

Discussion on online and offline mixed teaching mode of hydraulics course

Baiquan Chen^{1,a,*}, Zhicheng Xi^{1,b}, Qiang Zhang¹, Yin Wang¹, Hui Chen¹

¹College of Hydrodynamic and Ecology Engineering, Nanchang Institute of Technology, Nanchang, 330099, China

^a328452678@qq.com, ^b506054207@qq.com

*Corresponding author

Abstract: With the continuous development of information technology, the teaching mode is constantly updated. In recent years, online and offline hybrid teaching mode has received extensive attention. Taking the hydraulics course of water conservancy and hydropower engineering specialty in ordinary undergraduate colleges and universities with the cultivation of applied talents as the main direction as an example, this paper analyzes the problems existing in the single teaching mode, discusses the online and offline mixed teaching mode of hydraulics course, and analyzes the implementation effect, in order to further improve the teaching quality of hydraulics course and provide reference for the construction and reform of related professional courses.

Keywords: Hydraulics course, online and offline, mixed teaching mode

1. Introduction

With the continuous development of information technology, education and teaching methods are constantly updated, from the initial single classroom teaching to the diversified and diversified teaching mode. Online and offline mixed teaching mode combines online teaching with offline teaching, makes full use of network resources, stimulates students' interest in learning, and improves teaching quality and effect.

Hydraulics is a basic course of water conservancy specialty. The goal of the course is to enable students to master the basic concepts, understand the general laws, basic theories and analysis methods of liquid motion, and use the knowledge of hydraulics to solve practical engineering problems. Through the study of this course and the follow-up courses, students' theoretical foundation, strong practical ability, high comprehensive quality and innovative entrepreneurial spirit are cultivated. In the water conservancy, hydropower, civil engineering, railway and other industries, engaged in surveying, planning, design, construction and management of applied talents.

2. Problems in single teaching mode of Hydraulics course

2.1 Problems in offline teaching mode

(1) Single teaching method

Classroom teaching is teacher-centered, and the teaching method is relatively simple. It is difficult for teachers to take care of all students in classroom management, and it is difficult to grasp the learning situation of each student. Students lack initiative in learning, and the teaching effect is not good[1].

(2) Low student participation

In the traditional offline teaching, there is less interaction between students, and it is difficult for teachers to pay attention to the learning situation of each student. Some students dare not be satisfied with their learning. This will lead to the decrease of students' learning enthusiasm and affect the learning effect.

(3) Unreasonable assessment methods

The results of the 'Hydraulics' assessment are generally 70 % of the final exam results, 30 % of the usual results, and less of the assessment of the students' learning process.

2.2 Problems in online teaching mode

Online teaching is that teachers and students teach and learn through the network. In the first half of 2020, due to the impact of the new coronavirus epidemic, our school has fully carried out online teaching. Based on the MOOC resources of Chinese universities, the 'Hydraulics' course has established an asynchronous SPOC course, and students learn independently after joining. Teachers regularly answer students' questions through QQ telephone every week, and homework is also arranged and feedback through QQ. Hydraulics course through a semester of online teaching practice, there are mainly the following problems :

(1) Insufficient interaction between teachers and students

The online teaching videos of hydraulics courses are pre-recorded. Compared with traditional teaching, online teaching is difficult to achieve face-to-face communication. Students cannot ask questions in time, and teachers cannot observe students' learning reactions in time, thus affecting the teaching effect[2].

(2) Lack of supervision of student learning

Online learning Due to the lack of teacher supervision, it is difficult for students to maintain continuous attention. Most students use mobile phones to attend classes. It is difficult to supervise whether students open the teaching video carefully. The platform can only count the video viewing time, and cannot count the effective viewing time of students.

(3) Lack of teaching experience.

For most teachers, online teaching is a new teaching method. Making online courses requires preparing instructional designs and lesson plans adapted to online courses. At the same time, it is also necessary to make full use of multimedia elements such as pictures, shapes, sounds, images, and animations to make courseware. After the preparation work is done, it is also necessary to record video, video editing and beautification. For teachers, there is no previous experience to learn from, only through exploration and learning to achieve.

3. Discussion on online and offline teaching mode of hydraulics course

3.1 Curriculum organization and implementation

The online and offline mixed teaching mode of hydraulics course is composed of online teaching and offline teaching. Online teaching is mainly for students to watch teaching videos online and test each chapter online. Offline teaching is mainly classroom knowledge teaching and homework explanation. The problems encountered by students in the learning process are realized through online or offline centralized question answering and individual question answering.

(1) Online autonomous learning

Online teaching resources preferred love courses large public MOOC platform. Teachers designate courses and students learn independently. College students have more fragmented time, and online learning is not restricted by time and place, making learning easier. Students watching online courses and completing the test of each chapter can effectively improve their autonomous learning ability, problem analysis ability and data reading ability[3].

(2) Offline classroom learning

The offline teaching method is classroom teaching. Classroom teaching is mainly to teach the key and difficult points of the course and answer questions. Focus on answering questions is mainly to answer questions raised by offline and online students. After class, homework will be arranged. Students can watch online video again for re-learning when they have problems they do not understand in the process of doing homework. Teachers mainly teach the key points and difficulties of knowledge content, which

can not only reduce the teaching pressure, but also improve the efficiency of classroom teaching[4].

(3) Online tutoring

According to the feedback of students ' online learning, through QQ, WeChat and Tencent conference and other social software, online counseling and testing are carried out for students to solve problems and supervise students ' learning in time[5].

