A Case Study on the Application of Paperless Examination in Public English in Higher Vocational Colleges

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Abstract. With the continuous innovation of information technology and the rapid development of digital education, paperless examination has gradually become the mainstream examination method by virtue of its advantages in the online and offline mixed teaching mode. The application of paperless examination in the final examination for the Public English course on the the Teaching Management Platform of Colleges and Universities in Guangdong Province can save resources, reduce costs, improve the accuracy and efficiency of marking papers, promote the teaching reform of the course and innovate the assessment. Taking paperless examination also puts forward higher requirements for teachers, invigilators, computer room managers and teaching management personnel. It is necessary to strengthen the technical invigilation means and the examination room management, strictly implement the examination disciplines.

Keywords: Paperless Examination; Public English course; teaching reform.

1   Introduction

With the development of science and technology, human beings have gradually developed to the form of "digitalization+artificial intelligence". In 2022, the Ministry of Education asked to "actively adapt to the needs of quality diversification, lifelong learning, personalized training, and modernized governance in the popularization stage of higher education, and accelerate the construction of a new form of higher education characterized by digitalization"[1]. As educational institutions for knowledge accumulation and dissemination, higher vocational colleges have been following the pace of science and technology, making full use of digital teaching platforms and actively promoting and exploring the new forms of digital teaching reform. Examination, as an important way to test students' knowledge level, is also an important step in the teaching process. In the context of the continuous innovation and rapid development of information technology, the means of examination have become more and more diversified. As a new form of examination that has arisen in recent years, paperless examination has been paid more and more attention.

Paperless Examination is also called "computer-based examination", in which students can directly complete the test on the computer, mobile phone Apps or mobile

electronic terminals. The Ministry of Education also clearly pointed out that "the promotion of paperless examination in colleges and universities has the advantages of saving resources, simplifying procedures and rigor, and has positive significance for improving the scientific and fair examination"[2].It can be seen that the adoption of paperless examination has become a new trend of teaching examination under the background of information technology. Guangzhou Huashang Vocational College (hereinafter referred to as "the College") has considered the situation and adopted paperless examination into the final examination of the Public English course from 2021 to 2023, which has achieved good results as well.

2   The Implementation Plan of Paperless Examination

2.1   The Demand for Teaching Reform

The Public English course is an organic part of curriculum system of vocational education, and is a compulsory public basic course for students of all majors in vocational colleges[3]. Adhering to the guiding ideology of "facing the Bay Area, focusing on positions, assisting majors and focusing on application", the College's Public English Course Team (hereinafter referred to as "the Team") has been reforming the teaching of the course. Through the Teaching Management Platform of Colleges and Universities in Guangdong Province (hereinafter referred to as "the Platform"), the Team has been carrying out the personalized learning and targeted tutoring online and offline to cultivate students' ability to learn and apply English. By exploring flipped classroom and blended teaching, the Team has been committed to building the Public English course into a high-quality instrumental and humanistic course, which students are "willing to learn at school and can use after graduation".

2.2   The Implementation Plan

In view of the reform needs, the College decided to take paperless examination for the final examination of the course on the Platform. The implementation plan of taking paperless examination for the course is generally composed of four parts: Question Bank Management, Test Generation Management, Procedure Management and Scores management, as shown in Figure 1.
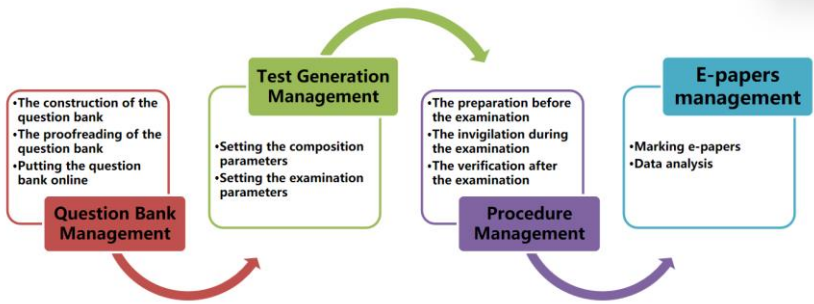
Fig. 1. The Process of Paperless Examination

2.2.1 Question Bank Management

(1) **The construction of the question bank.** According to the course teaching objectives, teaching contents and students' actual situation, the Team determined the examination contents and forms a question bank for the Public English courses, including the questions of listening, reading comprehension, translation, writing, etc, with varying amounts and difficulties.

