A Simulated Situational Assessment System for Evaluating Pre-Service Teachers' Information Teaching Ability

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ABSTRACT
With the deepening of educational reform, classroom teaching constantly emphasizes the importance of context, and the simulated situational teaching method is gradually applied in the instructional design of activities. As an important part of the education and teaching process, evaluation which is the process of determining the changes in students' behavior in teaching through various measurements and systematic data collection should be made changes. At the 2nd International Conference on Technical and Vocational Education, UNESCO proposed that the quality requirements of people in the new era are changing, and learners should not only improve their knowledge and skills but also can adapt and develop. Therefore, it is crucial to assess whether students can achieve problem-solving in real-world situations. Further, the reform of evaluation can provide a clearer direction for teachers' classroom teaching and guide students to change their previous rote learning methods to train higher-order thinking skills. According to the situational cognition and learning theory, the element attributes and preparation steps of situational items, combined with the course content, this study creatively designed and compiled a set of simulated situational items for the "Modern Educational Technology" course for mathematics normal students, and applied Qt which uses a cross-platform C++ application development framework, and MySQL to develop an electronic assessment system. This system can examine learners' ability in terms of using technology to support teaching in information-based teaching, including providing digital teaching resources, information-based instructional design, and teaching practice ability. Meanwhile, it will automatically collect students' answer data and upload them to the database system. It is convenient for teachers to make teaching decisions based on data to improve teaching. This research further promotes the simulation situation evaluation method, which has great application value, and more in-depth research and exploration are urgently needed in the future in this field.
Keywords: situated learning; assessment system; information teaching ability

ÖZET
Eğitim reformunun derinleşmesiyle birlikte, sınıf öğretimi sürekli olarak bağlamın önemini vurgulamakta ve etkinliklerin öğretim tasarımında simüle edilmiş durumsal öğretim yöntemi kademeli olarak uygulanmaktadır. Eğitim ve öğretim sürecinin önemli bir parçası olarak, öğretimde öğrenci davranışlarındaki değişikliklerin çeşitli ölçümler ve sistematik veri toplama yoluyla belirlenmesi süreci olan değerlendirmede değişiklikler yapılmalıdır. 2. Uluslararası Teknik ve Mesleki Eğitim Konferansı'nda UNESCO, yeni çağda insanların kalite gereksinimlerinin değiştiğini ve öğrencilerin sadece bilgi ve becerilerini geliştirmekle kalmayıp aynı zamanda uyum sağlayıp gelişebilmeleri gerektiğini öne sürmüştür. Bu nedenle, öğrencilerin gerçek dünya koşullarında problem çözmeyi başarıp başaramadıklarını değerlendirmek çok önemlidir. Ayrıca, değerlendirme reformu öğretmenlerin sınıf içi öğretimi için daha net bir yön sağlayabilir ve öğrencileri üst düzey düşünme becerilerini geliştirmek için önceki ezberci öğrenme yöntemlerini değiştirmeye yönlendirebilir. Durumsal biliş ve öğrenme teorisine, durumsal öğelerin öğe niteliklerine ve hazırlık adımlarına göre, ders içeriğiyle birlikte, bu çalışma normal matematik öğrencileri için "Modern Eğitim Teknolojisi" dersi için yaratıcı bir şekilde bir dizi simüle edilmiş durumsal öğe tasarladı ve derledi ve elektronik bir değerlendirme sistemi geliştirmek için platformlar arası C ++ uygulama geliştirme çerçevesi kullanan Qt ve MySQL uyguladı. Bu sistem, dijital öğretim kaynakları sağlama, bilgi tabanlı öğretim tasarımı ve öğretim uygulama becerisi de dahil olmak üzere bilgi tabanlı öğretimde öğretimi desteklemek için teknolojiyi kullanma açısından öğrencilerin yeteneklerini inceleyebilir. Bu arada, öğrencilerin cevap verilerini otomatik olarak toplayacak ve bunları veritabanı sistemine yükleyecektir. Öğretmenlerin öğretimi iyileştirmek için verilere dayalı öğretim kararları alması uygundur. Bu araştırma, büyük bir uygulama değerine sahip olan simülasyon durumu değerlendirme yöntemini daha da teşvik etmektedir ve gelecekte bu alanda acilen daha derinlemesine araştırma ve keşiflere ihtiyaç duyulmaktadır.
Anahtar Kelimeler: yerleşik öğrenme; değerlendirme sistemi; bilgi öğretme becerisi

