Practical Research on Large-Scale Examinations for Undergraduate Online Teaching

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Abstract

In early 2020, the sudden outbreak of COVID-19 completely changed the teaching form of higher education in China. Under such circumstances, online teaching and examinations have become new teaching methods. By studying the existing literature on online tests and analyzing the characteristics of the online assessment, this paper introduced the large-scale online final examination of the Central University of Finance and Economics from the aspects of regulations, organization, and quality control. Finally, relevant suggestions for improving the quality of online examinations were put forward.

Keywords: online teaching, massive, online exam

1. Introduction

At the beginning of 2020, a sudden outbreak of COVID-19 changed the teaching ecology of Chinese higher education. According to statistics from official channels, a total of 1.08 million teachers in Chinese colleges and universities have issued 1.1 million courses, and the frequency of online learning for college students has totaled 3.5 billion times. Besides, the offering rate of online courses in colleges and universities has reached 91% in China. The Central University of Finance and Economics (CUFE) has implemented online courses for most classes, and the online teaching rate has reached more than 95%.

With the development of modern technologies, such as artificial intelligence, big data, the Internet of Things, and blockchain, Chinese colleges have rapidly promoted the deep integration of information technology and teaching. The transformation of online courses from quantity to quality has been completed. Hence, online schooling has become the new normal of education.

As for the examination, which is an essential part of teaching, some critical topic for educators is: "How to adapt to the development and changes of online teaching?", "How to truly test and promote teachers' "teaching" and students' "learning?" and "How to ensure the quality of talent training?" To be concluded, online exams are not a simple copy of offline exams and have their characteristics and requirements. Online exams are subject to many constraints, such as software, hardware, and organizational methods. Not to mention, large-scale online examinations

are more complicated.

2. Literature Review

2.1 Related Concepts

Online teaching is a remote synchronous teaching form based on network technology, which realizes man-machine and interpersonal cross-border communication and remote interaction through information technology (QIN H, LI Z, & ZHOU J., 2020). The characteristics of online teaching are as follows: (1) the teaching content and carrier form have undergone a sudden change, showing a digital form; (2) the teaching method presents the course in a digital form through live broadcast, MOOC, SPOC (Small Private Online Course), etc.; (3) teaching methods have changed from oral language expression to the combination of sound, picture, text, and video. Online teaching mode reflects the advantages of convenience, fast, not being limited by time and place, and personalized (Hu, X., & Xie, Z., 2020). The history of online teaching in China can be traced back to the "Modern Distance Education" pilot project launched in 1999. After that, it experienced the MIT Open Courseware (OCW) in 2001, the video open course movement in 2009-2010, the large-scale online available course movement in 2012, and the large-scale use of online teaching during the epidemic in 2020 (Guo, W., 2020). Online teaching is a revolution in teaching mode. The development of new technology provides the possibility and guarantees for the development of online teaching. Online teaching is an expedient measure to deal with COVID-19 and an inevitable choice to adapt to the scientific and technological revolution and the industrial revolution.

The examination is a means of teaching evaluation. Its purpose is to check the teaching effect, find out the problems in teaching, and provide corrective feedback for the teaching process, to improve the teaching work further, improve the teaching quality and ensure the realization of the school's overall objectives (Shen, G., 2005). Teaching and examination complement each other and combine organically. Scientific and practical tests are vital in improving the quality of personnel training.

Online examination in the online teaching environment refers to the paperless examination of students' oral, written, or virtual operation on the examination platform (virtual examination room) provided by the Internet or local area network with the help of a computer or mobile intelligent terminal and corresponding online examination system software (Shen, Z., & Shen, R., 2022). The number of online assessment courses organized by the school to reach more than half of the total number of assessment courses or the number of online assessments of a single class to reach more than 100 people can be called a large-scale online examination. Besides, the organization form, process, and condition guarantee of large-scale online examinations are more demanding.

2.2 Aspects of Study

Online examination research mainly focuses on three aspects, online examination system, online examination organization, and online examination performance analysis.

2.2.1 Online Examination System

A sound examination system is critical to whether the online examination can be carried out smoothly. With the development of information technology, the examination system is constantly upgrading. The existing literature mainly studies and designs the development mode (B/S, C/S), functional structure (user management and authority authentication, examination process control and statistical analysis, test resource library construction and maintenance, information feedback) (Shen, T., & Chen, J., 2015), algorithm, and other aspects of the examination system. Through the above study, the existing literature puts forward the optimization measures of network congestion, examination safety, and test paper mechanism in the examination process (Xing, Y., Chen, Y., & Wu, B., 2020).

