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Innovative Design of Online Teaching Based on the Theory of Learning Sciences: Taking the Course "Preschool Pedagogy" of Adult Colleges as an Example

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Abstract

The sudden outbreak of COVID-19 not only fully shows the extreme importance and bright future of technology-based online education, but also fully exposes various problems existing in the original various online teaching systems. Practice indicates that it is extremely urgent to use the theory of learning science to scientifically innovate the curriculum design of adult colleges. Therefore, we must make full use of the latest research results of the theory of learning sciences actively create a variety of online learning situations, vigorously enhance the fun of online learning, and constantly stimulate students' learning motivation. Only in this way can we truly solve the current problems in online teaching.

Key words: Learning sciences; Online teaching; Innovative design of preschool education

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1. BACKGROUND AND SIGNIFICANCE OF ONLINE TEACHING INNOVATION DESIGN

We are in the powerful current of the largest and fastest technological innovation and reform since the industrial revolution, in which automation, globalization and unpredictable technological environment are affecting and changing everything, especially education. A educational revolution driven by learners is developing rapidly all over the world. Network media and other emerging technologies have become an integral and important part of education today, and artificial intelligence and other technological innovations can make learning more attractive. On the one hand, digital and virtual learning make learning more economical, convenient, easy, and no longer limited to schools; on the other hand, with the rapid development of online education, the innovation and applied research of the theory of learning sciences have also obtained better development opportunities. The key is how to fully integrate the two.

The sudden outbreak of COVID-19 not only fully shows the extreme importance and bright future of technology-based online education, but also effectively tests the functions of the original various online teaching systems. More importantly, it makes us deeply feel and realize the urgency of using the theory of learning sciences to scientifically design online teaching schemes, because only in this way can we truly realize the high-quality development of online education.

2. INTRODUCTION OF THE THEORY OF LEARNING SCIENCES

As an emerging discipline studying how people learn and how to support learning, learning sciences mainly studies how to support and promote people's learning activities throughout their lives, and promote the improvement of education through innovations in teaching, technology and social policies. This discipline has begun to have an impact on a series of changes and innovations in classroom teaching, off campus education, learning product design, learning organization design, teacher education, vocational training and so on.

Based on this theory, teachers should mainly focus on how to let students take the initiative to learn in teaching, and strive to require learners to participate in the entire cognitive process of understanding the learning materials.

The scientific design of online teaching schemes is of great significance for improving the quality and effect of online education. In the design, we should not only attach great importance to the use of the latest research results of learning sciences, but highly focus on the characteristics of the digital learning environment, thus making online learning play a role in testing and developing the learning theory. In a word, the enhancement of online teaching design is an urgent need for teaching practice and a process of exploring theory for teachers.

3. IDEAS AND OPERATIONAL LINKS OF INNOVATIVE DESIGN OF ONLINE TEACHING

"Preschool Pedagogy" is a course that systematically clarifies the basic principles and educational methods of preschool children's education, and helps students form the theoretical foundation and practical ability to engage in preschool education practice activities. It is a compulsory course for the preschool education major (adult college), and its primary textbook is "Preschool Pedagogy Tutorial" edited by Liu Yanghui of Fudan University Press.

The teaching object of this course is the off-job students majoring in preschool education of adult college. These students are basically between the ages of 18 to 20, able to quickly accept new things, liking instant and interactive tasks, liking virtual and collaborative learning behaviors, preferring visual pictures and audios and videos to static texts, and relatively proficient in operating mobile devices. Therefore, online teaching is the teaching mode favored by these students, and setting up virtual, animated, and challenging teaching methods is more easily accepted by them.

However, these students have poor ability to construct knowledge from the large amount of information in online teaching, and are weak in the durability of the learning process, the degree of participation, and interests. It often happens that the mobile devices are online but they are not studying seriously. Therefore, the curriculum design uses the research results of the theory of learning sciences to create diversified online learning situations such as knowledge forums, simulations, and games to enhance the interest of learning, highlights the to enhance the interest of learning from the actual cases around us to strengthen the motivation of learning and improve the effect of online teaching. In view of this, this paper carries out the following innovation design of online teaching.

