Design and Application of Blended Learning Based on Flipped Classroom

Zhenhui Li(✉)

Guangdong Peizheng College, Guangzhou, China
2602441@peizheng.edu.cn

Abstract. Blended teaching has realized the integration of teaching resources and improved teaching efficiency, but there is a lack of interaction between teachers and students, and students' online learning experience is insufficient. Flipped classroom is where students watch the teacher's videos before or after class and learn independently. The teacher no longer takes up the classroom time to teach knowledge. The classroom becomes a place for interaction between teachers and students or between students and students to answer questions or cooperate with each other. Therefore, combining the advantages of mixed teaching and flipped classroom, we design a mixed teaching mode based on flipped classroom. This model changes the traditional teaching process, creates the learning and teaching process, takes the student as the center, the teacher guides the teaching mode, and makes the classroom teaching process and modular. Each classroom learning is divided into three modules: self-study before class, classroom interaction and feedback after class. Apply this model to the teaching of Linux operating system course for verification. The experimental results show that this model can improve students' enthusiasm for learning, and is conducive to improving students' autonomous learning ability, practical operation ability and ability to analyze and solve problems.

Keywords: blending learning · flipped classroom · linux

1 Introduction

In traditional teaching, teaching means that teachers teach students to learn, and students are in a passive position to accept knowledge. The traditional teaching mode ignores students' dominant position, which is not conducive to cultivating students' interest, autonomy and innovation ability.

Blending teaching combines the advantages of traditional teaching and online teaching, which not only gives full play to the leading role of teachers in guiding, inspiring and urging students, but also gives full play to the initiative, enthusiasm and creativity of students as learning subjects [1].

Flipped classroom comes from Jon Bergmann and Aaron Sams of American Woodland Park School [2]. Flipping the classroom means that students watch teaching videos themselves instead of teachers' classroom explanations. In the classroom, they concentrate on completing exercises and communicating with teachers and classmates. This

X. Yuan et al. (Eds.): ICEKIM 2023, AHCS 13, pp. 1792–1801, 2023.
https://doi.org/10.2991/978-94-6463-172-2_199

practice reverses the traditional school teaching mode of "the teacher teaches in class and finishes the homework after class". Flipped classroom mainly includes two steps [3]:

- Create videos

It is necessary to clarify the objectives that students must master and the final content of the video. The differences of different teachers and classes should be considered when collecting and creating videos. Students' ideas should be considered in the production process to adapt to different students' learning methods and habits [4].

- Organize classroom activities

After the teaching content is delivered to students outside the classroom, high-quality learning activities are more needed in the classroom, so that students have the opportunity to apply the learning content in the specific environment. This includes students creating content, solving problems independently, carrying out exploratory activities, and implementing project-based learning.

The integration of multiple teaching modes can enhance the advantages and circumvent the disadvantages. By constructing blended teaching in the course of "Linux Operating System" and integrating it into the flipped classroom teaching mode, good results have been achieved.

2 Propose a Question

Blended teaching has realized the integration of teaching resources and improved teaching efficiency. However, in the implementation process, the following problems have also been found to affect students' learning effect [5]:

- Teaching design has not been updated

Whether the mixed teaching effect can achieve the desired effect is closely related to the teacher's teaching design. Due to the influence of traditional teaching concepts, some teachers still design the whole teaching process according to the teacher-centered principle when designing mixed teaching, and simply divide the content into online autonomous learning and offline classroom teaching. This design does not play the main role of students and the leading role of teachers.

- Lack of interaction between teachers and students

In online learning, due to the separation of time and space, it is difficult for teachers to supervise and manage students' learning behaviors and learning effects in time. At the same time, after students find problems in the process of autonomous learning, they have less communication with classmates or teachers through the network teaching platform, which makes it difficult for teachers to understand students' learning situation [6].

- Students' online learning experience is insufficient

The advantage of online learning in blended teaching is that students can conduct their own personalized learning in the appropriate space and time. Because of the flexibility of

blended teaching, students often watch videos alone. When students encounter problems and can't solve them in time, they often feel frustrated, thus dampening their enthusiasm for continuing learning. At the same time, due to the lack of emotional interaction in online learning, students' online learning mood is not high, learning efficiency is low, and some students with poor awareness of autonomous learning are often difficult to adhere to autonomous online learning. The main reason for this phenomenon is that there is no interactive communication between teachers, students and students for online learning, and teachers fail to pay attention to students' online learning problems and give feedback in time.