INTRODUCTION
With the continuous development and improvement of school education, it has gradually moved away from social life and has become the so-called "ivory tower". There seems to be a consensus that learning is something that

happens in the classroom, and that what used to be where learning primarily happens - social life is neglected instead. The latest round of curriculum reform is happening all over the world. The situational simulation teaching method is accepted by more and more teachers and students and is considered to be able to improve the teaching effect (Perin, 2011). The practice questions and tests after class should also be consistent with this practice. Students can solve problems in real situations, instead of blindly memorizing them. Therefore, the process of determining changes in student behavior in instruction through various measurements and systematic collection of data (Fry et al., 2008) should also be changed.

In today's drastic changes in the international situation, it's urgent to cultivate students' skills in the 21st century (González-Salamanca et al., 2020). The change of school education goals calls for the improvement of teachers' ability, especially the ability of informatization teaching, that is, the use of ICT to promote students' learning (Fernández-Batanero et al., 2020). This is the reason why major countries and international organizations in the world update the standards related to teachers' information technology capabilities all year round. However, if the level of informatization teaching ability of normal students cannot be effectively evaluated, it is difficult to get rid of blindness in the training work, and its effect cannot be guaranteed.

At this stage, the evaluation of normal students' informatization teaching ability is usually in the form of quantitative self-report and qualitative observation (Yusrizal et al., 2019). The two evaluation methods have their inherent defects. The former makes it difficult to assess students' ability to solve problems in real situations, and cannot avoid problems with participants' dishonesty or unclear self-perception. The latter is difficult to measure for a long time with large samples and cannot be applied to actual teaching evaluation. At the same time, the paper-and-pencil test method is not convenient for analyzing students' test data. As a low-fidelity simulation, the simulated situational test requires respondents to make hypothetical responses to a series of situational difficulties (Herde et al., 2019), which can effectively solve the existing problems.

Given this current problem, this research focuses on the technical support teaching part in the field of measuring normal students' informatization teaching ability, which is less researched on simulated situational tests. Based on the theory of situational cognition and learning, the elements attributes and preparation steps of situational test questions, programming technology, database technology, a set of simulated situational tests was designed and developed, and the application program is presented to the students as its carrier, to it is more convenient and effective to measure the technical support teaching ability of students' informatization teaching ability, and it is convenient for subsequent data analysis and processing to better improve teaching.

LITERATURE REVIEW

Situated cognition and learning theory

From behaviorism, modeled by the study of animal behavior in the early twentieth century, to Gestalt psychology, which emphasized the holistic nature of experience and behavior; to information processing theory, which emphasized memory and thought processes in the mid-twentieth century; learning theories have continued to be developed (Gao, 2001). But in the teaching model guided by these theories, students are separated from the real environment, knowledge, and behavior are separated, and schools focus on de-contextualized knowledge and well-structured problems. It is difficult for students to transfer what they have learned to reality in the world. Therefore, students with high scores own low abilities (Brown et al., 1989). Situational cognition and learning theory emphasize the powerful interaction process between knowledge and situation and gradually become the focus of learning theory.

The origins of the study of contextual cognition and learning theory date back to the late nineteenth century and have continued to develop to the present. As early as 1899, in School and Society, Dewey pointed out that life is the true educator and that hobbies learn from life itself, yet schools are disconnected from life and they are very isolated (Dewey, 1990). Subsequently, Whitehead referred to the knowledge that learners learn in school for exams only and not for solving practical problems as "inert knowledge"(Whitehead, 1967). Further, Riznick details the differences between daily life and school situations and shows that school education is individualized and abstract, while out-of-school learning is cooperative, situational, and concrete. Since then, she has published several books and played an important role in the development of situational cognition and learning theory. In 1989, Brown et al. published the paper " Situated cognition and the culture of learning", which was a relatively systematic and clear exposition of the theory of situational cognition and learning (Brown et al., 1989).

In the following decades, more and more scholars participated in the research and application of situational cognition and learning theory. The theory was continuously developed and improved, and its theoretical system was gradually formed. At the same time, the theoretical and practical research on situational cognition and learning has spread to other fields of education, including distance education, basic education, adult education, online

teaching, higher education, and so on (Wang, 2002). After more than 100 years of theoretical development, situational cognition theory has gradually moved from infancy to perfection. Now, situational cognition and learning theory has become important learning theory, which can provide effective learning and facilitate the transfer of knowledge to real life.

