

Research on Online Teaching Based on Multiple Platforms and Teaching Methods in COVID-19 Epidemic Period

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ABSTRACT

COVID-19 Epidemic broke out in 2020. Online teaching was adopted by teachers. Due to the change of teaching mode, the teaching design should be changed accordingly. Online teaching during the epidemic was a kind of distance teaching which used more teaching methods and platforms than MOOC and SPOC. Three teaching methods could be used, such as problem-based learning, task-driven and team teaching, which were beneficial to motivate students to study independently. And some platforms could be chosen, such as SuperStar Erya platform, SuperStar learning APP, QQ Group and Tencent classroom. Teachers can use these platforms to present their teaching content, manage the teaching process and analyze learning data. Moreover, the study has provided a feasible teaching program on how to use those platforms and teaching methods for online teaching during the COVID-19 epidemic. Finally, this paper presents a teaching design by taking “the course of database principle” as an example.

Keywords: *epidemic period, problem-based Learning, team teaching method, SuperStar platform, QQ group, Tencent classroom*

1. INTRODUCTION

The Ministry of Education proposed "Stop classes and don't stop learning" in COVID-19 epidemic period. Online teaching was the best choice. It was also a challenge to every teacher because the teaching contents didn't change and teaching mode changed. New research should be launched. The research aim was to improve effectiveness of teaching and learning by using teaching methods and information technology. The research content included what teaching mode is, which teaching methods and platform were chosen, how to reorganize teaching content, how to monitor learning situation, and how to examine learning results.

2. TEACHING MODE

Distance education is an educational form between students and teachers, students and educational organizations. Distance teaching carries out systematic teaching and communication by media. It transmits curriculums to students outside the campus. Distance education has five characteristics [1]. Firstly, students and teachers are separated in space and time. Secondly, media teaching is based on modern educational technology which occupies a dominant position. Thirdly, it is a kind of organized system engineering. Fourthly, students study by themselves mainly, teachers' guidance is auxiliary. Finally,

communication and feedback mechanism is adopted between students and teachers. The popular modes of distance education include MOOC (Mass Open online course) and SPOC (Small Private online course).

Online teaching of epidemic period had those five characteristics. So it's a kind of distance education mode. There were some differences and similarities by comparing with SPOC and MOOC, which were shown in "Table 1". Students are taught by ordinary teachers in the mode, which is closer to the SPOC teaching mode. Teaching resources were showed in the teaching platform which can be used to guide students to self-study before class, but teachers cannot communicate with students face to face and guide them hand in hand. That is similar to MOOC. Therefore, it's a problem of how to carry out effective online communication and online practical teaching in teaching design. Choosing appropriate teaching methods and platforms is the way to solve the problem.

3. TEACHING METHODS

Some teaching methods are widely adopted in engineering education, such as Problem-Based Learning (PBL), Task-driven method and Team Teaching method. Those methods can effectively motivate students to study autonomously. They can also be chosen firstly by online teaching.

- PBL is a new teaching mode based on constructivist learning theory. Its main idea is that students' learning activities must be combined with related

problems in order to guide and strengthen students' interest in learning. Students think about problems and explore with problems. So the initiative of learning is in the hands of students [2]. If teachers started the theoretical teaching design of online courses, the problem-driven method could be used to put forward the important or difficult points of teaching content, to explain the logical connection between knowledge points. During live teaching, it could attract students' attention and improve classroom teaching effect.

- Task-driven method is a kind of teaching method based on constructivist learning theory. Teachers set learning tasks, then students take tasks as study center. Students use learning resources actively and explore knowledge independently. It aims to guide the students to produce a kind of learning practice by completing the established task [3]. Task-driven method could be used in practical teaching design. Exercises and experiments are common tasks that can also measure the quality of online learning.

- Team teaching method takes topic as the main line, task goal as mission, team as carrier, teacher as leader, and students as main body. It aims to stimulate students' innovative ability effectively [4]. Team teaching method is a common teaching method used in practical teaching, such as comprehensive experiments teaching and designed experiments teaching. CDIO engineering education mode was founded in 2004. It is the latest achievement of international engineering education reform. CDIO represents Conceive, Design, Implement and Operate. It takes the life cycle from product development to product operation as carrier. Students learn engineering in an active, practical and organic way. It's necessary to incorporate CDIO engineering education into team teaching. Teachers can guide students to complete a "curriculum design" project in stage of practical teaching. That can cultivate students' engineering literacy, public moral literacy and professional ethics. Also, students' comprehensive practical ability can be improved.