2.2.2 Online Examination Organization

Since the epidemic, colleges have faced the problem of organizing online examinations. The existing literature mainly studies the online examination organization of certain classes, and the researchers are primarily teachers. This paper reviews the preparation and implementation of online examinations, including the preparation and notification of examination questions, the release of examination questions, the emergency handling of emergencies in the test, and the summary of test evaluation (Yang, W., 2021). The examination system used in the online examination mainly includes rain classroom, Chaoxing, and Sojump. Meanwhile, WeChat and

QQ groups work as auxiliary means. Generally, the functions of random test paper, topic disorder, and option disorder of the system are used.

2.2.3 Online Examination Performance Analysis

Achievement is an important indicator to measure the teaching effect. The equivalence of online and offline test scores is an essential issue in studying online examination organizations. The study found that under the conditions of good hardware equipment, a stable network environment, a smooth response system, and the same test resources as the traditional test, there is no significant difference between online test scores and standard tests (Dou, Y., 2022). From comparing the assessment results of a specific course, the distribution of scores is the same as that of offline tests with the preparation of the same online examination mode, mainly subjective topic setting, real-time invigilation with the help of an online conference platform in the examination, timely sending, and standardized archiving of the examination papers after the end (Liu, G., 2021). These studies show that online and offline tests can be homogeneous and equivalent if adequately organized.

The existing literature needs to include research on the organization of large-scale online examinations in the school from the perspective of teaching managers. Examination organization is one of the essential tasks of the school's teaching department. Orderly, effective, and high quality is the goal of examination organization. The examination organization of an online teaching environment is different from that of an offline examination organization. It is necessary to formulate examination rules, invigilation rules, and emergency plans for online examinations, select suitable examination systems, adopt diversified invigilation means, and improve the skills of teachers and students in using the examination system.

3. Features of Massive Online Exams

3.1 Difference Between Online and Offline Exams

3.1.1 Different Requirements

In the offline examination, teachers provide paper tests, and students answer questions on the spot, which means equipment requirements are low. The online exam is operated in the exam system. Teachers and students should master information technology and meet the equipment and network status requirements to complete the test.

3.1.2 Different Methods

Offline teaching is face-to-face communication between teachers and students. Teachers can monitor students' learning status in real-time, gain knowledge of the teaching effect, and adjust strategies. Therefore, the daily assessment generally accounts for a relatively small proportion of the final grade, which means the course assessment focuses more on the final evaluation. However, whether it is recording or live class, online teaching puts teachers and students in different spaces. Hence, teachers will pay limited attention to students' learning status. Usually, curriculum assessment is more inclined to increase the proportion of regular performance, increase the number of classroom discussions, homework presentations, usual tests, etc., and guide students to complete the course learning at ordinary times actively.

3.1.3 Different Contents

In offline examinations, students in the same class generally use the same test papers. In online tests, most teachers use the question bank for random or manual test papers, and students in the same class will meet multiple sets of papers. Offline examinations, especially closed-book examinations, most of the documents will include basic knowledge, the amount of questions is moderate, and the types of questions are relatively fixed. Considering the factors of invigilation, teachers will establish many test banks in online examinations. So, the content of the test questions will be more flexible, and the choice of test types will be more diversified.

3.1.4 Different Forms

In the offline examination, the school unified organization examination, the invigilator teacher can effectively monitor the students. The online test gets rid of the dependence on space. Students can complete tests online, and the invigilator teachers can invigilate online. Although the technology of anti-cheating function has been relatively mature, there is still a particular blind spot in online invigilating.

3.1.5 Different Incentives and Guidance Directions

Most teachers pay much attention to the final examination in the offline test. The teaching process is mainly based on teaching, and the

regular assessment is based on students' attendance and question-answering. Hence, students will focus on the final review. However, online examinations focus on process evaluation, which means teachers must carefully design various teaching links and arrange multiple tasks in their daily teaching process. Students usually need to increase their investment in curriculum learning, master more solid knowledge and think more deeply about the curriculum.