Simulated situational items

A mock situation test is a series of test questions that expose applicants to situations similar to what they might encounter in work or life to elicit how they would respond to these stimuli. Compared with non-situational questions, contextual questions tend to increase the difficulty of the questions while examining knowledge points or abilities and can make abstract questions concrete.

The simulated situation test is widely used in human recruitment. The candidates are placed in a specific pre-designed situation, and the recruiter observes, records, and analyzes the applicant's behavior and related information to assess the applicant's business ability (Schmitt & Ostroff, 1986). The researchers summarized the development process of the situational judgment test, which needed to go through three stages, including the development of stimulus materials, the development of response materials, and the development of scoring keys (Goldstein et al., 2017). In the selection of talents in nursing medicine, government departments, as well as in the field of psychological testing, the proportion of situational test questions is constantly increasing (Whetzel & McDaniel, 2009). For the field of education, simulated situational tests are more successful in the application of PISA. PISA items usually contain one or more questions in a situation, and the solution of the problem is contained in the situation, and it measures the ability of students to use intelligence to solve problems in a specific situation (Turner & Adams, 2007). PISA emphasizes that a situation is considered real when participants have experienced and practiced it in the real world.

Several studies have shown that simulated situational tests have high reliability and validity, and can effectively measure the ability level of participants. A study using simulated scenarios to create an assessment test tool, recruited 33 residents to perform a five-task simulation, suggesting that simulated scenarios can be used as a powerful tool for assessing surgical skill tool (Mannella et al., 2019). In addition, given the shortcomings of self-report evaluation methods in personality tests, some researchers have proposed the use of situational judgment tests to predict personality characteristics. Olaru used situational tests to measure personality, and the results showed that the use of situational tests to measure personality was psychologically reliable, further supporting that situational tests could effectively measure personality-related behaviors (Olaru et al., 2019).

However, there is currently a lack of research on applying simulated situations to measure pre-service teachers' information teaching ability. This study will design and develop an electronic evaluation system to test students' information teaching ability for a university's "Modern Educational Technology" course.

METHODS

Assessment framework

The evaluation question frame of this research comes from the technical support teaching module in the "Standards for Informatization Teaching Ability of Normal Students", which was promulgated by the research group "Empirical Research on Informatization Teaching Ability Standards and Training Models of Normal Students" on June 29, 2018. The technical support teaching module includes three aspects, namely, the provision of digital education teaching resources, the teaching design based on information technology, and the ability in the teaching practice process. Providing digital education and teaching resources refers to the ability to plan, produce, evaluate, optimize, manage digital education and teaching resources, and provide learners with personalized learning experiences and opportunities according to predetermined teaching situations. Informatization-based instructional design refers to mastering informatization instructional design models, principles, methods, strategies, evaluation methods, and related tools. The ability to master the teaching practice process refers to the applied skills that need to be mastered in the actual teaching process, including the use of information technology to track, analyze, evaluate and intervene in the teaching process

Situation selection

The context of the question should be the carrier of the idea and information of the question, not the context for the sake of the context. When designing a situation, first of all, the authenticity and scientific nature of the situation should be ensured, and no random fabrication is allowed. Secondly, the setting situation should be closely related to the content currently being examined. The ultimate purpose of setting the situation is to examine the ability of the subjects and to achieve the purpose of the test. While ensuring the above, try to be as novel as possible, which should be in line with the current social environment, but avoid blindly pursuing novelty that exceeds the cognitive level and experience of the subjects.

Based on the above considerations, the simulation situation of this research is: "If you are a junior high school mathematics teacher in a certain school, your class is about to start learning the unit "Parallelogram" in the second volume of the eighth grade, please combine your work in "Modern Educational Technology". The knowledge learned in this course is designed, developed, and organized to improve students' knowledge and skills, mathematical thinking, problem-solving skills, and emotions and attitudes.

Scripting

The content of the script is considered from the following perspectives: instructional goals, instructional contents, choice of instructional methods, instructional environment, instructional theory, instructional evaluation, development of teaching resources, search for teaching resources, and implementation of distance education.