(2) **The proofreading of the question bank.** The question bank for the course was proofread on three different levels. On the first level, the Team checked the correctness and preciseness of the question bank one by one, including the directions and reference answers of the examination questions. On the middle level, the related leaders of the College checked whether the examination questions in the bank can meet the requirements of the relevant examination regulations. On the top level, the experts of the English subject reviewed the validity of the questions in the bank, i.e. whether the academic level and English subject literacy of students could be fairly assessed thorough the examination based on the question bank.

(3) **Putting the question bank online.** Hereafter, the examination questions offline of the Public English course was imported online into the Platform, which surely are ensured to be correct and precise.

2.2.2 Test Composition Management

1) **Setting the composition parameters.** The setting of test composition parameters for the course included setting the question types, the difficulty ratio, the number and the scores for the test, etc.

(2) **Setting the examination parameters.** The setting of examination composition parameters for the course included setting the time limits, the examination questions extraction method for e-papers, and the questions in disrupted order, the anti-cheating model, the login limits, the screen toggling limits, score display method, etc.

2.2.3 Procedure Management

(1) **The preparation before the examination.** It would be needed to do a good preparation in the examination arrangement and invigilation training for taking pa-

perless examination. The preparation in the examination arrangement included debugging server, assigning examination IP address, generating examination login, invigilation links and the passwords, making examination schedule and timetable, etc. The preparation in the invigilation training refers to the training of invigilators beforehand, the contents of which included the overall process of the examination, the release of the login website and passwords, the guidance for students to log in, the exam precautions, the operations at the invigilation interface, the invigilation in the examination rooms, the normal emergency response plan, etc.

(2) The invigilation during the examination. The invigilation when taking paperless examination needed to be done well. During the examination, students would enter the login interface through the Platform in the arranged examination room with computers, type in the student's ID number and name, select the course in the exam list, browse the information, such as the subject, location, session and time, read the examination instructions, click the "Confirm" button when confirming the information and type in the password to enter the examination interface. When invigilation, the invigilators and inspection personnel would enter the invigilation login interface through the Platform, type in the session number and the corresponding session password to get into the invigilation interface, on which they would check the examination status and students' login status, answering time, remaining time, the updated answering progress, the submission time, screen toggling times, and so on. If any special circumstances occurred, they could handle with the guidance of the technicians from the Platform.

(3) The verification after the examination. It would be necessary to verify those special circumstances after the examination to avoid those careless mistakes. For example, the information of those students discharged from military service might not be updated in time, or students might go to the wrong examination location, or the students might have to change another computer due to some computer problems, etc.

2.2.4 E-papers Management

(1) Marking e-papers. The e-papers could be directly machine marked, including both the subjective questions and the objective questions. The Platform could provide a complete examination report, including all the detailed examination information of each student, such as: student's name, student number, examination session, examination location, examination subject, examination time, the landing time, the submission time, the total score (round), the objective score, the subjective score, the major, the class, etc.

(2) Data analysis. After the examination, the Team could easily obtain relevant data, such as: the rate of excellence, the rate of failure, the number of students in each score, the average score, the highest score, the lowest score, and the normal distribution of scores, etc.

3   The Results of Paperless Examination

Since 2021, the Team has implemented paperless examination for 6 semesters and established an examination system for the College. The practice shows that it has the advantages of saving resources, reducing costs, improving the accuracy and efficiency of marking papers, promoting the teaching reform and innovating teaching evaluation methods, which are all conducive to meet the needs for teaching reform of the course and improve the teaching level for the College.

3.1   It Saves Resources and Reduces Costs

According to the talent training plan of the College, students of non-English majors should spend 2 semesters to the learning of the Publish English course; the first semester is about general English learning, and the second semester is about workplace English learning. Before taking paperless examination, the College took the traditional paper-based examination. Every semester, about 5,000 students participated in the final examination of the course, with more than 5,000 copies of examination papers. The traditional paper-based examination involved many procedures, such as drafting out the paper manually, printing and packaging the paper, arranging the examination rooms, invigilating the examination, marking and archiving the paper, etc., which were not only cumbersome but also highly-cost. A successful final examination involved lots of personnel to send and receive the examination paper, to invigilate the examination rooms and to mark the papers. Based on the Platform, the separation of teaching and examination has been separated and the procedures of examination reduced. According to the pre-determined examination composition parameters and examination parameters, a large number of test e-papers with different contents could be generated and randomly allocated to the computer terminals. After the examination, the Platform could automatically collect the examination data and mark the e-papers. In this way, it does not only save the human and financial resources of the College, but also reduces the costs without using any papers, to a certain extent, it also do good for protecting the ecological environment.