3.2 Content of courses

(1) Online course content (28class hours)

This study takes the hydraulics course of water conservancy and hydropower engineering specialty of Water Conservancy and Ecological Engineering College as an example. The online course hours are 28 hours, and other specialties are adjusted according to the training plan and professional needs. The class schedule is shown in Table 1.

Table 1: The distribution of ' Hydraulics ' sections (online)

Chapter	Content	Class hours	Chapter	Content	Class hours
1	Introduction	1	6	Open channel flow	5
2	Hydrostatics	4	7	Weir flow and gate outlet flow	3
3	Flow filaments theory of liquid motion	4	8	Water flow connection and energy dissipation	2
4	Fluid flow pattern and head loss	3	9	Seepage flow	2
5	Pressured pipe flow	3	10	Foundation of hydraulic model test	1

(2) Offline course content (56class hours)

The course content of hydraulics is mainly composed of two parts : the basic theory of hydraulics and the application of hydraulics engineering. The course content involves many formulas, complex theoretical derivation, long course content and large class hours.

This study is based on the hydraulics course (56 hours) of water conservancy and hydropower engineering major in ordinary colleges and universities with the main direction of applied talents training. Other majors can be appropriately adjusted according to the training plan and professional needs. The specific class schedule is shown in Table 2.

Table 2: Distribution of ' Hydraulics ' hours and chapters (offline)

Chapter	Content	Class hours	Chapter	Content	Class hours
1	Introduction	2	6	Open channel flow	10
2	Hydrostatics	8	7	Weir flow and gate outlet flow	6
3	Flow filaments theory of liquid motion	8	8	Water flow connection and energy dissipation	4
4	Fluid flow pattern and head loss	6	9	Seepage flow	4
5	Pressured pipe flow	6	10	Foundation of hydraulic model test	2

3.3 Course assessment

The assessment method of ' Hydraulics ' course is carried out according to 15 % online score, 15 % offline score and 70 % paper score.

(1) Online performance

Online scores are reflected by students ' online viewing of teaching video progress, duration and online test scores of each chapter. Students watch the teaching video progress and duration of the teaching platform to statistics; each chapter of online tests is implemented through teaching platforms or online testing tools.

(2) Offline performance

Offline performance is mainly reflected in the number of homework completed, the quality of completion, classroom performance and so on. The final exam paper score refers to the final exam paper score.

3.4 Implementation effect

In the past three years, the water conservancy and hydropower engineering specialty of our school has taken the opportunity of engineering education certification. According to the training objectives of this specialty, the teaching practice of online and offline mixed teaching mode of hydraulics course of this specialty has been carried out[6]. The implementation effect is summarized as follows:

(1) Flexible learning methods: online learning allows students to schedule their own learning in their spare time, while offline teaching allows students to learn systematically at a fixed time and place. This combination of online and offline learning meets the learning needs of different students and improves the learning effect.

(2) Personalized teaching. The online and offline mixed teaching mode can provide personalized teaching resources and teaching arrangements according to the learning progress and ability of each student, so that each student can get full attention and guidance.

(3) Expand the teaching content. Online teaching resources can include multimedia teaching, network courses, virtual experiments, etc., which provide students with rich learning materials and help students understand and master hydraulics knowledge more comprehensively.

Through online and offline mixed teaching mode, teachers can keep abreast of students' learning situation, adjust teaching methods and strategies in time, and constantly improve teaching level. At the same time, teachers can also use network resources to carry out teaching research and exchanges with other schools and teachers to broaden their professional knowledge and educational horizons.

4. Conclusions

This paper takes the hydraulics course of water conservancy and hydropower engineering as the research object, and discusses the application of online and offline mixed teaching mode in course teaching. Practice has proved that the online and offline mixed teaching mode is conducive to improving the teaching quality and effect of hydraulics course, and is conducive to cultivating students' autonomous learning and collaborative learning ability. In the future teaching reform, the online and offline mixed teaching mode should be widely promoted and applied to improve the teaching quality of water conservancy and hydropower engineering and other majors.

Acknowledgments

This work was financially supported by Nanchang Institute of Technology Teaching Reform Research Project (2019JG005 and 2020JG050)

References

- [1] T. L. Tian, R. R. Yang. *Comparative Analysis of Online Wushu Routine Teaching and Offline Wushu Routine Teaching*, *Contemporary Sports Technology*, 2023, No. 4, 115-118.
- [2] J. H. Zhu. *Problems of Online Teaching in the General Institute of Higher Education and the Countermeasures*, *Heilongjiang Science*, 2022, No. 3, 128-129.
- [3] S. J. Wei, P. S. Yan. *Implementation and Discussion of Online Teaching Mode of Livestock Welfare*, *Acta Ecologiae Animalis Domastici*, 2023, No. 1, 93-96.
- [4] L. H. Chen, J. Wang. *Practice and Innovation of Blended Teaching Based on OBE: Taking Hydraulics Course as an Example*, *Education and Teaching Forum*, 2021, No. 44, 110-113.
- [5] G. X. Li. *Construction of Mixed Online and Offline Teaching Model for HSK Based on SPOC*, *Journal of Qiqihar University(Phi& Soc Sci)*, 2020, No. 6, 179-183.
- [6] Y. Xue, T. Wang. *Effect evaluation of online and offline hybrid teaching based on big data analysis*, *Information Technology*, 2021, No. 8, 70-74+80.