

Exploration and Practice of Online Segmented Teaching under Epidemic Situation

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ABSTRACT

In order to explore the method of long-distance online teaching under the epidemic situation of novel coronavirus, the traditional segmented teaching method is reformed and a new online segmented teaching method is formed. Namely, three teaching stages are employed by learning the designated unit knowledge via online video, guiding the key knowledge on demand, and conducting the targeted Q & A and discussion. The online unit learning is based on the MOOC platform video of Chinese University. And as for the key knowledge guidance on demand, and the targeted Q & A and discussion were carried out by setting up the course QQ group in which the aforesaid learning activities are conducted online. The completed teaching practice has proved that the online segmented teaching under the epidemic situation can effectively realize the student-centered education philosophy for that the students' learning attention, learning effect and learning ability are significantly improved. This is an important exploration and practice on reform of education and teaching.

Keywords: Online segmented teaching method; MOOC; QQ group; Student-centered teaching.

INTRODUCTION

Under the epidemic situation of novel coronavirus COVID-19 ^[1], the requirement of class suspension and non suspension learning, makes the distance online teaching an inevitable choice. Actually, before the epidemic, the Chinese Ministry of Education has long attached great importance to online teaching, because the online teaching is an inevitable product of modern information technology development, which can accommodate more much teaching content, adopt more abundant teaching resources and adapt to students of different levels of knowledge ^[2]. Moreover, the online teaching can more effectively implement the teaching philosophy of taking students as the main body of teaching, promote the transformation of teaching subject status from teaching to learning, and impel the transformation of teaching methods from tradition to innovation, so as to cultivate students' autonomous learning ability ^[3]. During the epidemic period, if the majority of teaching staff can adopt scientific and effective methods to carry out distance online teaching, then it is an important exploration and practice on reform of education and teaching.

However, different from the online teaching under non epidemic situation, the online teaching during the epidemic period is facing the most important challenge, that is, under the distance online mode, it is difficult for teachers to capture students' facial expressions timely and accurately, so it is hard to control the online classroom. In this context, it is particularly important to adopt appropriate online teaching methods.

Therefore, on the basis of the previous online classroom teaching, and under the premise of determining the online platform and resources available, the author explored and practiced the segmented teaching method under the online mode in the teaching process of Microbiology course, a specialized course of undergraduate students major in related Biology. The results showed that the distance online segmented teaching method can effectively control the attention of students in online classroom, change students into the main role in teaching activities, and effectively improve the online teaching effect ^[4]. In this paper, the online segmented teaching method under the epidemic situation is introduced for reference.

MATERIALS AND METHODS

Traditional Segmented Teaching Method and its Inapplicability

The traditional segmented teaching method divides the teaching activities of a class into five stages: teaching, reading, giving written argument, discussing for consolidation and summarizing learning knowledge. Each activity is arranged with a certain period of time. The students are the main body of the activity, and the teacher plays a guiding and coordinating role, which helps to cultivate students' expression ability, memory ability and main body consciousness^[5]. The advantages of segmented teaching are obvious. However, under the online mode, the reading and giving written argument in the traditional segmented teaching are no longer applicable. The distance online segmented teaching under the current epidemic situation should be modified and updated on the basis of the traditional segmented teaching method, so as to fit in the remote network online teaching situation, which can highlight the main body position of students in teaching, and cultivate students' initiative and autonomous learning ability.

New Segmented Teaching Method Suitable for Epidemic Situation

According to the basic theories of pedagogy and psychology, combined with the actual situation of online teaching during the epidemic period, the online segmented teaching method under epidemic situation should include three main teaching activities: Learning one unit knowledge via online video, guiding the key knowledge on demand, and conducting the targeted Q & A and discussion, with each stage of 5-12 minutes. In the first stage, the online unit learning is to decompose the course content into the smallest knowledge unit, and each unit content is viewed online. This arrangement helps students to focus their attention and realize autonomous cognition on knowledge through watching unit video. In the second stage, guiding the key knowledge on demand is to explain the key content after watching the video of knowledge unit online, by which most of students' questions will be solved. In the third stage, conducting the targeted Q & A and discussion is that, in the light of questions asked by individual students, teacher makes the specific answers and interactive discussions among students. While solving the questions, the motivation and interest of learning knowledge for

undergraduates will be naturally improved, and the learning effect can be guaranteed effectively.

