Discussion on online classroom teaching mode under the concept of active learning

Linbo Li*, Yanli Wang and Bing Wu
College of Transportation Engineering, Tongji University, Shanghai, China

*Corresponding author. Email: llinbo@tongji.edu.cn

Abstract. The rise and development of the new engineering poses challenges to the traditional teaching mode, and the online class under epidemics conditions also faces the transformation demand of the traditional teaching mode. In the face of difficulties met with the traditional teaching model and online classes, this paper takes the online classroom teaching of the curriculum of “traffic management and control” as an example, introduces into the class the concept of active learning in the teaching model design, and makes the bold innovation practice on the traditional teaching mode from the online teaching contents, teaching methods and evaluation.

Keywords: Active learning concept, Online classes, Teaching mode, Innovation practice.

1. Introduction

A sudden COVID-19, closed the land of China. For a short time, the daily production and life are seriously disturbed, and the normal teaching order is inevitably affected. On January 27, the Ministry of Education issued a notice on Postponing the Start of the 2020 Spring Semester. On January 29, the Ministry of Education suggested using online platforms for teaching to ensure "no suspension of classes". The school responded positively, and mobilized all the faculty and staff to overcome the difficulties together, which organizes teachers to conduct technical training for online teaching, and proposes that during the suspension period, normal teaching tasks should not only be carried out to effectively complete the teaching tasks, but also the advantages of the network should be utilized to further improve the teaching effect.

New engineering course is a unity of diversity and individuation with cross-boundary integration, advance, derivation, innovation and practicality [1]. Its rise and development also pose great challenges to higher education. The Outline of the National Program for Medium - and Long-Term Education Reform and Development (2010-2020) clearly states: "Education and teaching reform should be deepened, educational and teaching methods should be innovated, and various training methods should be explored. Focus on the combination of learning and thinking. Advocate heuristic, inquiry, discussion and participatory teaching to help students learn how to learn. Stimulate students' curiosity, cultivate their interests and hobbies, and create a good environment for independent thinking, free exploration and innovation." How to reform higher education according to the characteristics of new engineering and train students with innovation ability and engineering ability is an urgent problem to be answered in higher engineering education.
The traditional passive teaching model faces the need for change, and the persistence of COVID-19 coexists with us like the flu. It also requires higher education to accelerate the exploration of the rise of online education mode, and the construction of online classroom with the characteristics of active learning will be the basic content of future education.

2. Connotation of online classroom under epidemic condition

2.1. Difference between online classroom and online course
Due to some special circumstances, such as the epidemic, online classroom transferred the offline classroom teaching activities to online development by using modern information technology and hardware facilities. It is a daily and formal teaching activity aimed at completing the teaching tasks for specific academic qualifications. Online course, also known as network course, is the sum of the teaching content and teaching activities of a certain subject expressed through the network. It is a new form of course expression in the information age. There is no difference between the two in the form of expression. Generally, they do not make a strict distinction. For the convenience of narration, the online teaching of academic education is called online classroom, and the online learning generally due to the individual's pursuit of knowledge growth is called online course. Obviously, different from the characteristics of flexibility, autonomy and openness of online courses, online classroom has strict time requirements (made by the school), a fixed number of students, and clear teaching objectives, teaching content and assessment.

2.2. Online classroom's dilemma
During the epidemic, students were separated from each other, so they could only study online classroom through the network terminal, which caused the following problems: 1) Can the continuity of image and speech be guaranteed? After all, if the unified network class, the number of concurrency is too large, the bandwidth is difficult to be guaranteed; 2) When the teacher is on the spot, students often wander off. Can the students' attention in class be guaranteed without the teacher's supervision? You may not even know when a student is out of his or her seat; 3) Without the normal classroom atmosphere, how to promote the identity of students and continue to learn as before; 4) Because of the lack of eye contact, how to grasp the rhythm of the lecture, and always pay attention to fully mobilize the enthusiasm of students; 5) Due to the lack of the sense of presence, classroom tests, course experiments, as well as the need for on-site investigation of the course papers can't be carried out normally, how to make up for the corresponding through other means? 6) How to ensure that student assignments are submitted on time? 7) How to ensure the fairness and impartiality of the examination? 8) Is each student's hardware and software facilities guaranteed? And so on a series of problems in front of everyone, are teachers in the design of teaching mode must give full consideration.

