly, there are areas where our research needs to be improved. First, we choose the course E-commerce Logistics to analyze the teaching effect from three aspects: Online learning, Implementation of teaching, and After-school survey. However, the differences between different courses cannot be ignored. The differences in engineering, liberal arts, and science courses will have different effects on the results.

Second, students of different grades have different influences on teachers' feedback on teaching effectiveness. For example, junior students can master the learning methods of specialized courses better than freshmen students, and further, they can give teachers better feedback. However, in the investigation, we have neglected this content. Third, our overall sample size is small, we can increase the sample survey in the future.

5 Conclusion

Blended teaching is an effective way to combine traditional teaching mode with modern technology. It can provide students with a more personalized learning experience. This paper chooses the e-commerce logistics course as the research, and discusses the effect evaluation method of online and offline mixed teaching. The purpose of this paper is to improve students' learning effect and interest through the control of teaching methods. Among them, the analytic hierarchy process is the main research method in this paper: The main findings are as follows.

Firstly, Online learning, Implementation of teaching, and after-school survey are different stages of blended teaching implementation. The teaching implementation process has the greatest influence on students' learning effect. The weight reached 0.5485.

Secondly, the interaction between teachers and students in online teaching, the classroom activity in the teaching implementation process, and the Q&A of after-class feedback are the key factors that teachers should pay attention to when designing teaching methods and tools.

To sum up, in the blended teaching process, teachers need to provide more flexible and diversified teaching methods and teaching content according to the learning effects of students.

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