3.1 Ideas on Innovative Design of Online Teaching

3.1.1 To Promote Learners to Understand and Interact With Ubiquitous Information

In the 21st century, in the context of economic globalization, resource informatization, high correlation of knowledge and information, and social development, creative talents are facing unprecedented requirements in the spirit of innovation. Learners need to learn to distinguish information, select and extract the information demanded in daily life, work and study, and deeply interact with others to enhance their cognitive process.

3.1.1.1 Ability to Use Information to Solve Problems

Learners should develop the ability to use information to solve problems, including identification of demand information, information extraction, information understanding and organization, thus helping them understand the tasks to be handled. The innovative design of online teaching should try to cultivate learners' ability to obtain useful information.

Table 1
Relevant Information Sheet of "Preschool Pedagogy

Chapters	Relevant material sources
Overview of preschool education	"Views of Preschool Education" -- monthly "Parents" (Brainy Baby) "Preschool Education" -- monthly "Early Education"-- monthly "Émile" (France) Rousseau
Historical Development of Preschool Education	"Dr. Montessori's Own Handbook" (Italy) Montessori "Mosquito Coast" -- children education valuable book "Yan Family Instructions" http://tv.cctv.com/2016/03/28/VIDE R1msT8AH9vWpJ1K64K8k160328.shtml
Preschool Education and Social Development	Students search for information before class, explore ways to obtain information, identify information, and further search for relevant information after class to construct knowledge.
Preschool Education and Child Development	Interpretation of the sensitive period of children -- space sensitive period https://www.bilibili.com/video/av36498589/?p=2 Interpretation of the sensitive period of children -- Order sensitive period https://www.bilibili.com/video/av36498589/?p=3
Chinese Kindergarten Education Objectives and Principles	Students search for information before class, explore ways to obtain information, identify information, and further search for relevant information after class to construct knowledge.
Kindergarten Courses	Students search for information before class, explore ways to obtain information, identify information, and further search for relevant information after class to construct knowledge.
Kindergarten Activities	Search for information from platforms such as www.zjlll.net, zjerc.zjtvu.edu.cn.
Games for Kids	"Angie Game" Special Promotional Video https://v.qq.com/x/page/z0506dsaydt.html
Kindergarten Environment	Students search for information before class, explore ways to obtain information, identify information, and further search for relevant information after class to construct knowledge.
Preschool Teacher	"Guidelines for Kindergarten Education" "Professional Standards for Kindergarten Teachers (Trial)" "Guidelines for the Development of Children Aged 3-6"
Kindergarten Connection and Cooperation	Case Library (collected by teachers and students)

Preschool Pedagogy" contains 11 chapters. For some chapters, teachers can provide students with information

for further study before or after class; for some chapters, teachers can let students find information by themselves, and then conduct discussions or teacher guidance to let students understand how to obtain information and determine useful information. See the below table for details.

3.1.1.2 To Support Learners' Motivation, Participation and Interest in Interacting With Information

In learning design, learners should be supported to participate in the subject content through the provided scaffolds or task activities. In view of learners at different stages of interest development, the structure of tasks, activities or learning environment can be adjusted to encourage them to focus on different aspects of the task, and challenging tasks can be provided to strengthen their understanding.

The application of e-sports in education can enhance the learning effect of learners, not only creating learning resources and provide a participatory learning environment for distance students, but also having some gamified learning characteristics.

Of course, it is difficult for frontline teachers to develop an e-sports game based on the knowledge of "Preschool Pedagogy" but they can use this concept of game competition in teaching. We can connect mobile devices with DingTalk on the computer to open online teaching, use Kahoot and Quizalize and other software to create competitive quiz bank, and conduct classroom interaction with the concept of gamified learning to let students participate in the completions of classroom assignments in a confrontational manner. In the process of the game, the platform records the answers of all students, and the teachers can view the data of the students in the back-end to understand the students' mastery of the knowledge points of the course. In addition to the classroom interaction quiz, this quiz bank can also include the content of the written examination of the preschool teacher qualification certificate.

