

Research on Multi-agent Participation Inquiry-based Curriculum Reform and Hybrid Teaching Model of Online and Offline of Network Economics in the Post-epidemic Context

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Abstract: The COVID-19 outbreak in the spring of 2020 has brought severe challenges to the traditional face-to-face offline teaching in universities of China. To explore the online and offline mixed teaching model, it has become the only way for current teaching reform. Taking Network Economics course as an example, this paper applies the platform called Lirunyun of South China Normal University (SCNU) and carries out the multi-agent participation teaching model design in three scenarios with the concept of inquiry teaching, it considers the post-epidemic factors, curriculum characteristics and teaching objectives, and makes full use of intelligent media, network teaching platform and modern teaching software to carry out teaching reform, so as to meet the requirements of students cultivation. The course combines participatory and inquiry-based teaching methods, breaks the existing traditional offline teaching paradigm to guarantee the teaching quality and improves teaching effect. It takes the students of the school from the period of 2020-2022 as a teaching practice to verify its results. The good effect can provide a reference for the theoretical practice of inquiry-based teaching and the teaching reform of professional courses in the high education of the universities.

Keywords: Network Economics; Multi-agent Participation; Inquiry Teaching Mode; Online and Offline Mixed Teaching Model

1. Introduction

The COVID-19 epidemic occurred in the spring of 2020 hit the world, during which the internet economy, information economy and

digital economy played an important role in the epidemic period. It guarantees people's normal life and study order, and effectively supports the resumption of production and work of enterprises. The epidemic has had a huge impact on China's traditional face-to-face offline teaching model. The universities, primary and secondary schools across the country have responded to the advocates of no suspension of classes, they completed the teaching task through online teaching, and gained much precious experience and results. Through the practice of online and offline teaching mode in universities under the new normal in recent years [1]. In the process of teaching implementation, there are new changes, and the advantages and disadvantages of different teaching modes are fully reflected in practice [2-3].

Under the sudden epidemic situation, how to deal with the sudden public crisis and maintain the stability of teaching is a problem worthy of in-depth discussion. In January 2022, the government issued the 14th Five-Year Plan for Digital Economy Development proposing to further promote smart education and propose the implementation of national education digitization strategic actions. China's education informatization has gone from the 1.0 era to the 2.0 era, from simple application to deep integration, and the digital transformation of education has started a new journey. This paper focuses on the teaching reform of Network Economics, it identifies the problems faced in the teaching of Network Economics under the post-epidemic situation. The paper emphasizes the importance of multi-agent participation in the inquiry curriculum reform in the mixed teaching mode of online and the mixed online and offline. The research of multi-agent participation inquiry curriculum

with the online and offline mixed teaching can be used as an effective way for the college students' cultivation goals achievement, especial to the digital education transformation in the post-epidemic background.

2. Feasibility Analysis of the Teaching Platform-Liruyun

Liruyun platform of South China Normal University (SCNU) is an international open source teaching platform-Moodle, it uses hyper-converged infrastructure as its technical framework to realize docking with various campus information platforms, and uses teaching big data to track and feedback students. It has the advantages of various functional plug-ins and detailed data tracking, which are very consistent with the teaching purpose of Network Economics.

(1) One platform with multiple connections for multi-agent participation inquiry teaching model. One platform with multiple connections refers to the support of Liruyun platform, teachers and students can interact through the two ports, namely, Liruyun classroom Wizard plug-in and Liruyun small classroom-WeChat apps to achieve the data exchange on the platform. Teachers can upload the teaching files like course power-point, video recording and other learning content on the platform and set up online forums for students to facilitate communication between teachers and students (Figure 1).

