Research on Multi-dimensional Interactive Process of Blended Learning Oriented by Ability Cultivation

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Abstract. In recent years, online courses have developed rapidly, and blended learning has been generally used. In blended learning, instructional interaction has changed significantly. Oriented by Ability Cultivation, this paper studies the interaction types and modes of blended learning, establishes a multi-dimensional interaction model, designs interaction strategies, cultivates students' learning ability by improving interaction quality, and provides reference for improving teaching quality.

Keywords: blended learning · Instructional Interaction · Interaction model · Interaction strategy

1   Introduction

In traditional classes, interaction methods predominantly include teacher-student interaction, student-student interaction, and student-learning content interaction, etc. Teachers and students are in the same space and interact with each other in class. Most interactions are face-to-face, with teacher-student interaction as a primary and student-student interaction as an auxiliary. The teaching effect mostly depends on the teacher's design and organization of instructional interaction.

After entering the 21st century, MOOCs (massive open online courses) have developed swiftly, and a large number of high quality MOOCs have been launched on various MOOC platforms. However, high quality MOOCs do not bring excellent teaching effectiveness. The online learning process of MOOC completely depends on autonomous learning, which requires learners to have clear learning goals and strong self-control skills. But most learners gradually lose their interest and motivation in learning and ultimately give up learning because of the lack of teacher guidance.

To solve these problems, more and more universities choose blended learning in teaching. Universities use high-quality online MOOCs as basic learning resources for students. The teacher's main job is to guide and control the offline class. The blended learning integrates the advantages of online learning and offline teaching and eventually produces good teaching effects.

In the blended learning model, teachers construct resources on a teaching platform, and students watch videos, complete homework, and participate in online discussions.

In offline classes, teachers find students' shortcomings in the learning process by organizing group activities, discussions, tests, and other ways. After that, teachers explain the difficult and important questions, guide students to think deeply in offline classes, and ensure perfect learning effects.

Under the blended learning model, great changes have taken place in the types and methods of instructional interaction. In traditional classes, real-time interaction between teachers and students is the main mode of interaction. While in blended learning, interaction modes include online real-time and non-real-time interaction, real-time interaction between teachers and students, individual interaction between students in offline classroom, team interaction, human computer interaction and so on. The interactive data is saved in the teaching platform and becomes the foundation of the research on instructional interaction in blended learning.

The paper studies the blended learning process of the course "University Computer Foundation", integrates and analyzes all kinds of data in online and offline teaching process, comprehensive use of established interaction process model by using various instructional interaction analysis methods. Research designs interactive strategies based on data analysis to improve students' interactive participation, improve the quality of interaction, cultivates students' learning ability, and finally improve the teaching effect.

2   The Design of Multi-dimensional Interactive Model of Blended Learning

In a blended learning model, the teaching process is divided into online and offline parts. First, students learn teaching videos online under the guidance of teachers and complete experiments, assignments, tests and other learning tasks. The effect of autonomous learning online may vary greatly because students' learning goals, knowledge levels and learning abilities are different. This requires teachers to accurately detect students' problems through various interactive activities and learning data in offline classes, and guide them with pertinence and carry out personalized teaching.

During the blended learning process of the course "University Computer Foundation", the content is divided into eight modules and the duration of each module varies from one to three weeks. In each module, teaching videos, virtual simulation experiments, exercises, topic discussions and other learning resources are divided into basic, intermediate and advanced levels. The resource form the 3D system, as shown in Fig. 1. The basic content is the basic passing requirement of all modules, it requires students to complete by themselves. The intermediate content is the key and difficult content. Students should conduct conclusions under the guidance of teachers after autonomous learning to promote their integrative skills of applying knowledge. The advanced content is the extension of the knowledge of each module. Students with strong interest and learning requirements can complete the content to learn more and in depth.

