INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 15, Issue 3, (2025) E-ISSN: 2222-6990

Measuring Technology-Enhanced Assessment into Instructional Practices

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To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v15-i3/24930 DOI:10.6007/IJARBSS/v15-i3/24930

Published Date: 07 March 2025

Abstract

This paper explores the integration of Technology-Enhanced Assessment (TEA) into instructional practices in primary and secondary schools in China, in line with the educational reforms advocated by the Central Committee of the Communist Party of China and the State Council. The study emphasizes the role of TEA in enhancing the effectiveness, accuracy, and diversity of assessments through information and communication technology (ICT). It outlines a comprehensive framework for TEA that includes traditional assessments, innovative assessments, and assessment design stages. The findings suggest that TEA, through tools such as online questionnaires, learning management systems, and electronic portfolios, significantly improves the assessment process by providing timely feedback, facilitating self-regulated learning, and aligning teaching practices with students' needs. The paper concludes that the effective implementation of TEA can transform assessment methods, support personalized learning, and contribute to the modernization of the education system. Recommendations include the need for adequate training for educators, systematic integration of TEA tools, and continuous monitoring to optimize assessment practices.

Keywords: Technology, Instructional Practices, Enhance

Introduction

Recently, the Central Committee of the Communist Party of China and the State Council issued the overall plan for deepening the reform of education evaluation in the new era. This plan fully embodies the distinct characteristics of our times and clearly puts forward the following goals: adhere to scientific and effective methods, improve results evaluation, strengthen process evaluation, explore value-added evaluation, enhance comprehensive evaluation, make full use of information technology, and improve the scientific, professional, and objective nature of education evaluation. It reflects the diversity of education evaluation in the 21st century, moving away from a singular focus on results to consider the true nature of students. It aims to reverse the unscientific orientation of education evaluation, resolutely overcoming the detrimental issues of an overemphasis on scores, rigid structures, diplomas, superficial achievements, and outdated practices. The plan seeks to enhance educational

management capabilities and levels, accelerate education modernization, build an education power, provide satisfactory education for the people, and strive to cultivate the builders and successors of socialism with comprehensive moral, intellectual, and physical development in this new era of national rejuvenation.

In the overall plan, the words of science and modernization have been raised many times, and technology enhanced evaluation is a scientific and systematic educational evaluation close to the real situation. Technology Enhanced Assessment (TEA) is a systematic approach for evaluating and improving the performance and efficiency of technology processes, systems, or products. The aim is to enhance the technology level and competitiveness by analyzing and evaluating the performance of existing technologies, identifying opportunities for enhanced, and proposing optimization solutions. Technology enhanced assessment is a broad term covering a variety of approaches through which technology can be used to support the management and delivery of assessments in educational institutions, workplaces, and lifelong learning, professional training, and development. The novel and comprehensive framework of TEA lays the foundation for the systematic, accurate, effective and innovative application and use of TEA in educational institutions. System refers to a set of information and Communication Technology (ICT) tools and services, the ICT Toolset, to support the practical application of TEA, implement the TEA framework and use TEA with different ICT toolsets in different educational contexts, demonstrating the integration of the best TEA practices into the course. The ultimate goal of implementing scientific assessment is not only a better, faster, and more detailed assessment. It creates a powerful teaching and learning assessment method that can improve and improve the quality and efficiency of education. This article discusses the application of technology enhanced evaluation to the teaching practice of primary and secondary schools in China. The first part systematically understands what the evaluation of technology is enhanced; the second part describes the real educational situation in primary and secondary schools; and the third part is the systematic planning and implementation of technology enhanced assessment into the teaching practice.

Technology- Enhanced Assessment (TEA)

Tool and Platform

In the late 1980s, as personal computers began to spread, the transfer of information became easier. At the same time, with the continuous development of the Internet, tools used for learning assessment have become increasingly abundant. These online tools have made an important contribution to meeting the needs of various learning styles based on the concept of student-centered education (Laurillard, 2008). For example, according to a survey by (Jamil et al., 2018), in order to explore the potential of Assessment for Learning (AfL) through technology-based testing, and in order to assess students' perceptions of the benefits of AfL for enhancing adult learning in medical education settings. They administered six comprehensive assessments for learning activities to undergraduate medical students using the free online software Kahoot to create appropriate tests. In another example, due to the unique requirements and goals of the College of Dentistry (COD) at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia, and because existing solutions did not fully meet their specific needs. Therefore, they created a Web-based application (KEAP) (Al Ehaideb et al., 2024). In addition to this, Learning Management Systems (LMS) like Canvas, Moodle, Blackboard, etc., can provide

online testing and exam functions and can also track students' progress and performance. Online questionnaire tools like Google Forms, SurveyMonkey, etc. can be used to design and distribute questionnaire-based assessments. Teachers can also utilize Virtual Reality (VR) and Augmented Reality (AR) technologies to provide more immersive and interactive assessment. Different electronic online tools and platforms can be freely combined according to the actual needs of the students and the pedagogical goals of the teachers, which facilitates a better realization of the purpose of technology-enhanced assessment.