3.1.1.3 To Carry Out Collaborative Knowledge Construction Activities by Using The Support (Scaffolding)

Students deepen their understanding of what they have learned through discussion activities, especially self-directed learning and cooperative exploration, enabling students to learn the skills to cooperate, communicate and explore with others. Students feel happy and excited in the process of discovering and solving problems. Teachers should start from the actual situation of the students and the characteristics of the textbooks to carefully screen the basic questions to the students based on the knowledge goals and ability goals set in advance, let students conduct independent explorations based on the problems, give full play to their initiative to clarify the direction of explorations based on these problems, and let them boldly raise questions and hypotheses. This process is a process in which teachers set up scaffolding and let students explore, understand and master knowledge by themselves.

The design focuses on learners' central position in the whole learning process, taking learners as the main body, emphasizing learners' subjective experience and dominant position, and dividing them into collaborative groups for team learning.

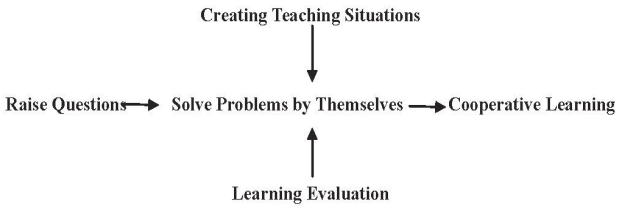

Figure 1
Scaffolding Instruction Flowing Chart

Situation creation. It provides students with meaningful real situations, in which students solve real problems through cooperative learning and explore learning content from multiple perspectives. Learning and teaching should be designed around an "anchor", which can be presented in the form of video, audio, pictures, etc., aiming at placing students in a real situation outside the classroom to realize the transfer of knowledge. VR technology can bring users a virtual simulation environment with multiple sensory experiences and make users feel immersive. If we combine the two by creating a real environment based on VR technology to throw a core "anchor" to the students in it, it will bring students a more realistic learning experience.

Problem raising. After introducing the new lesson into the created VR simulation situation, the teachers raise appropriate problems based on the situation, that is, the problems that students need to solve in learning, can be one or a series, which are the " anchor". The process for teachers to determine these problems is "anchoring". The problems raised by the teacher should be practical (that is, a scaffold), because solving practical problems in a real situation can promote the knowledge transfer of students. The process of teachers raising problems and then students thinking is actually the process of the interaction between teachers and students.

Autonomous problem solving. Autonomous learning is a process in which students find the methods to solve problems step by step under the guidance of the teachers based on their existing knowledge reserves and learning materials after the problems are raised. Students are the main body of the classroom, which means that teachers no longer carry out declarative knowledge explanations, and students use VR device to personally participate in solving problems.

Cooperative learning (group cooperative learning). Cooperative learning can condense collective wisdom through verbal, emotional, and physical communication between students to achieve correction and improvement of viewpoints. Cooperative learning can be the real-time

interaction between students, or the interaction in the multiplayer interactive VR system.

Teaching cases. The following situation is created: There are a few big sunflowers blooming in the kindergarten, making the children very surprised; many children come to see them every day. One morning, Teacher Li saw a 4-year-old girl in kindergarten picking a sunflower and holding in the hand, and then walking out calmly; teacher Li wanted to know the reason, so she bent down and asked her kindly: "Kid, who do you pick this flower for? Can you tell me?" "My grandma is very sick. I told her that there is a big sunflower in the kindergarten, but she didn't believe me, so I want to take it off and show to her, and I will take it back," the little girl said shyly. After listening to the child's innocent answer, what would teach Li do? What will you do when facing this behavior of the kid? How to become a qualified preschool teacher?