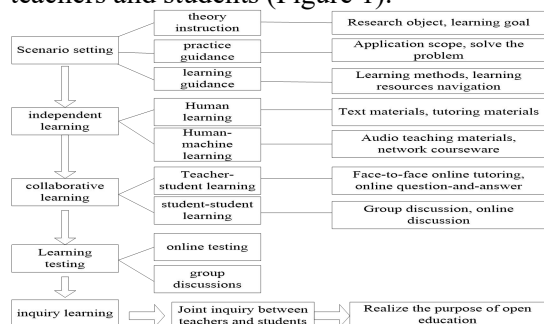


Figure 1. Multi-agent Based Flowchart of Liruyun Platform

(2) The online and offline mixed teaching mode is complementary to each other. Offline courses are combined with the platform of Liruyun to supplement problems such as lack of time for classroom discussion, while storing cases, audio and video recordings, so that students can carry out independently for learning through Liruyun platform once the

epidemic occurs and they cannot return to school normally.

3. Construction of Inquiry Teaching Model with Mixed Online and Offline

The idea of inquiry teaching has existed since ancient times, such as Confucius' "heuristic teaching" in ancient China and Socrates' "midwife technique" in ancient Greece [4]. John Dewey, a famous American pragmatist philosopher and educator, first proposed the use of inquiry method in school science education. Before 1909, most educators believed that the method of science education was mainly to let students learn a large amount of scientific knowledge, concepts and principles through direct teaching by teachers [5]. In 1909, John Dewey argued that this teaching method placed too much emphasis on the accumulation of scientific information and did not pay enough attention to the fact that science is essentially a way and attitude of thinking. Science education is not only to let students learn a lot of knowledge, but more importantly, to learn the process or method of scientific research. Therefore, the teaching method of student-centered "learning by doing" is put forward. It advocates the "five-step wisdom method" and argues that science teaching should follow the following basic processes: (1) feel the hint of solving a certain problem in the situation; (2) Identify the question to be resolved; (3) Propose hypotheses to solve the problem; (4) To infer the intrinsic meaning of the assumptions made; (5) Testing hypotheses in action [6, 7]. In the middle of the 20th century, the famous biologist and educator Joseph J. schwab formally proposed the inquiry-based teaching method for the first time on the basis of years of research.

The essence of inquiry teaching method is to regard the learning process of students and the research process of scientists as the same activity. It is a learning method based on students' independent inquiry and an active learning process. It allows students to think about how to do or even what to do instead of passively accepting knowledge [8]. It is a process for the students to independently discover, explore and reach conclusions under the guidance from teachers. The students are encouraged to independently seek or construct solution and meanings, so as to understand the

related information activities. This teaching mode enables students to discover and solve problems like "little scientists", and simulates the activities of scientists to construct scientific knowledge and comprehend scientific methods by means of inquiry used to understand nature, acquire knowledge, develop skills and cultivate abilities, especially innovation ability in the process of inquiry. Inquiry-based teaching allows students to explore independently by reading, observing, experimenting, thinking, discussing, listening and other ways. Teachers only provide students with corresponding cases and materials, which can better provide an environment for students to actively explore and solve problems by themselves. Through the initiative of students to explore and study the corresponding objective laws and their own discussion, and cultivate their innovation and active learning spirit. The main implementation process and steps of inquiry-based teaching are shown in Figure 2.

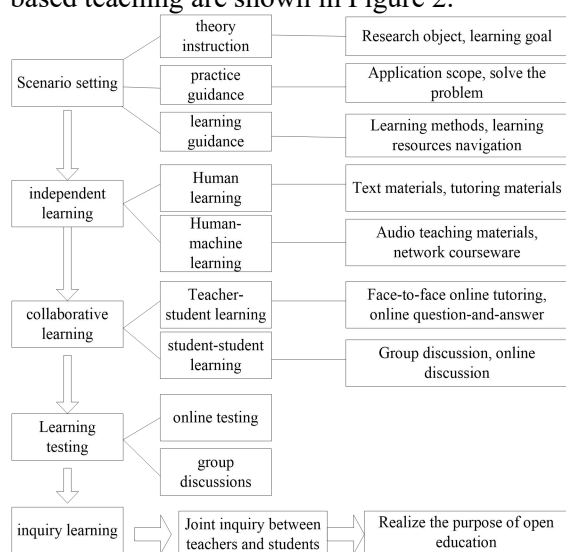


Figure 2. Implementation Process and Main Practice Steps of Inquiry Teaching

The hybrid teaching mode combining online and offline can not only reflect the guiding role of teachers, but also create more opportunities for students to learn independently by relying on internet means, inspire and motivate students to complete their learning tasks, and improve the teaching effect. [9-11]

There are three possible scenarios in the post-epidemic context to carry out teaching design and reform teaching methods.