3.2 Difference Between Massive and Common Online Exams

With the emergence of online courses, online examinations have emerged. In the past, online course examinations were mainly based on operational courses or general courses. They were generally carried out in the school computer room and on a smaller scale; the assessment methods of the classes are primarily qualified examinations, which have little impact on students. The large-scale online test after the epidemic replaced the original offline exam, covering all the school's courses, which have a large number of classes and difficulties of organization. What's more, the organization of large-scale examinations needs to consider more factors and has a far-reaching impact.

4. The Practice of Massive Online Exams

During the final examination in 2022, to face the complex and changeable epidemic situation in Beijing, the Central University of Finance and Economics decided to conduct online tests for nearly 2,000 teaching classes and 90,000 students. The Teaching Affairs Office pays attention to the system, the arrangement of each link of the tests, the quality control, and so on. Finally, the examinations of all subjects were completed, and the intended objectives of the test were achieved.

4.1 Perfection of Examination Norms

System construction is the foundation that provides operational standards and fundamental compliance for examination organizations.

Based on the documents such as "Overall Plan for Deepening Educational Evaluation Reform in the New Era," "Opinions on Accelerating the Construction of High-level Undergraduate Education," and "Opinions on Strengthening the Teaching Management of Online Open Courses in Colleges and Universities," the CUFE has formulated "Implementation Opinions on Comprehensively Deepening the Construction of Undergraduate Education Quality Assurance System," revised the "Full-Time Undergraduate Course Assessment and Performance Management Approach," Student Disciplinary Punishment Management Regulations, "Undergraduate Examination Room Rules," "Undergraduate Examination Invigilation Rules" and other rules and regulations. Provisions were made on all aspects of the examination, and requirements were put forward to ensure the smooth progress of the test.

The system construction combines talent training objectives with examination work, such as increasing the proportion of regular performance and encouraging and guiding teachers and students to pay attention to the teaching process. At the same time, the teaching management department standardized the examination rules, embodied moral education requirements and focused on cultivating students' integrity.

4.2 Organization of Each Process

4.2.1 Online Examination System Enabled

The development of modern teaching technology has provided the necessary tools and means for online examination organization so that online and offline examinations can be homogeneous and equivalent. Compared with 2020, after more than two years of improvement and perfection, the function of the online examination system has been dramatically improved. It has the parts of random test paper, the disorder of questions and options, face recognition capture, screen cutting detection, and so on, which meet the various needs of the examination. The research on the examination system before the test shows that many teachers are afraid of the system and want to use test methods other than the Exam-System. The school conducted a unique study on this situation, taking the examination as the most crucial topic of the final teaching work meeting. The principal made mobilization and deployment at the meeting, making teachers and students unify their understanding, and reach a consensus. Finally, large-scale online tests were completed with the efforts of all parties.

4.2.2 Orderly Organization of Examination

(1) Proposition and test papers organization. The CUFE requires that the proposition meet the

syllabus's requirements, have comprehensive coverage, accurate and standardized expression, practical and diverse design of questions, moderate difficulty, reasonable scoring standards, and sound discrimination. Teachers can determine the examination forms, such as closed volume, open volume, paper, and oral examination, according to the characteristics of the course and the exam objectives. The online examination question bank should be established in advance, and the random test paper function of the examination system should be used to implement one question and multiple volumes. Up to 20 sets of test papers can be formed.

(2) Paper distribution. The CUFE has formulated detailed guidelines for issuing test papers. So, teachers can easily set them according to the diagram. Teachers can choose the disorderly order of questions and options, limit the scope of students' login IP and multi-terminal login, and set the test duration as needed. These measures can effectively prevent students from cheating.

(3) Invigilation. The teacher is the principal supervisor and is generally responsible for the examination room management. Invigilation teachers must check in real time whether each candidate enters the examination, entry time, status, IP address, location, examination method, face recognition, number of screen cuts, number of captured photo recognition during the examination, number of captured photo recognition abnormalities during the test, number of screen capture recognition abnormalities, and whether they are marked. According to the invigilation manual, measures are taken to ensure the essential equivalence of online and offline invigilation.

(4) Collecting and marking. According to the characteristics of online examination, the examination time is 10 minutes longer than that of offline examination, which is used for students to take photos, upload handwritten answers and submit test papers. If the system recognizes that the number of screen anomalies and screen cuts exceed the range set by the invigilator teacher, it will be forced to retract. The system can automatically review the objective questions, and the subjective questions can be reviewed online by the teacher, which the flow can review. After the marking is completed, the exported test papers are archived according to the school's regulations, and the test paper

analysis statistics and feedback are performed.