2.3. The reform of online classroom teaching mode
In normal classroom teaching, the teacher speaks and the students listen. With the development of social demand and the change of science and technology, the disadvantages of this teaching mode soon appear, mainly manifested in the students' unsatisfactory learning effect, lack of innovation ability and practical ability. In the actual engineering practice, it is difficult to find problems, the ability to cope with the changes in reality is weak, and the ability to communicate and express each other is also relatively deficient. Everyone seems to have realized that teaching is the combination of teaching and learning, and knowledge explanation itself cannot transfer knowledge. Only by deeply participating in the teaching process and carrying out the benign interaction between teaching and learning can knowledge transfer play a role. Therefore, it is very important to take the rise of online classroom as an opportunity to reform the teaching mode.
3. Connotation of active learning idea

3.1. Rise and development of active learning

Active Learning is a teaching concept that emerged in the United States in the 1980s. It is reflected in the focus on students' Learning initiative, the emphasis on the participation in the Learning process, and the evaluation of the effectiveness of Learning results, which is in opposition to the traditional passive teaching methods to a certain extent, and has begun to explore beyond the traditional teaching methods, and formed 19 specific strategies and methods, such as reflective pause, one-minute writing, self-evaluation, large group discussion, peer evaluation, brainstorming and so on. It fully reflects the diversity, initiative and effectiveness of Active Learning. Practice shows that Active Learning, as the methodological basis of university teaching, has greatly promoted students' academic achievement and personal development, and has gone beyond the limitation of purely discussing the application of teaching technology to promote teaching [2]. It has become an inspiring educational concept and teaching methodology that has been continuously concerned for more than 30 years. The Horizon Report (2018), in its "Major trends driving the application of technology in higher education", points out that one of the short-term trends is the redesign of learning spaces. Active Learning is carried out based on digital technology to achieve the transformation of talent training objectives, and propose that Active Learning Classroom(ALCs) has three modes, as a form of Learning space redesign: The first one is SCALE-UP(Student - centered Active Learning Environment with Upside – down Pedagogies), it is student-centered Active Learning environment and reverse teaching method, aiming at enabling students to realize Learning through team questions and collaboration; The second one is TEAL(Technology Enables Active Learning), that is, Active learning supported by technology is a teaching method that integrates lectures, simulations and actual desktop experiments to create a rich collaborative learning experience for students. The third is (Transform, Interact, Learn, Engage), It aims to change education and help students succeed by changing teaching practice, on-site interaction, enhancing learning and increasing the participation of teachers and students. The classroom is student-centered and centered around education, practice and technical problems [3]. ALCs has been shown to have a profound impact on students' initiative and participation in learning.

3.2. Understanding of active learning

In Active Learning, students are mainly engaged in Learning activities centered on writing, dialogue, problem solving or reflection. It is a Learning method that enables students to be deeply involved in the Learning process, and it is also a method that helps students to be more involved in the Learning process. Teaching methods attracted by rich learning activities that require students to engage in meaningful learning activities and to think about what they are doing; For teachers, it refers to any teaching method that enables students to actively participate in the learning process [4].

Obviously, Active Learning here is a teaching method, rather than an attitude towards Learning in the general sense. Therefore, Active Learning does not mean that students are Active in Learning, but needs to guide students to change from passive to Active through certain teaching methods and means. In fact, when people engage in any activity, there is always an underlying question of "What's this got to do with me?", the internal judgment of the question is reflected in the behavior of active participation or indifference. If someone needs to participate in a certain link in this activity, he will prepare carefully and participate seriously until the end of the link he participates in. If someone just passively acts as a spectator, his reaction doesn't matter. He will play as much as he likes. If he doesn't, he will do what he wants. Class is so, even after the examination requirements do not matter, after all, there are many ways to get good grades, listening to the exam has an impact, but is not sufficient or necessary conditions, therefore, if the students can not take the initiative to participate in the teaching work, high-quality teaching is out of the question. At this time, we need to seriously think about a very important question, that is, "what is the relationship between the content of our class and the students", that is, to what extent can we involve the students, whether it can arouse the students' enough interest or motivation. In 2018, Arlington Independent School District proposed that the Active Learning Cycle includes five steps, such
as motivation, commitment, acquisition, application, and display [5]. Inspiration is to integrate topics or problems that students are interested in into the classroom to stimulate students' Learning motivation. Then according to the goals and requirements set in advance, give strong implementation in the development of teaching, prompting students to respond positively; Access is whether students have the opportunity to learn new knowledge; Application is to create practical opportunities to strengthen the imprint of knowledge and enhance students' learning enthusiasm by solving problems in real life. Demonstration helps students to self-manifest their learning achievements and enhance their sense of gain. Practice shows that this kind of cyclic Active Learning process can promote students to form the ability of self-planning, self-monitoring and self-evaluation, so as to develop the habit of independent learning [6].