In order to change the above-mentioned problems in blended teaching, flip classroom is introduced to enhance the interaction between teachers and students and improve students' sense of experience. Flip-over teaching means that students watch the teacher's video explanation before or after class, and learn independently. Teachers no longer take up classroom time to teach knowledge, and the classroom becomes a place for interaction between teachers and students or between students and students, so as to answer questions, cooperate and explore or finish their studies, etc., thus achieving better educational effects. In the flipped classroom, knowledge transfer is completed after class with the help of information technology, while knowledge internalization is completed with the help of teachers or classmates, thus forming the flipped classroom. With the reversal of the teaching process, all links in the teaching process have also changed [7]:

- The reversal of teachers' roles

In flipped teaching, the learning of basic knowledge mainly depends on students' independent learning outside class, while the internalization and extension of knowledge depends on the classroom. Teachers become learning planners, turning teaching you how to learn into teaching you how to learn. Flipped classroom teaching requires teachers to actively participate in students' learning activities in the form of group cooperation, theme research, skill training, role playing, etc. as equal. As teachers who participate in cooperation and communication, they must go deep into students' learning activities, such as searching and sorting out materials, and troubleshooting problems together, so as to narrow the distance between teachers and students, Let the students recognize the teacher as a member of their learning community, so that they can communicate or discuss problems equally with the teacher without restriction, and have the courage to express their own different opinions [8].

- The reversal of students' roles

In flipped teaching, students no longer passively accept the knowledge imparted by teachers, but actively explore the knowledge. Students independently arrange the learning of knowledge according to the learning goals jointly set by teachers and students. Students' learning freedom has been significantly enhanced, and they have the control over learning, so they can choose the depth of knowledge learning according to their personal circumstances. In class, students have more time to discuss with teachers, carry out cooperative learning on some key knowledge, and show their own learning achievements. At the same time, each student can also reflect on their own learning achievements and evaluate others' learning achievements as an evaluator. Therefore,

in the flipped classroom teaching mode, students are the protagonists of the whole classroom learning, and students change from a passive learner to an active learner, which is conducive to realizing the deep construction of knowledge.

- Class time reallocation

Flipped classroom has changed the original classroom time allocation. The time for teachers to directly teach new knowledge has decreased, while the time for students to learn independently has increased accordingly [9]. Flipped classroom completes the extension of teaching and learning time by maximizing the "preview time". The key is that teachers need to seriously consider how to use the time in the classroom to achieve the efficiency of "classroom time".

3 Construction of Blending Teaching Mode Based on Flipped Classroom

We should change the traditional teaching process, create a learning and teaching process, take students as the center, and guide teachers to help students, so as to streamline and modularize classroom teaching [10]. Each classroom learning is divided into three modules: self-study before class - classroom interaction - feedback after class. The whole teaching process module is shown in Fig. 1.

1. Self study before class

Students log on to the chaoxing.com website, watch the video by themselves, and complete the corresponding exercises.

2. Classroom interaction

The classroom teaching adopts the flipped teaching mode. Each course includes two basic modules, namely, sign in and interactive teaching. According to the characteristics of each course, it includes optional modules such as voting, questionnaire and quick answer. In the whole teaching process, students are the leading roles in the classroom. Teachers urge students to learn and answer the problems or puzzles they encounter in their learning.

3. Feedback after class

Although the flipped classroom teaching mode has subverted the teaching process of teachers' teaching in class and students' homework after class, students still need to reflect on and summarize the learning content after class, which can be completed by completing homework, drawing mind maps, group discussion and other forms. Teachers also need to reflect on and improve the teaching process after class. They need to correct homework, improve videos, improve courseware and other activities.