In the teaching process of each module, the instructional interaction is divided into three stages: online autonomous learning, online classes and offline classes according to the blended learning process. Interactive content is designed for different levels of learning content in each stage, and the interaction model is shown in Fig. 2. In the online
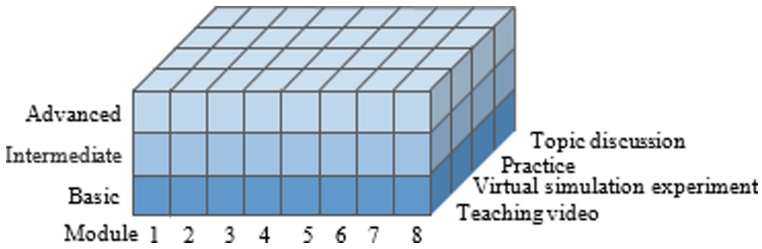
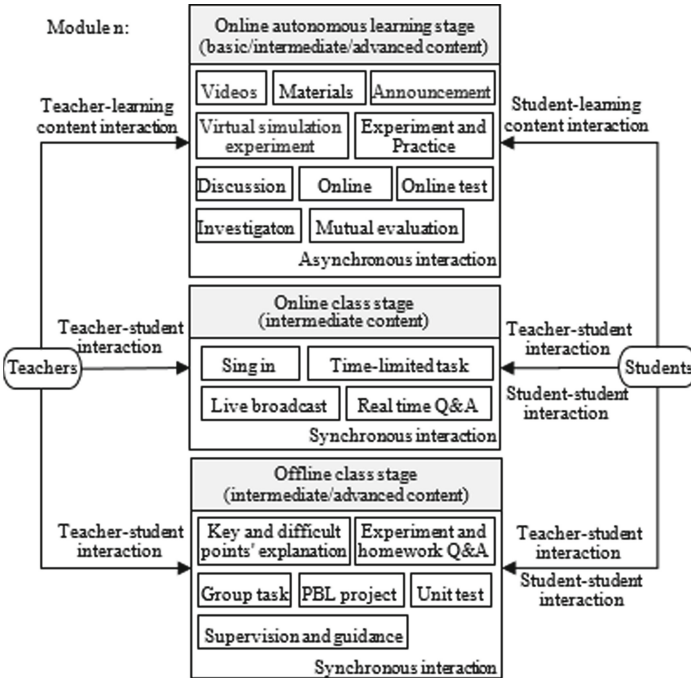**Fig. 1.** 3D teaching resource system

Fig. 2. Multi-dimensional interactive model of blended learning

autonomous learning stage, students can complete the interaction with the learning content according to their objectives and status. Basic and intermediate content is the focus at this stage, and students can choose to learn advanced content. In online classes, teachers confirm the interactive content and organize real-time online activities by observing the interactive data of the online autonomous learning process, guide students to find and solve the problems existing in intermediate learning content by using online time-limited intermediate tasks, and help students solve basic problems by online discussion and Q&A. In offline classes, teachers organize group activities to analyze and discuss the intermediate and advanced content, and grasp the students' learning conditions through unit tests. The interactive evaluation data in all platforms and unit test data are fused and stratified to provide personalized guidance to students. Students who complete all

learning tasks in one module can move on to the next module. Students who fail to complete the learning tasks in time must complete the basic tasks under the supervision of the teacher before entering the next module.

3 A Analysis of Phased and Multi-level Interactive Strategies

In view of the process of blended learning, the phased and multi-level interaction strategies are put forward to form the interactive norms by analyzing the influence of various subjective and objective factors in interactive process and summarizes the characteristics of interactive processes. Cultivate students' good independent learning habits and enhance their learning ability through teaching interaction.

3.1 Online Autonomous Learning Stage

In each module, the online autonomous learning is the earliest stage, but also the least valued by students. At this stage, teachers should adopt various methods to improve students' enthusiasm for autonomous learning and encourage them to develop good habits of autonomous learning.

3.1.1 Improve the Frequency and Quality of Teachers and Students' Interaction with Learning Content

In order to enhance students' interaction with online videos by promoting the interest and attraction of videos, teachers can add introduction of knowledge points in the form of character dialogues and more analysis and explanation of universal problems. The virtual simulation experiment is designed as a game with multiple difficulty levels. A large amount of feedback is set up in the experiment process to provide students with real-time guidance. Students will have a sense of achievement and satisfaction in the process of playing the game.

3.1.2 Keep the Timeliness of Asynchronous Online Interactions

During online interaction, most teacher-student and student-student interactions are asynchronous that have a certain time delay. To students' questions and the discussions, teachers' rapid response can not only help students solve various problems in time and promote students' deeper thinking, but also encourage students to participate in various interactions more actively.

3.1.3 Strengthen Online Interactive Supervision

Teachers should invite students as teaching assistants, reward students who actively participate in the discussion and help their classmates, and encourage interaction between students and students. These measures will gradually guide students to become the key person in discussion and learning community, create a learning atmosphere of mutual assistance and discussion, and improve the enthusiasm of interaction between students.

Using the interactive data of the teaching platform, teachers can find silent and inactive students in time. For these students, teachers should encourage them to choose appropriate expressions to participate in interaction and gradually change students' interaction habits. Teachers should also be strict with students who post garbage on the forum and pretend to be studying. These measures will promote the class to form a positive and beneficial interactive atmosphere.