The first thing you need to do is to write the objectives for the lesson, which are the results that the teacher expects to achieve through the lesson. Therefore, the teaching objectives are not written casually but follow certain writing rules. Nowadays, there are many methods of writing objectives, among which the ABCD method is most commonly used because of its easy-to-operate process.

You recall that parallelogram is not the first time that parallelogram appears in the textbook, and it is not the first time that students learn about parallelogram, in terms of the textbook that students have learned, the second semester of the first grade is the first acquaintance with parallelogram, the first semester of the fourth grade learns the concept of a parallelogram, the first semester of the fifth grade explains the area of a parallelogram in the second semester of the eighth grade, students will learn the properties of parallelograms, so what principle does this arrangement of teaching contents follow?

After analyzing the content of this lesson, you begin to design the teaching process. Recently, you have noticed that the students in your class are generally not interested in learning and have a lazy attitude in class, no longer listen to the teacher carefully, and are eager to be independent. Because the school has already popularized the electronic schoolbag, you intend to use a combination of online and offline ways to provide resources and activities related to the learning environment, students first use the resources in the electronic schoolbag, independent learning parallelogram knowledge in class time, for the pre-class questions left in class with the teacher and classmates to solve, give full play to the students' conscious initiative to learn, then you need to learn in this case Which teaching style's specific implementation plan?

In the process of learning how to implement the above teaching methods, you gradually find that the current classroom is not good enough to carry out this teaching method, and you recall the meeting before the principal said that nowadays the school strongly supports information technology teaching, providing a variety of teaching environments, in addition to the traditional chalk and blackboard classroom, there are classrooms equipped with projectors, teachers and students with a computer room classroom, and Where do you plan to implement the teaching of this lesson?

Many learning theories underlie your chosen teaching style: mastery learning theory, deep learning theory, primary learning theory, and active learning theory. Which theory emphasizes the need for students to understand how to use knowledge to solve real-world situations, and the teaching process focuses on the integrated application of knowledge and higher-order thinking activities, such as creative problem-solving? In the course of lesson planning, you feel more and more that you still have a lot to learn, especially in the area of technology support for teaching, but you don't know which areas to make up for, so a colleague suggests that you can refer to TPACK theory to help your professional development. What three areas of knowledge should you focus on learning and reserving according to TPACK theory?

Evaluation is an integral part of the teaching process, and there is a growing emphasis on not using scores alone to determine students' abilities, you have come to accept this view as you continue to learn and teach. There are many different types of evaluation, and you intend to use this type of evaluation, which is a comprehensive assessment of students' learning in the process of education and teaching, including the effectiveness of learning, the process, and the non-intellectual factors closely related to learning. It not only makes judgments and identifies problems in the quality of learners' learning, but also encourages students to reflect on the learning process to better understand the ways and means of mastering learning. Which type of assessment does it belong to?

After the initial design of this lesson, you start to create the teaching resources used in this lesson. The process of proving the median line theorem is abstract and not well understood by students with poor foundations. At this time, the mathematics teacher of another class has created his lesson materials for this lesson and then asked you to give him some suggestions. Why?

After your careful study and careful arrangement, the lesson went very successfully and was liked by the students. Some students even became very interested in the mathematical history behind geometric figures such as parallelograms and asked you about it, but if you did not know the relevant historical background, what are you going to do about it?

This concludes the lesson successfully. Although this lesson is the most energy-consuming since you have been working, it is also the most rewarding. But your good mood is spoiled by a sudden announcement that the local CDC has informed you that there is a confirmed local case in your school district, so the school intends to suspend offline classes and switch to online classes, but without limiting the specific teaching method.

Design items

First of all, a qualified test question should be logically rigorous, and the expression is clear and reasonable. Second, a situational test question should not only focus on the details, fragmentary knowledge points, and memorized knowledge in the textbook, but should pay more attention to the core concepts and knowledge content of greater value, and can also appropriately add some complex questions. Third, if a test question is still valid after being removed from the situation, it is not a qualified situational test question. The test question and the situation should be closely integrated, and formalism should be rejected. Fourth, for an excellent situational test question, students may not be able to easily solve the problem through memory but need a real understanding and mastery of knowledge to answer correctly. As for the sets of questions in the same situation, the questions should be coherent and intrinsically linked, and students should be guided step by step to explore the students' abilities and experience the process of integrated problem-solving. Therefore, based on the above principles of test question formulation, combined with the scenarios and scripts set up, as well as the important theoretical knowledge and skills of the "Modern Educational Technology" course, this research has designed 11 simulated situational questions, including 3 multiple-choice questions and 8 multiple choice questions, see Appendix A.