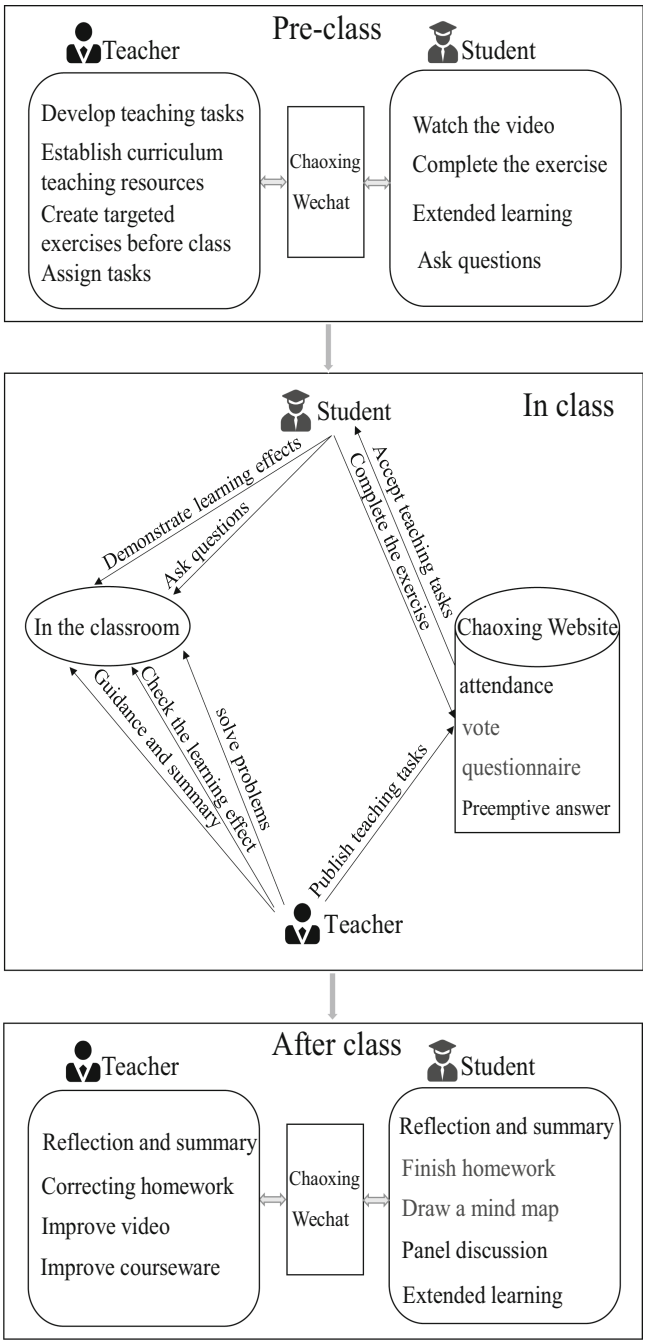

Fig. 1. Teaching flow chart

4 Specific Implementation

In the course teaching of "Linux operating system", the construction process of the above hybrid teaching mode based on flipped classroom has been realized. The whole process can be divided into [11]:

1. Develop teaching tasks

First of all, detailed teaching tasks shall be formulated according to the syllabus, which shall be made with independent knowledge points as a unit to facilitate students' independent learning. Therefore, the whole course needs to be divided into several modules according to the knowledge structure, and each module is divided into several knowledge points.

Based on the above ideas, the course content of "Linux Operating System" is adjusted, and the course content is divided into several modules. Each module is composed of several knowledge points, which is convenient for students to learn independently. There is coupling between modules. Each module is connected in series to form a complete teaching system, as shown in Table 1.

2. Establish curriculum teaching resources

In flipped classroom, the knowledge is generally taught by the teaching videos provided by teachers. When making teaching videos, teachers need to consider visual effects, key points to support and emphasize the theme, interactive strategies to design the structure, etc., to help students build a learning platform with the richest content, and also consider the time that students can insist on watching videos.