Table 1 Comparing Online Teaching of Epidemic Period with MOOC and SPOC

Type of Distance Teaching	Participants	Instructor	Teaching Location	Method of Releasing Teaching Content	Teaching Process	Course Examination Method	Cost
MOOC	Any online learner without access	Mainly come from famous schools or are famous	Online	MOOC platform	Learners can learn at anytime, anywhere. Learning process depends on the learner's consciousness. Dropout rate is high.	Usual Examination: unit tests, unit assignments, discussion. Final Examination: online exam.	Free
SPOC	Students in school or eligible online learners	Ordinary teachers are also allowed	Online and physical classroom	MOOC platform and on-campus teaching platform	Student study MOOC before class. Teachers teach students or answer questions at a fixed time in class. Communication is online or offline after class. Learning process is supervised by teachers and teaching managers. Dropout rate is low.	Usually Examination: online or offline attendance, unit tests, unit assignments, discussions or questions. Final Examination: online or offline exams.	Included in tuition
Online Teaching in Epidemic Period	Internal student	Mainly ordinary teachers	Online	MOOC platform and on-campus teaching platform	All teaching activities are carried out online according to the curriculum schedule. The learning process is supervised by teachers and teaching managers. Dropout rate is low.	Usual Examination: online attendance, unit tests, unit assignments, discussions or questions. Final Examination: online or offline exams.	Included in tuition

4. TECHNICAL SUPPORTS

The academic affairs office of Chengdu University published "Chengdu University Online Teaching Quality Report (February 24-March 8)" on the official website on March 11, 2020. It was statistics on the usage of online teaching form and teaching platform. About online teaching form, 3914 teaching classes were live online teaching, 427 classes were MOOC/SPOC, 1553 classes were offline self-study + online interactive form. Live teaching had given student a best experience (37.4%). The second was the form combined offline self-study with online interactive (23.8%), The third was online discussion teaching (18.6%). The fourth was recording and broadcasting teaching (14.4%). MOOC/SPOC teaching

was the worst (5.8%). Therefore, live online teaching was more acceptable to teachers and students.

About platform, 37.61% of teachers used QQ groups or WeChat groups, which was the most. The second was SuperStar that 35.56% of teachers used it. Other teachers used Tencent conference, Tencent classroom, ZOOM and so on. 27.2% of students used SuperStar Learning APP. QQ Group was 25.2%. Tencent Conference was 19.5%. Tencent Class was 15.7%. SuperStar Erya platform had the lowest usage (4.5%). The main reason was that first four platforms were accessible through mobile devices, SuperStar Erya platform could be accessed only on the computer side. To SuperStar learning APP, the order of activity frequency from high to low is: visiting course, completing task point, check-in, submitting homework, participating test and discussion. More students don't use

the discussion function of SuperStar learning APP because QQ groups were more convenient and fast than it. But QQ group files had only 10G free spaces, while SuperStar Cloud Disk provided 100G free space. There were more

advantages if SuperStar Cloud Disk combined with SuperStar Erya platform.

Based on the above analysis, it's shown in "Table 2" how to use teaching platform or information technology from "before class, in class and after class".

Table 2 Integrated use of teaching platforms/information technologies

Teaching process	Platform Users	Platform usage requirements	Platform selection	Recommended equipment
Before class	Teachers	Releasing course materials, study/work assignments, topic discussions	Superstar Erya platform	Computer
	Students	Browsing course materials	Superstar Erya platform or Superstar learning APP	Computer or mobile phone
In class	Teachers	Releasing check-in and answering activities	Superstar Erya platform	Computer
	Students	Check-in and answer	Superstar learning APP	Mobile phone
	Teacher /Student	Live teaching and discussing	Tencent classroom or QQ group	Computer
After class	Students	Submitting assignments and questionnaires, participating in tests, thematic discussions	Superstar Erya platform	Computer
	Teacher /Student	Online answer and notification	QQ group	Computer or mobile phone
	Teachers	Counting learning data and questionnaires	Superstar Erya platform	Computer