FINDINGS

Demand analysis

The purpose of this test platform development is that students can answer questions on the computer, teachers or school administrators can upload test question information and basic information about students from the background, download students' answers and final scores to enter the scoring system, or conduct subsequent data analysis. This design adopts the design mode of client and server, which is divided into front and back. The front is for the students being tested, and the back is for teachers or school administrators.

Database

The MySQL database is selected for this development, which has the advantages of free and low maintenance costs. Alibaba Cloud's relational database RDS (Relational Database Service) provides a stable, reliable, and elastically scalable online database service based on high-performance SSD storage and Alibaba Cloud distributed file system. RDS supports MySQL, PostgreSQL, PPAS, SQL Server, and MariaDB TX engines and provides a complete recovery solution. It has the following functions and features: a high-security level to ensure data security; simultaneous deployment in many places around the world; flexible product forms to meet the needs of multiple purposes; significantly reducing operation and maintenance costs. Therefore, the Alibaba Cloud Database RDS MySQL version was finally chosen for this development. Then, the conceptual structural design and logical structure design are carried out for students, items, and grades respectively.

Front-end development

The front-end development is carried out on Qt software, which realizes the login interface [Figure 1] and the answering interface [Figure 2]. The reason why Qt is chosen for software development is that Qt is a cross-platform C++ application development framework that can create and develop cross-platform GUI applications. Its biggest feature is "write once, compile everywhere" (Blanchette & Summerfield, 2006). Qt not only has a complete C++ graphics library, but also has gradually added network, database, XML libraries, in recent versions, which significantly improves Qt's ability to develop large-scale, complex, and cross-platform applications.

Figure 1. Electronic assessment system login interface and error warnings. a, Login interface. b, Warning if complete information is not entered. c, Warning if there is no student information in the database.

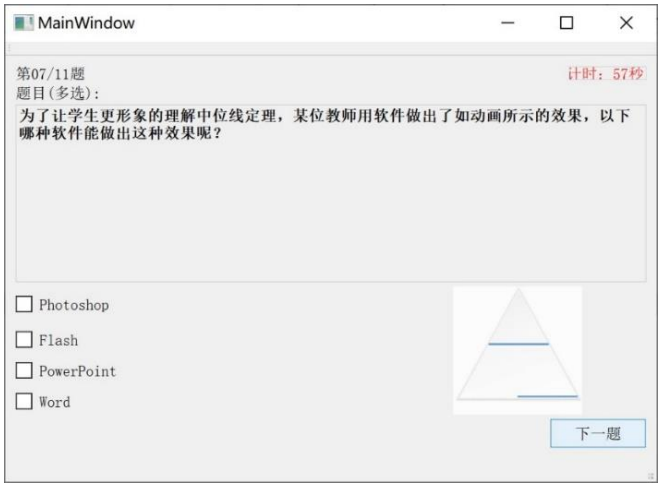

Figure 2. Question answering interface.

CONCLUSIONS AND EVALUATION

The ordering of simulated situational test questions is a lengthy and repetitive task. This time is mainly used to select the appropriate situation, create test questions in combination with the situation, maintain the consistency of the test questions, set the options, and express the language of the test questions. Therefore, in the teaching process, it is difficult for teachers to take the time to design simulated situational test questions when the task is heavy. However, evaluation is an important part of the teaching process. Only the implementation of evaluation reform can provide a clearer direction for teachers' classroom teaching and can guide students to change their previous rote learning methods and train higher-order thinking skills.

In the future, it is necessary to increase the proportion of test questions in simulated situations in the assessment, but schools should have specialized personnel to design related questions or complete the test question design through the cooperation of teachers under the premise of reducing teachers' work pressure. At the same time, question designers should receive relevant training exercises to avoid formal situational questions. At the same time, relevant departments can consider building relevant mock-scenario test question banks to directly provide front-line teachers for use

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Appendix A

If you are a middle school math teacher at a school and your class is about to begin a unit on parallelograms in the second book of Grade 8, please design, develop, and organize this lesson to improve students' knowledge and skills, mathematical thinking, problem-solving skills, and emotions and attitudes, taking into account what you have learned in the course "Modern Educational Technology".