(5) Emergency response plan. The Registry, secondary colleges, and teachers have formulated emergency response plans if the examination system is stuck in the examination process, paralysis, etc., depending on the length of time to determine whether to continue the examination or choose the opportunity to organize the test again.

4.2.3 The Role of Teams

We have set up an online teaching work guarantee team to ensure enough staffing to deal with emergencies during the examination period. The school-level guarantee team comprises the leaders of the competent teaching school, all the academic affairs office staff, and the intelligent campus construction center personnel. It comprehensively organizes and leads the online teaching work. The college-level security team comprises the president, the vice president in charge of teaching, the teaching secretary, the department director, and the teachers with high teaching levels. The online teaching work is fully implemented. The final exam gives full play to the role of the security team, to assist teachers and students as soon as possible to master and skillfully use the functions of the examination system for teachers and students in the examination process can actively and quickly solve the problems, to ensure the smooth progress of the examination.

4.2.4 Construction of Examination Integrity Atmosphere

The fairness and justice of the final examination require the candidates to strictly abide by the examination system and take the exam in good faith. The CUFE regards the integrity education of candidates as an essential part of the work of moral education. Besides, the Academic Affairs Office and the Student Affairs Office have carried out the integrity examination propaganda in various ways and put forward strict work requirements for the college. All colleges and classes have organized pre-examination lectures, in-depth interpretation of the 'Central University of Finance and Economics undergraduate examination room rules,' 'Central University of Finance and Economics final online examination candidates must know,' 'Central University of Finance and Economics student disciplinary management regulations,' and other relevant examination systems. We have firmly

established a rigorous examination style through these measures and created a good atmosphere for online assessment.

4.2.5 Care for Students

The online examination has higher requirements for students' networks, computers, and other hardware and software. We have thoroughly investigated the students' examination conditions in advance. For students with difficulties preparing for the examination, we have provided as much help as possible to ensure equality in the final test. For students who cannot participate in the examination due to exceptional circumstances such as epidemic control and sudden illness, the examination was postponed by the regulations. We pay attention to psychological counseling for students with psychological pressure in examinations, and professional psychological counseling experts serve one-on-one to help students cope with examinations calmly.

4.2.6 Training of Examination System

To enable teachers and students to quickly use the examination system, according to the characteristics and needs of teachers and students, the school has produced an illustrated operation manual, which simplifies the operation as much as possible so that teachers and students can use it conveniently and skillfully. At the same time, the school organized several training meetings, covering the groups of the teaching support team, teachers, invigilators, and students. Each college organized training separately according to the mastery of teachers and students. This systematic training provides the necessary guarantee for the smooth progress of the examination.

4.3 Quality Monitoring of the Whole Process

Quality is the lifeline of examination, and scores are the core interest of students. Therefore, the high-quality test embodies fairness and justice and the requirement of talent training quality.

The CUFE has established a final examination group, which included these members: (1) the school leader in charge of undergraduate teaching (principal examiner); (2) the director of the Teaching Affairs Office (deputy chief examiner); (3) the leaders of each college (chief examiners); (4) the staff of the Teaching Affairs Office and the teaching secretaries of each college (organization staff). In this process, the

examination team members earnestly implemented the final examination plan and worked according to their responsibilities. In addition, the school discipline inspection commission and the teaching supervision group also supervised and inspected all aspects of the examination, including the examination organization work of the Teaching Affairs Office and the course unit. In this final examination, face recognition, screen capture, screen cutting detection, dual-position, patrol examination, and other parts of the examination system were used to support the realization of high-quality tests from technical means.

5. Conclusions and Recommendations

The online examination practices of the Central University of Finance and Economics showed that large-scale online examination is practical and feasible as long as it is well-considered and well-organized. The successful trials of large-scale online tests have enhanced the confidence of teachers and students in online teaching and laid a foundation for the reform of education and teaching in the future. Since COVID-19, online schooling has been running for three years. The mentality of teachers and students is quietly changing, from exclusion and questioning to the current acceptance, indicating that teachers and students have gradually adapted to this mode. During offline teaching, teachers have become accustomed to using the online teaching platform to assist in the regular assessment of the course; more teachers have deep thinking on teaching work and actively practice classroom teaching.