Three Stages to Enhanced

According to Bennet (2015), technology- enhanced assessment is divided into three stages. Briefly, the first stage is traditional assessment; The second stage is innovative assessment; The third stage is about the assessment design. I'll introduce these three stages in detail below.

Stage1: Traditional Assessment

In the past, many people equated assessment with a paper-pencil test, that is exam. The paper-pencil test is a useful tool for getting evidence of a variety of behaviors from students. For example, if a teacher wants to know what a student knowledge, it's easy to get that information from a traditional paper-pencil test of assessment, as long as the student can express his or her ideas in writing or can read and check off the choices on a multiple-choice test or other similar test. The traditional paper-pencil test assessment is sufficient for the mastery of knowledge points, but it has some limitations for the assessment of education. For example, it is difficult to measure students' practical operation ability in paper-pencil tests, and the content of the tests is easy to mislead students to focus on mechanical memory, which cannot well reflect personal creativity and reasoning ability. In addition, the paper-pencil test is designed for a certain content, and different content cannot be compared, so the norm is difficult to establish. Nowadays, with the development of science and technology, educational practice has also developed, and the traditional paper-pencil test methods are faced with challenges, and it is difficult to meet the needs of today's education. Moreover, both higher order thinking skills and 21st century skills emphasize the improvement of students' critical thinking and creative thinking. Therefore, some innovative assessment methods will be introduced in the second stage.

Stage2: Innovative Assessment

At this stage, we will make use of modern technologies and tools such as computers, the Internet and other digital technologies to carry out assessments and achieve more flexible, efficient and diversified assessment methods. For example, our common online questionnaires assessment, such as SurveyMonkey, Google Forms, Type form, etc., is used to collect and analyze respondents' opinions on a specific topic or issue to obtain valuable data and feedback. It is not only efficient, low cost, fast collection, but also more accurate to survey the population, we can directly find and confirm that the person filling in is the population we want to survey. Another example is mobile technology assessment. It is the use of mobile devices and related programs to collect, analyze and evaluate data, can enhance the flexibility and interactive teaching assessment in a number of ways. In addition to these two innovative assessment methods, there are social media, learning management system, visual presentation tools, e-examinations, e-portfolios, electronic

voting systems and electronic archives and so on, these are all types of technology used for assessment. In a word, the efficiency, accuracy and diversity of assessment can be improved through the effective use of these type of technology.

Stage3: Assessment Design

In order to make better, systematic and effective use of modern technology to improve the quality and effectiveness of assessment, I have divided assessment design into the following three key stages: The first stage is the use of technology to enhance the preparation of assessment. At this stage, we need to determine the purpose and objectives of the assessment, the content and scope, and what technology to choose for the assessment. The second stage is the implementation stage of technology- enhanced assessment. The assessment is carried out through the selected technology, the data collection and recording are carried out to ensure the real-time and integrity of the data, and the analysis and interpretation of the assessment data are carried out after the assessment is completed. At this stage, we need to pay attention to the following five principles (Fuller et al., 2022): (1) Advancing assessment authenticity; (2) Engaging learners with assessment; (3) Enhancing design and scheduling of assessment; (4) Optimizing assessment delivery and recording of learner achievement; (5) Tracking learner progress and faculty activity—supporting longitudinal learning and continuous assessment. The third stage is the technology-enhanced assessment results stage. According to the assessment results and feedback, the problems found in the assessment process to propose improvement measures and optimization. Therefore, we can know that through the above three key stages, we can better implement and optimize the technology-enhanced assessment.

Assessment

Assessment as Learning

(Earl, 2003) defines assessment as learning as the active participation of students in self-assessment and self-directed learning as a unique function of improving the learning process. In this view, the student is seen as an active and engaged assessor to support the development of metacognitive and self-regulated learning skills (Lam, 2016) . It requires students to be actively involved in monitoring their own learning progress and what they have mastered. The purpose of this approach is to put students in the shoes of the adjudicator to critically assess their work through practices such as self-assessment and peer assessment quasi (Chusni, 2022; Wijaya et al., 2023). By integrating assessment as learning into educational practice, students are encouraged to reflect on their learning, develop metacognitive skills, and be the director of their own educational path (Rapi et al., 2022).