Scenario 1: all students return to school and take offline classes;

Scenario 2: some students return to school and use offline and online simultaneous classes or recording and broadcasting mode;

Scenario 3: normal online and offline mixed teaching mode.

In view of the possible emergencies in the post-epidemic context and the characteristics of inquiry-based teaching, the method of inquiry teaching is organically combined with the mode of online and offline mixed teaching. It is designed in different scenarios, the main process is divided into three stages:

(1) Preview before class. Students use the learning platform to receive teaching videos, documents and other materials delivered by teachers, and collect or raise corresponding questions. The main purpose is to clarify the teaching objectives of the course, and they can also use the platform to discuss and communicate among the students.

(2) Teaching in class. It is a process for class, in which the teacher gives a detailed lecture, organizes a discussion and guides the students to summarize and build a knowledge framework.

(3) Feedback after class. Students finish the corresponding homework and tests according to the class teaching content, and give feedback based on class content. The main implementation process and steps are shown in Figure 3.

With the help of Liruyun teaching platform of SCNU, this paper upload relevant case materials, course power point and course requirements. The students were divided into groups on the internet and discussed with different learning objectives in different groups. The themes and problems were defined, and the students were required to discover and dig the economic problems existing in the cases description, so as to form relevant conclusions and condense them into theoretical learning points.

This paper employed the cases such as network industry, Internet industry and information economics to embed different knowledge points on the teaching. With the appropriate elicitation method of teaching, students fully participate in classroom teaching, carry out group simulation discussions according to the form of groups, and replace the small class teaching mode with a system of 4-5 people. Students can fully discuss according to the division' assignments in groups, and the

teacher gives instructions nearby. Students will lead the work of case knowledge points, responsibility division, literature review, case analysis, data collection, case sharing and

presentation. It can let the students fully enjoy the learning process and state of "master", this can reflect students' mastery and application ability of knowledge.