1. ABCD goal formulation is a way of stating instructional objectives. According to ABCD goal formulation, which of the following instructional objectives presents all the elements of the statement? (Single choice)
A. By watching the animation, students can state the triangle median theorem accurately.
B. By exploring and proving, students can master the special properties of parallelograms with opposite sides to angles.
C. Students can write in detail the process of proving parallelograms based on the properties of parallelograms.
D. The teacher will be able to fluently state the characteristics of various properties of three special parallelograms.
2. For example, in the second semester of the first grade, parallelograms are introduced, in the first semester of the fourth grade, the concept of parallelograms is studied, and in the first semester of the fifth grade, the calculation of the area of parallelograms is explained, and in the first semester of the eighth grade, the properties of parallelograms are studied. (Multiple choice)
A. Spiral principle
B. Straight-line principle
C. Thoughtfulness principle
D. Expanding principle
3. For students to better master parallelograms, the teacher intends to use a combination of online and offline approaches to give full play to students' self-motivation in learning and to provide resources and activities related to the learning environment. Which of the following teaching approaches do you think meets the above requirements? (Single choice)
A. Individualized instruction
B. Blended Learning
C. Traditional classroom teaching
D. Task-driven teaching
4. To accommodate the teaching style of this lesson, the course is planned to be conducted in this environment: a learning space built up with the help of advanced computer technology, Internet of Things technology, and cloud technology, which enables human-environment interaction, thus facilitating communication, collaboration, and sharing, and promotes personalized, open, and ubiquitous learning. Which of the following is this type of teaching and learning environment? (Single choice)
A. Traditional chalk and blackboard classroom
B. Traditional classrooms with projectors
C. Computer room classroom with one computer for teachers and students
D. Smart classroom
5. Teaching requires students not only to memorize the properties and decision theorems of parallelograms but also to learn how to use what they have learned to solve real-world problems. The teaching process focuses on the integrated application of knowledge and higher-order thinking activities, such as creative problem-solving. This teaching philosophy is consistent with which of the following learning theories? (Single choice)
A. Mastery learning theory
B. Depth learning theory
C. primacy learning theory
D. Active learning theory
6. Based on TPACK theory, which of the following knowledge is required for teachers to teach the class well? (Single choice)
A. knowledge of educational research methods, knowledge of pedagogy, and knowledge of technology
B. Knowledge of subject content, knowledge of educational research methods, knowledge of pedagogy
C. Knowledge of subject content, knowledge of pedagogy, knowledge of technology
D. Knowledge of subject content, knowledge of educational research methods, and knowledge of technology
7. Evaluation is an integral part of the teaching and learning process, and there are various ways to evaluate, one of which is to make a comprehensive assessment of students' learning as education and teaching proceed, including the effectiveness of learning, the process, and the non-intellectual factors closely related to learning. It not only makes judgments about the quality of learning and identifies problems, but also encourages students to reflect on the learning process to better understand how and how to master learning. Which of the following belongs to this type of evaluation? (Single choice)
A. Diagnostic evaluation

B. Group evaluation
C. Summative evaluation
D. Process evaluation
8. To make students understand the median theorem more visually, a teacher used software to make the effect shown in the animation. Which of the following software can make this effect? (Multiple choice)

A. Photoshop
B. Flash
C. PowerPoint
D. Word
9. A teacher presented such a PowerPoint in a class. According to Meyer's multimedia learning theory, what mistake do you think he made? (Single choice)

A. No error
B. No focus
C. Appearing unrelated images
D. Contrary to the principle of temporal proximity
10. A student is particularly interested in the mathematical history behind geometric figures such as parallelograms and asks you about it, but you don't know the relevant historical background, what are you going to do about it? (Multiple choice)
A. Search for relevant knowledge through search engines such as Baidu
B. Ask expert teachers, seniors, and colleagues
C. Tell the students to master the knowledge of the textbook
D. Read relevant academic papers
11. Which of the following software can be applied if there is an outbreak at the school site and the school director requests that all courses be switched to online? (Multiple choice)
A. WeChat
B. Tencent Meeting
C. Ding Talk
D. QQ Classroom