4. Design of online classroom teaching mode

Traffic Management and Control already has a relatively mature offline classroom teaching system. However, COVID-19 has taken it by surprise and pushed it to the cloud. Although we have been exposed to video courses and developed video courses in the construction of the first batch of state-level high-quality resource-sharing courses, our classes are still face-to-face teaching, and online video courses are only used for students' reference study or self-study by aspiring young people. Therefore, in the face of some difficulties mentioned above, how to complete the normal teaching tasks online, and to complete the teaching tasks with high quality, is a great challenge.

Based on the advanced ideas of Active Learning, it is understood that the essence of university education is to cultivate students' character, culture and ability, and the teaching of knowledge is only the carrier of cultivating students. We have established the teaching goal of "virtual environment, intensive thinking", and designed the online teaching mode of Traffic Management and Control from three aspects of teaching content, teaching method and assessment.

The arrangement of teaching content is not only the organic combination of curriculum knowledge structure, but also the key path to guide students to enter the classroom. Although the good teaching content does not necessarily represent the good teaching effect, but the chaotic content certainly does not have the good teaching effect. In order to encourage students to be deeply involved in the learning process, the teaching content is arranged according to the internal logic of knowledge points, and the case teaching is fully introduced to stimulate students' interest in learning, so as to create a good environment for students to think independently, explore freely and innovate bravely. Firstly, according to the principle of scientific arrangement of knowledge points from general to concrete and from simple to complex, such as driving and parking management, signal-free intersection management, bicycle and pedestrian traffic management, traffic organization optimization and congestion management, ...... single point timing signal control, single point induction control and bus priority control, trunk intersection signal linkage control, regional traffic signal control and so on. Case teaching combines some hot traffic problems in the current society, introduces them through after-class thinking questions, and is closely related to the knowledge points of the next class. In class, 2~3 students are invited to make PPT presentation and exchange. With the help of case analysis, guide the students to explore the root of the problem and the nature and rules of things through investigation, analysis and speculation. For example, when dealing with and analyzing a traffic accident, students should be guided to collect and analyze the data related to the case, such as traffic laws and regulations, and traffic accident processing process, etc., and express their own opinions in class. The teacher will guide and correct the problems through students' explanation, so that students can further realize the existing problems. Have a more profound understanding of thinking mode, teaching essentials and so on.

The development of case teaching is a great test for teachers' theoretical level and academic sensitivity. When choosing cases, they should first be related to the key points of teaching knowledge so that students can put what they have learned into practice and play a role in assisting teaching. Secondly, the case should have a certain speculative, there is no fixed result, and the content involved is related to the book, but far beyond the book knowledge, so as to trigger the thinking of students, conducive to the development of students' research and exploration ability. In addition, the case should not be too old, to
reflect the current social reality and hot spots. Hot events in real life, the social attention and discussion are very heated, which can arouse students' interest, so as to better understand the development status of traffic management and control.