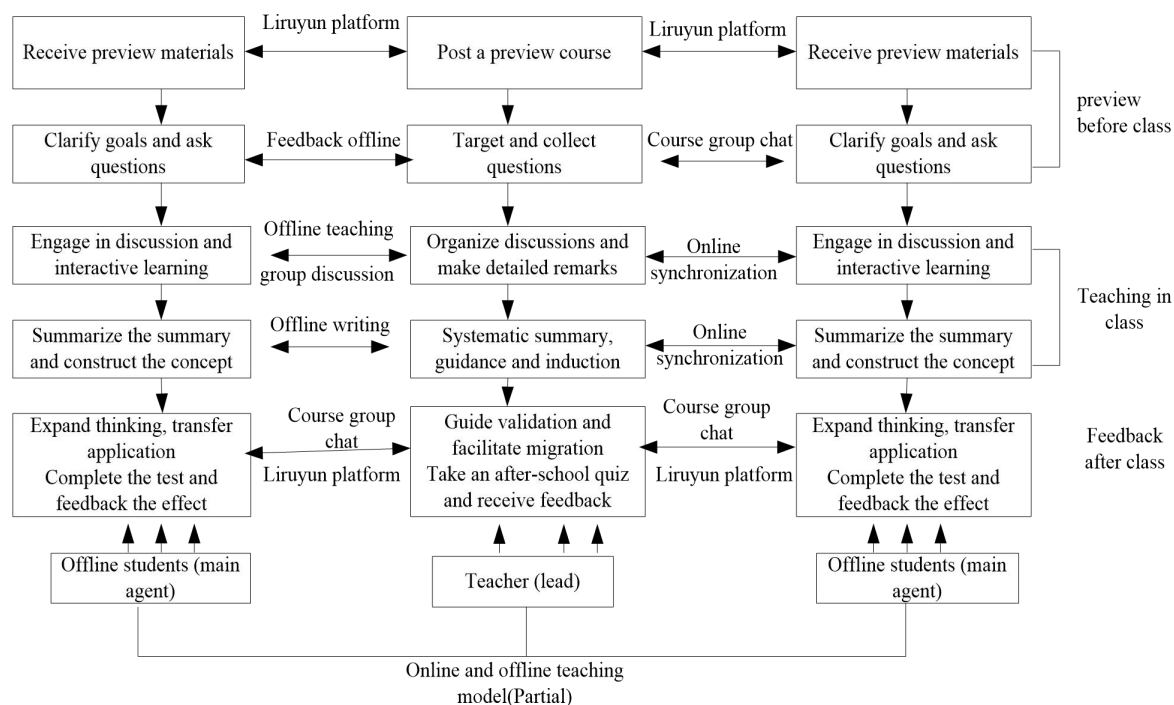


Figure 3. Online and Offline Implementation Process of Inquiry-based Teaching

Teachers will upload PPT teaching material and video recording onto the Liruyun teaching platform and open the online forums for students' discussion and problem solving. The offline courses are combined with Liruyun teaching platform as supplement material for the students who are lack of time for classroom discussion. It also reserves cases and audio or recordings to facilitate independent learning through the platform just in case the epidemic occurs when the students cannot return to school normally.

4. Construction and Implementation of Classroom Experiments

The traditional teaching mode is that teachers talk about theory, assign homework and correct cases in the class. Students' initiative and practical ability are poor. Based on the idea that students take the initiative to acquire knowledge, teachers guide and stimulate students' interest to learn independently, and cultivate their ability to master knowledge and find answers in inquiry. This paper constructs and implements the curriculum reform combining inquiry teaching with online and

offline teaching according to the following process:

- (1) Teachers arrange the class according to the teaching demand, and assign tasks through Liruyun platform of SCNU.
- (2) Students discuss in groups according to tasks assigned by the teacher, review and connect with previous knowledge; Students in each group are encouraged to integrate the collected data, shoot their own videos for reporting, and upload the data and video onto the Liruyun platform for online comments by teachers. In task-inquiry interactive method, the correlation between task design and teaching content determines the success or failure of interactive teaching. On this basis, we will accumulate teaching experience and obtain relevant data and reports to promote the reform of task-based inquiry teaching model and multi-agent interactive teaching method by implementing it on the basis of students in the academic year 2021-2022.
- (3) Exploring the reform of diversified curriculum assessment methods. The nature of the course determines that the course assessment cannot be carried out with pure examination, it should consider students'

interaction performance in the class, and form their practical ability and analysis ability. Classroom interactive assessment can make students join the class more actively; Practical ability can reflect students' adaptability and practical operation ability. The course dissertation can reflect the students' ability of scheme design and the ability of applying theory to solve practical problems; thus, a diversified assessment improvement to strengthen the evaluation of students' performance are designed as follows.

The assessment of this course is normal grade (50%) + exam score (50%). The performance in peacetime account for 50%, including attendance and personal homework, attendance accounts for 5%, individual homework accounts for 25%, and group homework accounts for 20%. The exam account for 50%. The thesis is required to combine the theory and method of Network Economics, apply economic thinking to analyze the selected topic, collect and sort out the topic materials through library or internet resources, and form their own academic language.

The course thesis selection requirements: First of all, it requires one person, one topic. It is mainly based on the classification of national economy, students can choose different topics to ensure the original and innovative course papers. Secondly, the students should analyze the case from the perspective of network economy, and use the methods, principles and inferences of network economics to discuss the phenomena and the laws of economics. Finally, it requires the combination of teaching books, data and theoretical knowledge, application fields and examples

5. Suggestions on Multi-agent Participation Inquiry Curriculum Reform and Hybrid Teaching Mode of Online and Offline

(1) Multi-mode stimulating students' participation initiative. In order to enable students to truly grasp the role of the internet in economic development and analyze the impact of internet technology on the economy by using the principles of economics, the inquiring teaching methods are used to guide students to simulate themselves into merchants and consumers in the O2O e-commerce model. The market decisions are made according to the participation of multiple agents to discover for the students' role or utility of the internet in

economics. With the knowledge system of Network Economics as the theoretical support, students develop their own cases to form their own problem framework and build more case resources, rather than the cases selected by teachers.