- Before class, teachers could use the Superstar Erya platform to build classes, show the teaching plan and progress, release teaching materials, study/assignment tasks, topic discussion, etc.
- In the class, there are two aspects of work, one is teaching interaction, and the other is teaching content. To teach interaction, teachers could set up check-in, selection and answer activities on the SuperStar Erya platform. Students used SuperStar learning APP to participate in classroom activities on mobile phones, so as to help students focus their attention and strengthen their deep thinking on the teaching content. Live broadcast could be used to explain core knowledge by teachers. QQ group or Tencent classroom were optional live broadcast platform. Their advantage was that students do not need to install additional software for live class. Especially Tencent classroom had the function of automatic playback, which made students review easily after class. QQ group had the simple sharing screen function only. During live broadcast, students could ask questions through QQ group or Tencent classroom, and teachers could answer questions in time.
- After class, teachers and students could discuss questions online by QQ groups. And SuperStar Erya platform was used to submit or correct homework, to conduct unit tests and questionnaire surveys. SuperStar Erya platform had a powerful statistics function in students' data of learning. Teachers could know each student's level of learning, students knew only themselves.

5. TEACHING DESIGN OF "DATABASE PRINCIPLE" COURSE

Several core questions had been researched on online teaching of the epidemic period, such as teaching mode, teaching methods and educational platforms/information technology. Then the teaching design of online teaching would be discussed on "the course of database principle". Contents of teaching design included: theoretical teaching design, practical teaching design and assessment mechanism. The design of the assessment mechanism was the focus of teaching design and played a guiding role in theoretical teaching design and practical teaching design.

5.1. Theoretical Teaching Design

The problem-driven method was used to design the theory teaching. The process of problem-driven teaching was: "Firstly, the initial problem was presented. Secondly, the students thought and discussed problem. Thirdly, the teacher presented students' answers and continued to ask the question, once again guided the student to think. Such was a circular process "[5]. There were three aspects to pay attention to in teaching design for the course of "Database Principle".

- The first was to establish a "problem set" before class, and the teaching content was planned with the key problems in each stage of database design.
- Then problems were analyzed and discussed in class. Compared with offline theory teaching, online theory teaching could not see students'

expression change and have no language feedback, but it could understand students' questions and control the course process through real-time conversation in QQ group or Tencent classroom. In addition, the "selection" and "answer" activities could be set up by using SuperStar Erya platform. And the respondents could be given certain scores, which was benefit to enliven the classroom atmosphere and promote the students' active thinking.

- Finally, Task-driven method was adopted. There were two types of assignments: study notes and literature reviews. The student would finish and submit them to SuperStar Erya platform on time.

5.2. Practical Teaching Design

Comparing with offline practical teaching, online practice teaching was more flexible in arrangement of practical time, and it connected more closely with theoretical teaching. And the disadvantage was that problems could not be demonstrated and corrected hand to hand. Two kinds of practical tasks were set up that were general experiments and curriculum design. Experiments applied task-driven teaching methods and curriculum design used team teaching method. Experiments included confirmatory experiment item more and design experimental items less. Curriculum design adopted "CDIO team teaching method". Students were grouped to complete design and development of database application system. Curriculum design could train students' ability to use knowledge comprehensively, cultivate students' ability of teamwork.

5.3. Assessment Mechanism

At present, the general curriculum assessment mechanism includes the usual evaluation and final evaluation [6]. Two problems should be considered preferentially to design assessment mechanism:

- Firstly, assessment accompanied the whole teaching process. It aimed to urge students to study step by step as far as possible, and to reflect the students' real learning level.
- Secondly, teachers would save time and effort to assess students.

With the help of SuperStar learning platform, those problems were effectively solved. Teachers carried out a unit examination and final examination on SuperStar platform, and then the platform counted test results automatically according to question bank. In addition, the platform also recorded whether students had studied teaching materials or participated in teaching activities, whether student had completed practical task, which would be used as usual evaluation. A student's final grade was a combination of his usual grade and his final examination grade.

6. CONCLUSION

The course teaching of epidemic period was special teaching under special circumstances. It was necessary to carry out proper teaching design to achieve the teaching goal. Practical teaching design was difficult for teaching design. Seemingly, experiments of computer course can be carried out by students to use a laptop. But students' questions are not same in different software and hardware environment. And students' understanding is different. So the effect of online experiment would be inferior to offline teaching without hand-to-hand instruction. Two technical means could be used to improve the situation. One was to use the QQ remote assistance function to operate the students' computers and eliminate the problems in experiment. The other was to record micro-videos of experimental operation by providing detailed experimental steps, which could assist students to learn the experiment process and master the experiment method.

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