3.2   Online Class Stage

After online autonomous learning, most students master the basic content in the module. However, some students may have defects in the comprehensive application of knowledge, so the main task of online class stage is to solve intermediate learning content.

3.2.1   Discover Learning Problems Promptly Through Time-Limited Tasks

In online class, teachers and students are online in real time. Teachers can check students' ability to apply knowledge through comprehensive time-limited tasks. Time-limited tasks should be refined, have certain difficulties, can be completed quickly, and can truly reflect the students' learning situation of intermediate content. For those students who can complete the time-limited tasks quickly, teachers should encourage them and arrange advanced tasks for further learning. Teachers can also use live broadcasts and online Q&A to help students who have difficulty completing time-limited tasks.

3.2.2   Adopt Interactive Methods that are More Acceptable to Students

The instructional interaction in online class is teachers and students' real time communication. Teachers can adopt a more acceptable communication method. For a time-limited task, teachers can use live broadcasts to explain problems or lead students to do it while explaining, so that students can quickly master the learning content. During the live broadcast, teachers can use tools to interact with students so that students can have a better learning experience. Teachers can organize students to grade other students' exercises online. Students will find more problems and have a deeper understanding of what they have learned through the scoring process.

3.3   Offline Class Stage

In offline stage, teachers should analyze and summarize online learning. In class, teachers should explain the key and difficult points and the existing problems of students. In addition, teachers should use group tasks to guide some students to master advanced learning content. At the end of each module, teachers should organize tests in the offline classes and evaluate students' learning process by integrating learning data from all platforms, so as to provide personalized guidance more accurately.

3.3.1   Use Teaching Apps to Organize Real-Time Interaction in Offline Classes

Teachers should organize class activities by using teaching apps in offline class to improve students' learning interests and participation, such as randomly selecting students to answer the questions, racing to be the first to answer a question, real time discussion and so on. The interaction data will be recorded by teaching apps to provide teachers with a more accurate teaching reference.

3.3.2   Design PBL Group Tasks

Teachers can adopt PBL (Project-Based Learning method) in offline class. Students are divided into small groups to complete projects or solve problems designed by teachers. Through group discussion, project presentation, mutual evaluation and other flipped classroom activities, students' comprehensive ability and teamwork skills will be improved and more students can achieve advanced learning goals.

3.3.3   Strengthen the Offline Real-Time Interaction Between Teachers and Unqualified Students

Teachers provide face-to-face guidance to unqualified students offline to help them find out the reasons for the failure. If there are problems with students' learning ability and knowledge mastery, teachers should patiently explain knowledge points and problems. If there are problems with students' learning attitude, teachers should strictly supervise them so that they can complete their learning tasks.

4   The Effect

Since 2018, the blended learning interactive model and interactive strategy have been applied and continuously improved in the course "University Computer Foundation". More than 4,000 students in 45 classes have implemented the model and strategy every year. As new people in the new age, students are more willing and good at using mobile phones and the Internet to communicate. The frequency of interaction in blended learning far exceeds that in traditional teaching, and interaction methods are diversified. The unidirectional interaction between teachers and the whole class in the traditional classroom has changed into a large number of bidirectional interaction between teachers and students in blended learning. By adopting a blended learning interaction strategy, teachers can more accurately recognize the learning status of each student and provide personalized guidance. In the past four years, the pass rate and excellent rate of the final exam of the course have continued to increase. The results of the questionnaire survey indicate that teachers and students generally agree with all kinds of interactive blended learning methods. Teachers' goals have changed from teaching knowledge to guiding students to learn. Hierarchical supervision and guidance based on interactive evaluation enables students to devote themselves to learning, gain a stronger sense of achievement, and achieve greater results in the course.

5   Conclusions

It can be seen from the results of five years' use that the muti- dimensional interactive model and phased and multi-level interactive strategy of blended learning can improve students' learning interest, urge students to complete learning tasks, cultivate students to develop good habits of independent learning, and achieve good teaching effects. The interactive model and interactive strategy can be promoted to other blended learning courses.

The teaching team has collected a large amount of interactive data in the research process. In the future, it can continue to analyze the interactive data and examination results, find the correlation between interaction model, interaction strategies and learning results, and establish an intelligent predictive analysis model. The prediction model is used to make profile of students at all stages and push the analysis results to teachers, so as to reduce the workload of teachers, make teachers focus on the design of interactive content and interactive activities, pay more attention to personalized guidance for students, and achieve better teaching effects.

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