Electronic Voting System (EVS) is also known as a question-and-answer machine or personal response system. Electronic Voting System is a classroom technology that facilitates increased student engagement, concentration, and maintained student attendance in the classroom. (King & Robinson, 2009) present an evaluation case study: based on students' perceptions, to assess the impact of EVS use on student learning and engagement. The results showed that most students were very positive about the usefulness and overall benefits of using EVS in the classroom. (Cubric & Jefferies, 2015) conducted a survey in which the authors referenced 64 peer-reviewed journal papers from 2000-2007 to

summarize the literature on the benefits of electronic voting systems. The authors state that: the first benefit is that Electronic Voting System improves attendance, participation, and engagement; the second benefit is that utilizing Electronic Voting System improves the quantity and quality of classroom discussions, and improves student performance and quality of learning; the third benefit is that using Electronic Voting System facilitates improved feedback from students and helps the teacher in effective formative assessment, as well as improving students' ability to compare their performance with others. Therefore, when using Electronic Voting System for learning assessment, the following aspects can be considered: Firstly, teachers need to choose a suitable Electronic Voting System according to the actual teaching needs and the number of students. Common e-voting systems are Poll Everywhere, Kahoot and so on. Secondly, when designing questions, teachers need to design clear and relevant questions to ensure that students can understand and answer them accurately. This facilitates effective assessment feedback. Finally, teachers should analyze students' performance and feedback based on the result reports generated by the e-voting system, make timely adjustments to teaching strategies and curriculum design, and continuously optimize the effectiveness of learning assessment.

Assessment for Learning

Most of the definitions of AFL now used are the second generation of AfL's definition of assessment for learning as part of the everyday practice of students, teachers and peers seeking, reflecting and responding to information from conversations, modeling and observations in ways that enhance ongoing learning. The second-generation definitions build on the first-generation definitions by making it clear that the central focus is on learning and that students and teachers are key elements in this process (Klenowski, 2009). (Lim, 2024) used 2018 TALIS data from 47 countries to investigate elements of the classroom environment. The findings suggest that AfL can be used not only as a tool in situations where students' learning processes are challenging, but also to understand and address the different learning potentials and contexts in the classroom.

The purpose of AFL is to embed the assessment process into teaching and learning and use it to better help teachers understand student progress and guide progress. Electronic Portfolio is a good electronic assessment tool. Electronic Portfolio bags (EP) are digital containers that are capable of storing visual and auditory content, including text, images, video, and sound. The EP is also a learning tool that can support a variety of instructional processes and assessment purposes. (Meyer et al., 2010) conducted an experiment with an experimental group of students using Electronic Portfolio on a regular basis, and after one year they found that teaching with ePEARL had a positive impact on students' literacy and self-regulated learning skills when the ePEARL tool was used on a regular basis and integrated into the classroom instruction. The advantage of the Electronic Portfolio is that it can overcome deficits in core competencies by engaging learners. electronic Portfolio also allows for detailed tracking of the development of students' work (Fuglík, 2014). Teachers can create an Electronic Portfolio at the beginning of the semester or sometime during the semester, depending on the type of student. When utilizing the Electronic Portfolio, teachers can record data such as student test scores, homework completion, and class participation in the Electronic Portfolio. Personalized assessment of students based on the Electronic Portfolio provides targeted feedback and guidance based on students' needs and characteristics and serves as an important basis for formative assessment.

Assessment of Learning

Assessment of Learning (AoL) is assessment with a summative function, which is often used to judge performance and measure outcomes after formal learning activities (Crooks, 2011). Summative assessment is an assessment tool often used by schools and teachers, with common summative assessment tests, projects, and presentations to name a few. Summative assessments are essential for assessing student achievement at the end of a learning period and provide a quick snapshot of what students have learned during the semester. In an investigation to quickly measure learning and development in literacy, numeracy, social and emotional learning (SEL), and executive functioning (EF) skills of 4- to 12-year-old children in the EiE program, the authors designed the Holistic Assessment of Learning and Development Outcomes, HALDO, and analyzed the data to draw conclusions. The authors concluded that the HALDO is a more holistic assessment of learning and development that provides a quick snapshot of children's skills in EiE (Krupar & D'Sa, 2024).

As a result of COVID-19, schools around the world have been forced to teach online. So, online assessment methods are on the rise. (Dennick et al., 2009) points out that online assessments can reduce the marking burden, release results quickly, and enable exam boards to review results quickly. According to (Makokotlela, 2022) , the implementation of online summative assessment is due to the university's belief that summative assessment is key to ending the academic year and allowing students to make progress. Online Questionnaires serve as an online assessment that measures mastery of the lesson based on student feedback on assignments and student satisfaction at the end of the course. Before creating an online questionnaire, be clear about what you want to assess. When creating an online questionnaire, create questions that meet the learning objectives and are appropriate for the level of the learner. Also use different forms of questions to collect answers. Platforms such as Google Forms can be utilized to distribute online questionnaires. Once the responses are received from the students, analyze the data to understand how the students are learning and form a summative assessment.