The large-scale organization of online examinations will also improve the innovation ability of university teaching management departments. Teaching management departments should formulate various systems and ensure the effectiveness of system implementation; they should master hardware and software applications, deal with various emergencies, and comprehensively evaluate the risks in the examination process. In this process, the working idea of the management department will be more open, and the working efficiency and working ability will be significantly improved.

As a new type of work, the large-scale online examination may replace or surpass the original offline test. From the current practical effect, some links need to be improved, such as the

security of network data, the impact of online invigilation, and the quality and fairness of the test paper. These problems can be gradually solved by improving the information construction level and deepening school education and teaching reform. The following suggestions are put forward to improve the quality of online examinations.

5.1 Improvement of Teachers' Information Literacy

Good teacher information literacy is the foundation of the organization of large-scale online examinations. Information literacy refers to teachers' information ability and level, including teachers' information awareness, information acquisition, processing and useability, and application ability of modern teaching software, tools, and methods. The digital era has arrived. Currently, the country is implementing the digital strategic action of higher education. Teachers should take the initiative to adapt to this significant change and improve their information literacy. At the same time, schools should also take active measures to help teachers improve their information literacy.

5.2 Strengthening of the Construction of the Test Collections

A high-quality test database is critical to high-level online examinations. The test question bank plays a vital role in improving the reliability and validity of tests, which is more meaningful for online quizzes than traditional offline examinations. Meanwhile, the general online examination system has the function of random test papers, which can group dozens of test papers simultaneously. Therefore, the large number and high quality are the basic requirements of the test database. From the actual situation, schools and teachers pay more attention to constructing public and introductory courses, while professional courses are more needed. To improve the quality of examination and personnel training, it is necessary to pay attention to constructing the question bank of all systems in the future.

5.3 Research on the Integration of Teaching and Examination

The proposition and invigilation of online examination differ from offline examination, which requires a closer linkage between classroom teaching and assessment. Especially in the experimental and other courses where operation details need to be assessed, the invigilation of such classes is more complicated.

The screen contains test questions, answer areas, software operation interfaces, etc., and it is easy to have a blind spot for invigilation, which are prone to plagiarism and cheating in the examination. Therefore, teachers must consider teaching and tests, such as increasing the intensity of regular assessments and increasing the proportion of regular performance. Some operational ability tests should be carried out in regular classes as much as possible.

Online examination is not only an expedient measure during the epidemic, but its practice and development will have a more far-reaching impact. It will drive the reform of teaching methods, let more teachers think deeply about classroom teaching and curriculum assessment, and promote the teaching management department to explore the diversification of teaching work and talent training.

References

Dou, Y. (2022). Research on the Equivalence of Online and Traditional Test Scores: A Meta-analysis Based on International Empirical Research from 2000 to 2020. *Chinese Journal of Distance Education*, (01), 73-84.

Guo, W. (2020). What Is the Real Problem of Online Education Research—The Socratic Trap and the Transcendence over It. *Educational Research, 41*(09), 146-155.

Hu, X., & Xie, Z. (2020). On the Advantages and Challenges of Online Teaching & Learning in Universities & Colleges under the Epidemic, 4, 18-22.

Liu, G. (2021). Exploration and practice of online examination of soil mechanics course under the influence of epidemic situation. *China Journal of Multimedia & Network Teaching*, (03), 38-40.

QIN H, LI Z, ZHOU J. (2020). A Probe into the Satisfaction with Online Teaching of Different Subjects and the Willingness to Continue Using It —An Empirical Analysis Based on the Technology Acceptance Model. *Educational Research, 41*(11), 91-103.

Shen, G. (2005). The Suggestions of Improving the Quality of Examination Work in University. *Higher Education Forum*, (05), 77-79.

Shen, T., & Chen, J. (2015). Comprehensive Describes of Domestic Online Examination. *China Educational Technology & Equipment*,

(14), 19-22.

Shen, Z., & Shen, R. (2022). Research on Large-scale Online Examination of Ideological and Political Theory Course in Colleges and Universities. *Ideological & Theoretical Education*, (06), 77-82.

Xing, Y., Chen, Y., & Wu, B. (2020). Optimization Design of Online Examination System in Colleges and Universities. *College Mathematics, 36*(03), 35-39.

Yang, W. (2021). Discussion about online assessment in the teaching of analytical chemistry course. *Basic Medical Education, 23*(8), 581-584.