Platform for Online Video Learning

The MOOC excellent course teaching platform of Chinese Universities is a very good online course resource library^[6], which contains rich course resources, extensive content, and refined explanation of knowledge points. Teachers can select the smallest knowledge unit according to the major requirements of teaching objects and the characteristics of corresponding courses, and arrange students watch it online. It is used for the first stage of online segmented teaching, i.e., online video learning by unit.

Platform for Online Guidance, Q & A and Discussion

The QQ online platform, as we all know, this is a chat and communication platform that rose earlier^[7]. The technology of this platform is mature, and the quality of network communication is high. The majority of teachers and students are familiar with the platform, which can be used skillfully. It is very suitable for the communication between teachers and students in online teaching. In order to achieve a good effect in online teaching, we constructed the QQ group of corresponding class students, and conducted the voice and text communication within the QQ group before the online class started. The communication effect was relatively ideal, and everyone expressed satisfaction. The QQ group can be used as the second and third stage of online segmented teaching, that is, guiding the key knowledge on demand, conducting the targeted Q & A and discussion.

RESULTS AND DISCUSSION

Example for Online Segmented Teaching Practice

At the beginning of Microbiology course, combined with the epidemic situation, it is pointed out that the novel coronavirus is a special kind of microorganism, though extremely small, it is harmful to human health. For the sake of safety, teaching activities have to be carried out online. Nevertheless, we can master the knowledge of microorganisms and recognize scientific anti epidemic methods by studying the course of Microbiology and using learning knowledge. Then, it is introduced to learn the course Microbiology, Chapter 1,

Section 1, cell wall of prokaryotic microorganisms.

Here, the ideological and political education can be inserted in time, to encourage students making concerted efforts and responding scientifically under the wise leadership of the Party Central Committee, headed by general secretary Xi Jinping. And further, it is firmly believed that we will soon be able to control the epidemic situation. This way of introducing the course makes students feel the significance of learning Microbiology and thus respond positively.

In the follow-up teaching process, students put forward a lot of related problems and discuss them warmly, which has achieved good teaching effect. As follows, the content "cell wall of prokaryotic microorganism" is taken as the minimum knowledge unit to illustrate the practical process and teaching effect of online segmented teaching method.

Learning the Unit Knowledge and Guiding the Key Knowledge

The first stage of the online segmented teaching method is learning the unit knowledge via MOOC video. In the watching process, the teacher is not completely separated from the teaching process and should make some auxiliary guidance instructions to clarify the

Table 1. Examples of online segmented teaching method: Learning the unit knowledge and guiding the key knowledge

Guiding the key knowledge/5-10 minutes		
Watching video online/6-10 minutes	The key knowledge (Guiding methods)	Time/ seconds
1. Showing content: Bacterial cell wall 2. Watching MOOC video online 3. Having emphasis in watching: 1) Home page display 2) Cell wall structure 3) Gram staining	1. Cell wall protection (screenshot + voice)	22
	2. Gram staining (screenshot + voice)	38
	3. Cell wall components of gram positive bacteria (screenshot + voice)	24
	4. Structure and connection of disaccharide unit, peptide tail and peptide bridge of peptidoglycan from gram positive bacteria (screenshot + voice)	93
	5. Classification, function and binding site of phosphowallic acid (screenshot + voice)	36
	6. Cell wall composition, structure and function of gram negative bacteria (screenshot + voice)	54
	7. Composition and structure of peptidoglycan from gram negative bacteria and its difference from peptidoglycan from gram positive bacteria (voice)	54
	8. Interpretation of Gram staining results (voice)	66

Conducting Online Targeted Q & A and Discussion

The third stage of targeted Q & A and discussion, is an examination on the learning effect of the first two stages and also further

target content within watching, seen in Table 1. The instructions in the process of watching can increase students' attention to the corresponding content of MOOC video, improve the viewing effect, and help students learn relevant knowledge independently through watching.