After the problem is raised, the students are required to act as Teacher Li to interact with the kid who picks the flower. Students wear VR devices on their heads to realize the interaction between their bodies and the environment, and use VR technology to talk to the kid in the virtual scene. In the group discussion, all students express their own practices and demonstrate all the practices in the virtual environment through cooperative discussion, so as to determine the best practice, discuss how to be a qualified preschool teacher, and truly experience those professional qualities that a qualified preschool teacher should possess.

Of course, if there is no virtual device, we can adopt the teaching method of video + anchoring. AR videos can be made by "Sight Plus AR". AR is a new technology that integrates real world information and virtual world information, superimposing the real environment and virtual objects on the same screen in real time, which can enhance the students' interest in learning and improve their teaching and practical ability.

3.1.2 To Design a Fun and Challenging Learning Environment

Learners need to get some help if they want to succeed in learning. A challenging learning environment can be designed to provide support for learners to succeed in ZPD, and to promote the transfer and application of learned knowledge and skills in different scenarios.

3.1.2.1 The Design of the Knowledge Construction Activity Community Supported by the Knowledge Forum

Knowledge construction is carried out based on the community knowledge space, namely knowledge forum. In a certain learning space, learners can share and improve their views and theories based on the knowledge forum. This course uses the topic discussion sector of the online platform "Chaoxing App" as a knowledge forum for students to share their views. For example, the teacher posts some questions on the forum after class, such as "What do you think of the teacher's practice in the case?" and " If you are a teacher, how do you think you should do when facing this situation?", to let students give opinions.

3.1.2.2 Creation of a Real Learning Environment Based on Simulations, Games, Etc.

To acquire in-depth knowledge and skills, learners need active learning methods, such as experiential learning and inquisitive learning, which usually take place in the real environment. With the development of technology, online simulation and virtual games can simulate the real environment and promote learners' active learning.

In addition to the above-mentioned quiz of "anchoring" teaching method and "bodoudou.com" classroom interactive game, we can also use experiential teaching method to create authentic learning environment. After learning some theoretical knowledge in the "Preschool Pedagogy", students can have some teaching practice experience, such as using "Sight Plus AR" to make AR teaching videos or using Douyin to publish short teaching videos. For example, when teaching "Games for Kids", you can first let the students play the game of throwing the handkerchief (or watch the game) in the virtual environment, then import the new lesson: What games have you played? What games do you know? and expand the analysis: Why do children love to play games? What are the types of games? How to organize these games? Finally, students guide children to play a game with the role of preschool teachers and make a video, so that they can not only experience how to guide games for kids as a preschool teacher, but also watch their own teaching videos to reflect their own teaching process.

3.1.2.3 Creation of Diversified Learning Environment

Students can learn from live classes on the DingTalk and publish their views and theories on the forum of Chaoxing APP. They can also learn by themselves on MOOC (i.e. the chapter "Games for Kids" can be learned from the "Games for Kids" of Qiu Xueqing from Nanjing Normal University on MOOC). These platforms can provide students with learning information, can support and practice different learning methods, and supplement the formal learning methods of schools.

To provide learners with learning information in a diversified learning environment, provide students with the data of classroom learning content and learning methods, support them to expand personal knowledge and networks through virtual learning communities, provide them with effective feedback, and provide learners with the future knowledge related to their development, and so on. In the coming years, the main challenge for learners is how to construct knowledge in an open online learning environment. They must cultivate the ability to access websites to search for information and conduct autonomic learning.

3.1.3 To Construct an Evaluation System to Promote Learners' Learning

The information provided by the learning evaluation system can help educators, administrators, policy makers, parents, and researchers accurately judge the learning status of students, and make decisions based on its impact and action. Learning evaluation is an important part of any kind of learning activity. The main purpose of inquiry-based learning evaluation is not to distinguish the level of student learning results. Students have gains and experience in the process of inquiry-based learning, so it is really a pity to show their learning results only in the form of rankings or scores. Therefore, substantive comments should be used to evaluate students' learning effects in inquiry-based learning, using dynamic evaluation results to replace static one-time evaluations.