(2) Forming the system and teaching paradigm of multi-agent participation teaching mode based on inquiry teaching. Through the knowledge theory of Network Economics and the analysis of students' class performance, case presentation and personal course thesis in the past four years, this paper studies students' thinking way and their habits in solving problems, it combines the theoretical system and methods of inquiry teaching to form a multi-agent participation teaching mode system and teaching paradigm experience based on inquiry teaching.

(3) Explore modular teaching based on small groups to adapt to the teaching mode of large class system. The implementation of inquiry teaching is suitable for small-class courses, and teaching modules are constructed according to knowledge points. Through knowledge embedding and goal orientation, it is verified on the basis of 2020-2022 teaching course selection classes. Considering the epidemic situation and other emergencies, students' low participation in class and less interaction between teachers and students, this paper enhanced the combination with Liruyun teaching platform of SCNU to issue homework, encourage students to read teaching material like PPT, record videos and other learning content, and make timely improvements to ensure the scientific and effective implementation of the teaching model.

(4) Continue to improve the course construction of Liruyun teaching platform. Using the courses selected by students in the semesters from 2022-2023, this paper holds view to continuously build and improve the construction of the network platform of Network Economics in South China Normal University, it including the courses design, teaching plans, case resources, question bank, student forums and uploading of video and audio resources. The case focuses on the novelty and importance of the content, it does not stick to a fixed template, and integrates cases, video clips or other resources that stimulate students' interest. So that students can learn and use themselves.

6. Effect Evaluation

This paper takes the course of Network Economics selected by 105 students majored in E-commerce from 2019 to 2022 as the experimental and cooperative base and take nearly 4 years teaching practice and exploration, it conducted the case analysis, task arrangement and group division to achieve the specific goals of the teaching reform. The task inquiry interactive teaching method is adopted and the expected effect is achieved based on the review of the students' performance. In the process of case making, students are required to complete the whole process by themselves, from the selection of the topic to the presentation of the final results, teacher is acting as an instructor, only provides online consultation or offline question answering when necessary. The operation method adopts group stage reporting, group members' mutual evaluation, group leader scoring, etc. The teacher gives comprehensive assessment results based on the scores of each group and the actual performance. Below is the achievements of the work.

(1) Teaching case base (embedded knowledge points). It mainly based on the group cases running of two classes of Network Economics selected by e-commerce students from 2019-2022, through which it combined with relevant knowledge points and formed 56 group case resources and materials;

(2) Group PPT case presentation and presentation of audio/video documents. In the process of student reporting, the teacher recorded the discussion and case presentation of students through the on-site mobile phone, so that the whole class could fully understand the knowledge system and content of Network Economics, such as the long tail theory, standardization, monopoly competition, economies of scale, network scale, market efficiency, the operation law of network economics and other knowledge system and content. It can strengthen the theoretical knowledge explained by the teacher in the early stage;

(3) Students personal course thesis resources. Through course report assignments, students can complete the study and assessment of this course in the form of course thesis, it requires the students to make the course case report based on the requirement from the teacher. All

the thesis submitted to the system should have a knowledge embedded of Network Economics.

7. Conclusions

The core point of view of this paper is that students should take the initiative to acquire knowledge, and teachers should be the guiders. By releasing learning objectives before class, students should learn micro-lessons, videos, cases and other materials independently in the platform.

In class, teachers should give detailed instructions and adjust the specific implementation of curriculum practice according to the real-time feedback of students and the twist of thinking when adopting inquiry-based teaching.

After class, online tests related to the course are assigned to help students master the knowledge of Network Economics. Through platforms such as Liruyun of SCNU, the teacher can keep close contact with students, answer their questions in time and solve doubts. It can help the students to jointly discuss the realization of open education goals. The experiment shows that the combination of online, online and offline teaching mode with multi-agent participation inquiry teaching method is not only easier to be accepted by students, but also easier to stimulate students' interest and independent learning ability. It offers students having a deeper cognition and understanding of teaching content, and a distinct transformation from passive learning to active learning.

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