3.2   The Accuracy and Efficiency of Marking Papers are Improved

The marking of questions has been divided into two parts: marking the subjective questions and marking the objective questions. The Platform, with the "computer reading and marking" method, can automatically mark each objective question completed by students and the error rate is zero[4], ensuring the accuracy of marking objective questions. The Platform has adopted the "content-based semantic technology" to understand the text content of the standard answers of subjective questions and students' answers through various semantic technologies, and automatically marked subjective questions based on the understanding of the semantic content. The text content of the answer to the subjective questions is regarded as a collection of paragraphs, the paragraphs as a collection of sentences, and the sentences as a collection of words. By forming a similarity matrix, the similarity of words is extended to the

sentence, paragraph and text levels, so as to compare the semantic similarity between students' answers and reference answer[5]. The accuracy of automatically marking subjective questions is now superior to manually marking. When taking traditional examination, teachers in the Team usually took an average of eight days from examination to the archiving. Whereas when taking paperless examination, the average time is shortened to 0.5 days, which not only reduces the work burden, but also enables faculty members to do evaluation at flexile time and reduces the burden of arranging centralized evaluation, assembling all faculty at one place on same time.[6].

3.3   The Assessment is Innovated

In addition to the text-description questions, the question bank of the course also includes pictures, voice, video and other forms of questions. Compared with the traditional paper examination, taking paperless examination helps to enrich the types of questions, so as to examine students' abilities comprehensively. In order to better construct and maintain the question bank for the course, the Team has innovatively built two groups of teachers to develop and improve the question bank according to the teaching objectives and the actual situation of students. One group is specifically responsible for establishing the question bank for the Public English course in line with the actual learning conditions of those who major in Business and Liberal Arts, including the majors of Business Administration, Big Data and Accounting, Marketing, Human Resource Management, Finance, International Business, Tourism and Hotel Management, Pre-School Education, etc. The other is responsible for those who major in Science and Engineering, such as the majors of Artificial Intelligence, Automobile Repair, Visual Media, etc. Thus, the Platform generates e-papers for students of different majors which are suitable with their academic level and the phenomenon that large numbers of students of certain majors failed in the examination has been avoided, and the final examination scores of different majors are always in a normal distribution. After the examination, the Platform automatically generate electronic files, including the randomly generated e-papers, student scores, examination data analysis tables, etc. Teachers only need to download and save, which all make the examination management more convenient.

3.4   The Teaching is Gradually Improved

After each paperless examination, teachers can view the examination data of students through the Platform, such as: the highest score, the lowest score, the average score, the standard deviation, etc.; teachers can also view the details of all students' answers, find out the questions on which students lost their points, and get to know the ratio of excellence and passing. Based on the statistics, the two groups can judge the difficulty level of the examination more objectively and reasonably and update the question bank and the composition parameters accordingly to improve the examination. Teachers can better understand the academic level of their students and analyze the actual learning conditions of students, which not only promotes the reflection on the teaching of the present semester, but also gives the direction for the teaching of the

next semester. At the same time, taking paperless examination is also one of the ways to assess the teaching reform of the College and the Group, and provides statistic support for the overall teaching reform. The practice shows that the two groups of teachers have already reset the difficulty level of the examination questions according to the examination results. The examination   quality has been improved and a stable question bank and examination composition parameters in line with the actual learning conditions of students has been formed. According to the analysis of the examination, the teachers have adjusted the teaching key and difficult points, updated their teaching methods and improved the teaching effect.

4 The Risks and Improvement Measures of Paperless Examination

Although taking paperless examination is convenient, it also puts forward higher requirements due to the new cheating behaviors or behaviors suspected to be cheating. Taking paperless examination requires students to have the general operating skills of information technology[7]. In addition, teachers, invigilators and computer room managers all need to master the basic operations to standardize the management of paperless examination. In order to prevent students from cheating behaviors, it is necessary to build a paperless examination management system [8].