Watching MOOC video can avoid the repetition of teacher's explanation of knowledge unit, but it can't completely replace teacher's lecture. After watching MOOC video, teacher should focus on guiding the key knowledge in the second stage of online segmented teaching method in QQ group. In the part of 'microbial cell wall', the guided key knowledge are as follows: cell wall protection function, Gram staining method, cell wall components of Gram-positive bacteria, peptidoglycan of Gram-positive bacteria, phosphoteichoic acid, cell wall components of Gram-negative bacteria, peptidoglycan of Gram-negative bacteria, Gram-negative bacteria peptidoglycan, gram-negative staining effects, etc., as shown in Table 1. These contents are screened according to the actual situation of major students at the stage of lesson preparation, and explained after watching the video, so as to highlight the key knowledge, remove some questions arised in the process of watching, eliminate the obstacles of autonomous learning, and enhance the sense of acquisition of students' autonomous learning.

improve the learning effect. In the stage, although it is for individual students to ask questions, the questions are usually representative. Also teacher can make specific answers and interactive discussions between

teacher and students or among students, in order to solve the questions proposed by students. At the same time, naturally students' learning motivation, interest and effect are enhanced.

In this Q & A process, it is easy to cause discussion among students. As shown in Table 2, in the QQ group, student 1 first raised the question 1 about bacterial staining “Are Gram stained bacteria viable?”, which raised a series of answers, questions and discussions. It can be sure that the student carefully watched the MOOC video and listened to the teacher's knowledge guidance, so as to think about the physiological state of the stain bacteria and put forward the problem. It can be inferred that the student has a strong motivation for autonomous learning, and the question raised is really representative, which is easy to ignore in the above two stages of learning.

First of all, the teacher gave a text answer and a voice explanation to the question in the QQ group. Then other two students participated in the discussion. Student 2 asked whether it was dead bacteria staining. The teacher confirmed that it was dead bacteria staining through typing text words and voices. Student 3 further questioned whether the cell wall structure was damaged by dead bacteria staining. The teacher gave the explanation that the cell wall was not damaged through words and voices. Relatively, student 4 may consider that the dead bacteria

stained cell wall will not be damaged, which will lead to another question of crosslinking degree implication of cell wall. After the teacher answered the question, the question and discussion again returned to the problem of dye properties. Student 5 asked if the dyed crystal violet could not be removed after bacterial stained and the teacher gave the answer through the screenshot picture and text words. Continuously, students 6-8 had a further speculative discussion on dye dyeing and the teacher confirmed the reliability of crystal violet dye dyeing and explained the mechanism that the dye could not be washed out of positive bacteria by text words and little video.

Through the above activities, questions were asked, answered and discussed one by one, so as to make the knowledge points clear. It not only solves the questions of knowledge, but also stimulates the students' interest and cultivates their ability to ask, think and infer problems. In this kind of learning activity, a small number of students directly participate in asking questions and discussions, and experience the student-centered learning activities, but they play a student-centered initiative learning demonstration and driving roles for other students in the QQ group. Also the activity has a great promoting effect to the follow-up course learning and the cultivation of students' learning ability.

Table2. Practice examples of online segmented teaching method: targeted Q & A and discussion / 5-10 minutes

Students' questions and discussions		Teacher's explanation	
Questions	Contents/words	Explanation (methods)	Time/seconds
Question 1	Student 1: Are Gram stained bacteria viable?	1: Gram staining is not live bacteria staining (text + voice)	30
Spontaneous discussion question 1	Student 2: Is that dead stain?	2: Yes, Gram staining is dead bacteria staining. In the fixed stage, bacteria have died (text + voice)	46
	Student 3: Hasn't it destroyed the structure of bacterial cell walls?	3: Basic cell wall structure has not been destroyed (text + voice)	25
Question 2	Student 4: The crosslinking degree is the degree of connection between who and whom?	4: Crosslinking degree refers to the crosslinking degree of peptide tail and peptide bridge, which is very high in Gram-positive bacteria (text + voice)	24
Question 3	Student 5: Crystal violet can't be removed?	5: Cell wall meshes have shrunk (screenshot + text)	12
Spontaneous discussion question 3	Student 6: Is the blue did not wash out, red can not enter?	6: Yes, for positive bacteria, crystal violet doesn't come out, decolorization is also ineffective (text).	20
	Student 7: No room for red?	7+8: Yes, crystal violet and iodine combine to form a macromolecular complex. In addition, the peptidoglycan meshes become smaller after ethanol treatment, so crystal violet can't come out (text). Explain the steps and principles of Gram staining (small video)	160
	Student 8: Purple is full of space, right?		