Dynamic evaluation combines the individual's learning process and learning results through teaching and intervention to examine the individual's future development level or learning potential. For example, in the aforementioned classroom interactive game quiz of "bodoudou.com", students can answer the questions on their mobile phones; this platform retains the original data of the quiz results of each student for teachers to review and analyze after class. In addition, in the learning process of "Preschool Pedagogy", the teacher dynamically evaluates the students' theoretical application and case analysis level, allowing students to analyze the case and answer the questions for many times, and taking the best results, so as to examine whether students' ability to use the theoretical knowledge they have learned to solve practical problems in preschool education continues to develop.

3.2 Operational Links of Innovative Design of Online Teaching

Based on DingTalk, Chaoxing APP, bodoudou.com, Douyin, Sight Plus AR and other network teaching platforms and smart teaching tools, the teaching design of this course focuses on the design concepts of information interaction, learning tasks, scaffolding, autonomous learning, dynamic evaluation, and generative learning to carry out the corresponding teaching links, such as creating situations, introducing course content, conducting analysis, guiding practice, practical application, etc.

Before class, the teachers can push various forms of information through DingTalk groups in advance, including PPT, Word, PDF documents, videos, and web links. Students who learn fast can carry out information interaction in advance. During the class, the teachers carry out DingTalk live class, including screen sharing mode or camera mode. The screen sharing mode includes PPT real-time class and video creation of teaching situations. Students can raise questions, build scaffolds, discuss and report in groups, and finally conduct interactive classroom tests in the form of games or practice teaching on teaching tools such as Douyin and "Sight Plus AR". In the practice session after class, students can complete homework on the "Chaoxing APP" or post information on the knowledge forum, which can be submitted in multiple forms such as text descriptions, images, and videos.

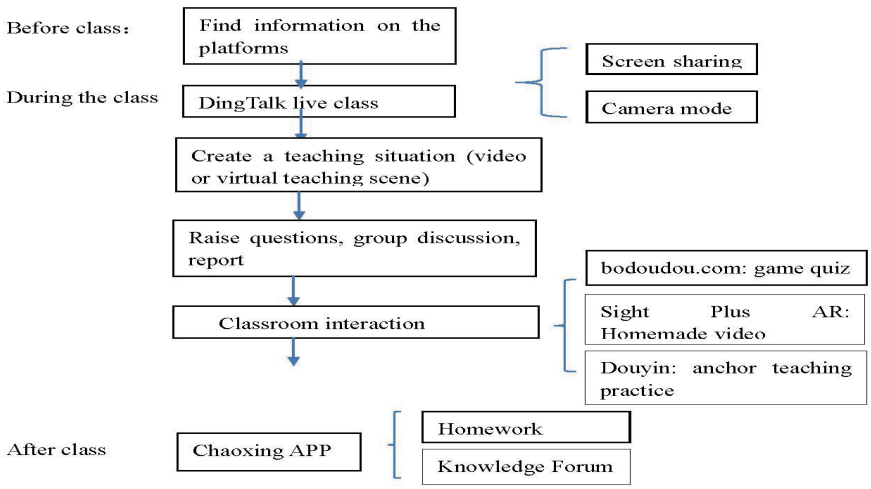

Figure 2
Online Teaching Links

CONCLUSION

This innovative design of the online teaching is just stepping store, still having many shortcomings. In the long run, the schools has begun to resume school classes; after that, we should have a forward-looking strategic vision, profoundly summarize the online teaching experience in the epidemic, and rethink and explore the innovative way of future teaching development. It is necessary to fully tap the potential of digital teaching devices in future teaching, and carry out software training or guidance for teachers and students, so as to explore and improve the online and offline hybrid teaching mode, and learn about how technology serves education to promote the teaching quality.

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