4.1 The Risk of Cheating in Paperless Examination

Paperless examination truly breaks the traditional unified examination mode, and significantly improves the efficiency of organizing examinations. However, judging from the actual situations while taking paperless examination, there are suspiciously new cheating behaviors, and invigilators have some difficulties to judge whether students are cheating or not only based on their physical behaviors in the examination room. Students might find excuses to log out and re-log in to the examination interface with the answers to the questions by taking advantage of the time difference, even though the number of times to log in is strictly limited. Students might toggle the screen to look for the answers to the questions even though the number of toggling screen is strictly limited, and toggle back to the examination interface with the answers. Students might also use other browsers to log in to the examination interface and take the advantage of the translation function to translate the examination contents into Chinese even though the browser is strictly limited to Google. In theory, there must be hints when students doing the above behaviors. However, due to the minor movements and the huge number of students in one examination room, students still have chances to break the examination regulations. Because students do not follow the examination instructions to use the browser, the cheating behaviors can not be observed through the invigilation interface on the Platform.

As we know, cheating behaviour threatens exam validity as well as student learning and well-being [9]. Therefore, it is necessary to strengthen the technical invigilation means when taking paperless examination, and at the same time strictly implement

the examination disciplines to enforce the examination management to ensure the fairness and effectiveness of paperless examination.

4.2   The Improvements for Paperless Examination

In view of the possible cheating risks when taking paperless examination, the following measures can be taken to reduce the cheating risks and standardize the paperless examination management.

First, before the examination, the computer room managers should cut off the Internet connection and set mobile hard disk as "unreadable", install the appointed browser, open the examination link through the teaching management system in the computer rooms with the designated browser, so that students can directly log in after arriving.

Second, the examination parameters should be strictly set. The number of times that students can re-log in should be zero. If there are special circumstances, students need to report to the invigilator, and students can only re-log in when the permission is given from the invigilator. Thus, it can be avoided that students find excuses to log out the examination interface to find the relevant information. The number of times that students can toggle the screen should be zero. Students would be forced to submit or regarded as cheating if toggling screen. Thus it can be avoided that students toggle screen to look for the answers to the questions or to use the translation function. If there are special circumstances, the invigilator can use the "view student's computer" function through the teaching management system in the computer room to double check, thus to avoid misjudgments on students.

Third, invigilators should also check students' ID cards and pay close attention to students' behavior during the examination. At the same time, the video monitoring in the examination rooms should cover the whole process of examination. Therefore the data from the invigilation interface and from the teaching management system of the computer rooms and the data from the invigilators can be used to investigate and re-check violations after the examination.

Taking paperless examination requires the cooperation of the teachers, invigilators and computer room managers. The three should communicate and negotiate the examination requirements beforehand, make corresponding provisions, clarify their respective tasks, and cooperate to troubleshoot abnormal situations after the examination. In general, paperless examination management should achieve full coverage of the three stages, that is, the setting of software and hardware environment, the technical supports, and the after-treatment [10].

5   Conclusion

In the process of the Public English course teaching reform, the College adopted paperless examination on the Platform. On the one hand, it not only breaks the barriers of time and space, but greatly simplifies the steps of examination, which helps to save resources and reduce costs. On the basis of ensuring the confidentiality and fairness of

the examination content, it also realizes the automatic marking of subjective and objective questions, which helps to reduce the error probability and improve the accuracy and efficiency of marking. On the other hand, the multi-dimensional statistical analysis function plays an auxiliary role in the teaching and assessment researches, which helps to guide teaching in a targeted way and promote the teaching reform of the course based on the data. In the actual implementation of paperless examination, the question bank has been formed, which can meet the examination needs of students with different majors and different academic levels, and has gradually built a professional examination database for the Public English course, which innovates the assessment in the College. Taking paperless examination also puts forward higher requirements for teachers, invigilators, computer room managers and teaching management personnel. It is necessary to strengthen the technical invigilation means and the examination room management, strictly implement the examination disciplines. Only in this way can the paperless examination system be improved and the applicability of paperless examination be enhanced.

Acknowledgement

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