Student Evaluation on Online Segmented Teaching Method

After class, through the QQ group, feedback survey was conducted on online segmented teaching class. The survey results are listed in Table 3. In conclusion, online segmented teaching has obvious effect in improving learning attention, learning effect and learning ability.

Improvement of Learning Attention

The video of knowledge unit has characteristics such as clear picture, strong dynamic, concise explanation and short time. It is easy for students to understand and not easy to appear visual fatigue. Combined with the key explanation, Q & A and discussion after watching the video, the students can further understand the knowledge more thoroughly, and the positive speech can enhance the students' interest in learning. The students' attention is more focused, and the cognitive ability can be improved.

Improvement of Learning Effect

MOOC video can be played back and played repeatedly, which can make students actively check and make up for the deficiencies and strengthen the cognition and memory of

knowledge. Based on MOOC video watching as the premise, the teacher can explain the knowledge points in a more orderly way. Text + voice + screenshot + supplemented small video, can clear the remaining students' questions about knowledge points in a multi angle way. The subsequent Q & A and discussion further remove the obstacles of students' understanding of knowledge, and especially the heated discussions push students' understanding of knowledge points to a new height.

Improvement of Learning Ability

In MOOC video watching, students can selectively play back and replay the video according to their own needs, which is the exercise of students' autonomous learning ability. Asking questions for students is the cultivation of students' ability to independently think and find problems. The discussion and question answering among students and between students and teacher can activate students' thinking ability and guide students to learn knowledge actively with themselves as the main body of teaching activities. From the degree of students' active participation in the discussion, it is signified that they have really thought on learning knowledge.

Table3. Examples of students' feedback on teaching contents and methods

Student	Evaluation
Student 9	I like the teacher's way of explaining to everyone after watching a video. It makes us concentrate more, and the students also actively speak and ask questions. This kind of online classroom method is very interesting.
Student 10	MOOC is combined with voice teaching to learn knowledge fully, we can discuss and supplement knowledge under the guidance of teacher. Video + voice teaching allows us to repeatedly read, listen and understand the places where we don't understand. If we still don't understand, we can ask questions and get answers in time. This teaching method allows us to fully understand the learning content and learning is in right place.
Student 4 ^a	The course schedule node arrangement is reasonable and moderate. More moderate nodes, let students just finish the course and retain some questions, and questions will not pile up too much. Students actively ask questions and discuss them in class, which also provides a new perspective in learning for other students.
Student 11	I also think this kind of teaching method is very good. The teacher's voice lectures are very organized. I feel that the general framework of knowledge at the beginning is very clear. Moreover, MOOCS can be played back to make up for some gaps. Online teaching makes people feel more active than offline, so it becomes interesting.
Student 12	I think the teacher spoke very well, focusing on the key knowledge, deepening the understanding on the knowledge.
Student 13	I think the teacher's teaching method is very good. Watching videos can absorb some knowledge, but still there are many doubts. Through the teacher's key explanation and Q & A, we can understand the knowledge points well.
Student 14	I think the teacher's teaching method is very good. MOOCS can give us a general understanding of the content of each small unit. Further the teacher focuses on explanation on the important content, we can remember it more deeply. By the discussion after each unit of knowledge learning and explaining, we can find and put forward the shortcomings of our own learning knowledge, so as to strengthen them.

^a Same as the student 4 in Table 2.

CONCLUSION

Practice of online segmented teaching in Microbiology course has proved that, during the epidemic period and by using online platform to carry out distance teaching via online segmented teaching method, the teaching effect is not worse or even better than face-to-face teaching, the enthusiasm of class is increased, and the active learning effect with students as the main body is obvious. Teacher also deeply feels that the main position of teaching process is students, not teacher. Through online segmented teaching, it is the most important to give students more space for autonomous learning and independent thinking, and to cultivate students' autonomous learning ability. Generally speaking, teachers are only temporary companions in students' life. More often, they need their autonomous learning ability and their own potential. Therefore, for the teaching of university stage, the best teaching effect should be "teach one how to fish" rather than "give one a fish", and cultivate high-quality talents with real innovation and entrepreneurship ability. Online segmented teaching under epidemic situation is an important practice and exploration to deal with teaching under special circumstances.

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