3. Create targeted exercises before class

After students watch the teaching video, they should record the gains and questions in the video. At the same time, students should complete the targeted pre class exercises assigned by the teacher to strengthen the consolidation of the learning content and find the students' difficulties. For the number and difficulty of pre class exercises, teachers should reasonably design to help students use old knowledge to complete the transition to new knowledge. For students' pre class learning, teachers should use information technology to provide network communication support. At home, students can interact with their

Table 1. Course structure setting

Teaching module	Content
basic command	system installation, directory operation, software installation, network management, file search and filtering, user group management, process management
applications	grub, vim, xwindow
service management	web service configuration, ftp, NFS, Samba, remote login
shell programming	variables, operators, process control, array functions

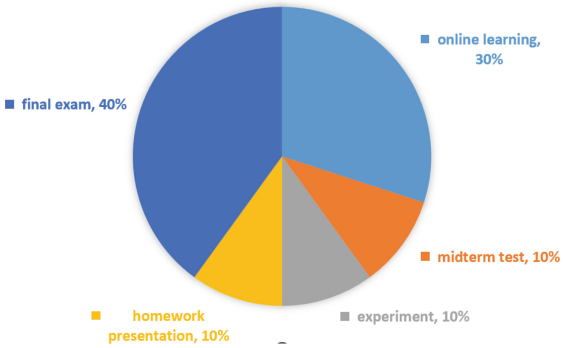

Fig. 2. Teaching evaluation system

classmates through message boards, chat rooms and other online communication tools to understand their gains and questions, and students can answer them interactively.

4. Specific implementation stage

Based on the chaoxing.com teaching website, carry out teaching activities according to the teaching process described in Fig. 1. The whole implementation process is centered on student activities, and teachers play a guiding role. Supervise students to learn by signing in, and communicate with students through voting, questionnaires, preemptive answers and other forms to solve students' confusion.

5. Teaching evaluation

The total scores of students in traditional teaching are composed of usual scores, experimental scores and examination scores, each of which accounts for a certain proportion. It is difficult to avoid students' plagiarism of homework or experiment in teaching, and it is difficult to make an objective and correct evaluation of students. Therefore, the whole process and diversified assessment is adopted, which is different from the single assessment method of traditional teaching, and the composition of scores is diversified and detailed. The total score of the course consists of online learning, mid-term test, experiment, assignment presentation and final exam. The online learning performance includes sign in, course audio and video, classroom interaction, number of interviews, group discussion activity, etc. It organically combines online and offline assessment, which not only increases process management, but also reflects the fairness of assessment. The teaching evaluation system is shown in Fig. 2.

5 Implementation Effect

First of all, the use of online teaching platform is compared. Figure 3 shows the statistical results of a semester before and after using the mixed teaching mode based on flipped classroom. It can be seen from the figure that the utilization rate of online teaching platform has improved after the new teaching mode is adopted. The number of chapter learning, the number of resource downloads, the average viewing time, the number of

discussions, and the number of questions answered by students have doubled, and the number of assignments and experiments is the same, indicating that students' enthusiasm for learning has improved.

Secondly, in order to know whether the mixed learning teaching model based on flipped classroom has achieved the expected teaching objectives and effects, a questionnaire on learning effects was issued to the course learners.

The questionnaire is conducted around the following aspects: satisfaction with learning effect, improvement of learning interest and motivation, enhancement of autonomous learning ability, improvement of basic knowledge, enhancement of practical operation skills, improvement of ability to analyze and solve problems, improvement of innovation awareness and innovation ability, and improvement of their long-term development potential. The evaluation grade is divided into five grades: very helpful, helpful, average, almost unhelpful and completely unhelpful. A total of 42 questionnaires were sent, 42 were returned, and 42 were valid. The survey results are shown in Fig. 4.

According to the survey results, only 2.38% of the students are dissatisfied with the learning effect. Most of the students have achieved good learning effect through independent learning. Their interest in learning has increased, their ability to learn independently, practice and operate skills have been enhanced, their ability to analyze and solve problems has been improved, and their innovation awareness and ability have been