The change of teaching methods often has a decisive influence on the teaching effect [7]. When teaching itself is characterized by interactivity, participation, experience, openess and generative nature, all students can be attracted to and participate in colorful learning activities [2]. After class, the homework of thinking questions should be submitted on time. As the usual results, each student can be encouraged to preview before class, and through the reference of literature to deeply understand some knowledge points learned and to be learned, which can be used to explain and answer the questions. At the same time, the class discussion of thinking questions after class ensures that every student has an opportunity to communicate openly, and this kind of open communication also allows students to constantly stimulate their motivation by comparing with each other. In the process of classroom teaching, each knowledge point will be asked once, and as the usual results, which is equivalent to a classroom inspection every 15-20 minutes, random sampling when answering questions, so students must listen carefully and take notes in class, otherwise it is difficult to cope with. In order to further expand students' scope of knowledge, students are required to register for the national excellent resource sharing course *Traffic Management and Control* (Professor Wu Bing, etc.), make full use of the expanded resource pool and communication forum in it to study, and improve the knowledge structure through the course video playback function.

Curriculum evaluation and examination is a comprehensive feedback to the teaching effect, and also an important means to improve the teaching effect. Since this course is an elective course and it is not convenient to conduct examinations under cloud conditions, I took the homework of after-class thinking questions, communication of after-class thinking questions, and questions and answers in class as my usual results, and took the course paper writing and defense as my final results. Finally, these results were weighted and summarized to form the total result. The topic of the course paper will be designed according to the key points and difficulties of the course. More than a dozen topics, such as the setting of urban road speed limit standards, the optimization design of the operation of an intersection, and the optimization design of the traffic organization of a campus, were assigned at the beginning of the semester for students to choose freely, and they were required to write them in accordance with the template format of *Tongji University Journal (Natural Science Edition)*. To encourage collaboration, work in groups of two to write a course paper and explain their contributions in the paper. Practice shows that whether it is homework or classroom communication, with the passage of time, the quality of students' homework has been improved significantly. The class communication has made great progress in terms of content, presentation and performance. Especially in the last part of the thesis defense, the students' calm, wonderful presentation of PPT scheme and the depth of answering questions made us find it refreshing. I think, maybe teachers always underestimate the ability of students, an important goal of teaching is how to do everything possible to create the ability of students, the concept of Active Learning undoubtedly plays an important theoretical support.

5. Conclusion

The classroom teaching content of undergraduates is still mainly based on books. Although students pay attention to the quotation and introduction of the latest achievements in the teaching process, the limited class time will inevitably lead to students' insufficient understanding of the latest developments in the subject field. At the same time, the classroom teaching is still dominated by teachers, which is obviously not conducive to the cultivation of college students' practical ability and innovative ability. College students have already acquired the ability of self-study. The real teaching should be based on students' analysis of problems, so as to obtain corresponding resonance and generate profound understanding and practice ability, instead of being measured by a single test score on the basis of passive acceptance, the knowledge illusion of high scores and low abilities should be taken seriously by every educator. The concept of Active Learning undoubtedly provides a better methodological support for the curriculum teaching reform. Especially under the epidemic situation, the application of the concept of Active
Learning in the teaching reform should be paid more attention to when online classroom is facing difficulties.

References

[1] Zhang H.S. The Concept, Main Characteristics and Development Idea of Emerging Engineering[J]. Review of Higher Education, 2018, 006(001): 36-42.

[2] Yang, M.F., Qin, W.W. The Idea and Methods of Active Learning: A New Perspective of University Teaching Reform in the Inter plus Era[J]. Journal of Guangxi Vocational and Technical College, 2020,13(02):82-88.

[3] New Media Consortium. Horizon report – 2018 higher education edition. [EB/OL]. [2020 -09 – 02].
https://library.educause.edu/~/media/files/library/2018/8/2018horizonreport.pdf%20Accessed%2010%20December%202018.

[4] Prince, M. Does Active Learning Work? A Review of the Research[J]. Journal of Engineering Education, 2004, 93 (3): 223-231.

[5] Arlington ISD. Active Learning Cycle Facts [EB/OL]. [2020-09-02].
https://www.aisd.net/wp-content/files/2018/10/Active-Learning-Cycle.pdf.

[6] Huang, R.H., Wang, Y., & Wang H.H. et al. The New Instructional Form of the Future Education: Flexible Instruction and Active Learning[J]. Modern Distance Education Research, 2020,32(03):3-14.

[7] Qu, M.F., Gong, F. Harvard University and Contemporary Higher Education-An Interview with Derek Bok[J]. Institute of Education, Nanjing University, 2011(10): 1-19.