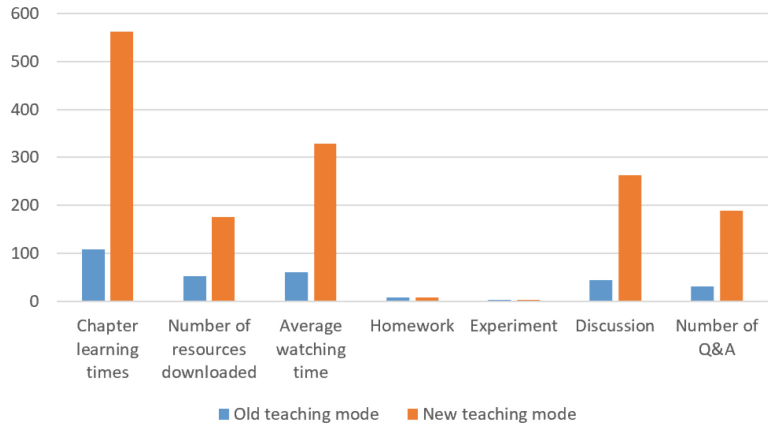

Fig. 3. Comparison between new and old teaching modes

	very helpful	helpful	generally	almost unhelpful	totally unhelpful
Satisfaction of learning effect	19.05%	71.43%	7.14%	2.38%	0.00%
Improve learning interest and motivation	21.43%	64.29%	11.90%	2.38%	0.00%
Enhance the ability of autonomous learning	16.67%	61.90%	16.67%	2.38%	2.38%
Improve the mastery of basic knowledge	16.67%	61.90%	16.67%	2.38%	2.38%
Enhance practical operation skills	14.29%	64.29%	16.67%	2.38%	2.38%
Improve the ability to analyze and solve problems	14.29%	61.90%	14.29%	4.76%	4.76%
Improve innovation awareness and ability	14.29%	57.14%	19.05%	4.76%	4.76%
Improve their long-term development potential	11.90%	61.90%	19.05%	2.38%	4.76%

Fig. 4. Learning effect questionnaire

enhanced. To sum up, from the perspective of teaching, students' learning, students' own abilities and other aspects, the mixed teaching model based on flipped classroom has achieved remarkable results.

6 Conclusions

This paper introduces flipped classroom on the basis of blending teaching, which can improve students' enthusiasm for learning, and is conducive to improving students' autonomous learning ability, practical operation ability and ability to analyze and solve problems.

Acknowledgment. This paper is supported by the research project of the teaching reform of Guangdong Peizheng College (Project No. PZ07202020).

References

1. He Kekang See the new development of educational technology theory from Blending Learning [J] Journal of the National Institute of Education Administration, 2005 (09): 37–48+79
2. He Chaoyang, Ou Yufang, Cao Qi Revelation of flipped classroom teaching mode in American universities [J]. Higher Engineering Education Research, 2014 (02): 148–151+161
3. Zhang Yueguo, Zhang Yujiang Perspective on "flipped classroom" [J]. Information technology education in primary and secondary schools, 2012 (03): 9–10
4. Wang Hong, Zhao Wei, Sun Lihui, etc The design of flipped classroom teaching model -- based on the analysis of typical cases at home and abroad [J]. Modern Educational Technology, 2013, 23 (08): 5–10
5. Lu Haiyan Feasibility analysis of the application of "flipped classroom" model based on micro-class in college English teaching [J]. Foreign language audio-visual teaching, 2014 (04): 33–36
6. Ma Xiulin, Zhao Guoqing, Wu Tong An Empirical Study on Flipped Classroom Teaching of University Information Technology Public Course [J]. Journal of Distance Education, 2013, 31 (01): 79–85
7. Zhang Jinlei, Wang Ying, Zhang Baohui Research on Flipped Classroom Teaching Model [J]. Journal of Distance Education, 2012, 30 (04): 46–51
8. Zhao Xinglong Knowledge internalization process and teaching mode design in flipped classroom [J]. Research on Modern Distance Education, 2014 (02): 55–61
9. Wang Jian On the essence of flipped classroom [J]. Higher Education Research, 2016, 37 (08): 53–59
10. Yang Yuxiang, Huang Jiye, Wu Zhanxiong Implementation scheme design of online and offline mixed teaching mode [J]. Curriculum Education Research, 2015 (05): 3–4
11. Zhu Zhiting, Guan Jueqi, Qiu Huixian Practice and reflection on domestic application of flipped classroom [J]. Research on Audio-visual Education, 2015, 36 (06): 66–72