Instructional Practices

Teachers' Teaching

Formative Evaluation

The role of teaching evaluation is not only after the study of the students' learning results, and teachers teaching progress and teaching results to make a simple conclusion, more important is in the process of teaching and learning of teachers 'teaching and students' learning feedback, reflection, improvement, optimization, improve the efficiency of teachers 'teaching and students' learning. This section mainly talks about how to use the formative evaluation more efficiently in the teachers' teaching. For example, when adding and subtracting the fraction of different denominators: Teachers can first understand the students 'knowledge background through the pre-class investigation, of course, this form of pre-class survey can be conducted in the form of electronic questionnaire or electronic voting. For example, to understand the students' learning situation of adding and subtracting to the same denominator score. This pre-class survey can be conducted in the form of questionnaire, or in class, before the formal lecture in the form of course introduction, which can not only understand the students' knowledge reserve related to this class but also do a simple classroom introduction. So, facilitate teachers' subsequent course, if the content of the students for learning knowledge situation is better, so teachers can directly import the

knowledge of this lesson, but if the students with the denominator plus and minus master's in general, teachers can adjust their education teaching strategy, can choose to guide students to review, in this lesson course import. Secondly, in class, after the teacher talks about the method of adding and subtracting the denominator, students can use their own understanding and language to make a simple summary. This summary is the students' feedback on the knowledge and content spoken by the teacher, rather than a simple indoctrination of knowledge. This can not only effectively improve the interaction between teachers and students, but also timely improve and optimize the teaching process.

At the same time, the corresponding evaluation table can also be designed in the classroom for teachers' self-evaluation. Because the evaluation is not a unilateral evaluation of teachers or teacher evaluation of students, the evaluation is diversified, including self-evaluation, expert evaluation, peer evaluation and other evaluations. In order to make the evaluation more efficient, objective and real, we must carry out a comprehensive evaluation. Then, in addition to students' classroom feedback, teachers can also design classroom evaluation forms for themselves for self-feedback and self- reflection. For instance, in Table 1:

Table 1
Classroom Evaluation Form

Evaluation project	**Evaluation points**	**Summary of facts**	**Monthly evaluation**	**Term evaluation**
The theory is clearly narrated, and can be correctly reported by students (to make students understand)	▪ Is it clear to tell, the blackboard writing theory? ▪ Do you want a student to rephrase it?		/ /	
The example board book is clear, the students can correctly master the answer template (let the students master)	▪ Is it clear and complete for the example board book and explanation?		/	
The logic of the idea and process is clear, and students can understand and use logical thinking to solve related questions independently (teach students to use them)	▪ Is each step of the solution process clearly explained? ▪ Do you cite the relevant questions according to the examples, and let the students try to answer and get feedback?		/ /	

Actively interact with the students in the class, to understand the students' class lectures and grasp the situation in class	▪ Do you have eye contact and other communication with students in class (find students to answer questions, and try to write on the blackboard)?		/	
Timely feedback after class	▪ Are you giving timely feedback on students' homework problems and class status after class?		/	
Timely tutoring after class	▪ Are the students who do not fully master the knowledge being tutored after class?		/	

From the scale, we can see that this evaluation runs through the whole teaching process, and teachers can reflect on the scale, so as to adjust the education and teaching strategies and methods in time, so as to promote the more efficient implementation of education and teaching. In the process of formative evaluation, of course, can also invite other teachers to listen to lectures, there is an old saying called "do authorities onlookers", sometimes immersed in the classroom teachers cannot timely recognize the problem, so find teachers to listen to lectures can be the fastest aid to find the problem, to adjust the education teaching strategy, more efficient to complete the teaching.

Summative Evaluation

For summative evaluation, the most common is that at the end of the semester, students make summary feedback through electronic questionnaires or electronic voting. The summary evaluation of teachers mainly includes the following parts, students 'evaluation of teachers, teachers' self-evaluation, mutual evaluation among colleagues and school leaders 'evaluation of teachers' work results. We can mainly use the form of electronic questionnaire to conduct the evaluation, but we should pay attention to the design of the questionnaire, according to the comprehensive design of the teaching tasks, teaching objectives, teaching process and so on of the whole semester. These can include:

Students' Evaluation of Teachers

Whether the teacher's blackboard writing is clear, whether the teacher's lecture rhythm is smooth adaptation, whether the teacher's feedback is timely, whether the teacher makes you understand more through examples, and other questions to fully understand the students' evaluation of the teacher's lecture.

Teachers' Self-Evaluation

Whether I am clear about my teaching objectives, whether I use a variety of teaching tools, whether I complete teaching tasks, whether I timely reflect after class, whether I timely adjust the teaching plan according to students 'learning situation to understand teachers' reflection and evaluation.

Mutual Comments among Colleagues

Whether teachers can actively interact with students in class, whether teachers are skilled in the use of multimedia, whether teachers' pay attention to students' personalized (fully pay attention to each student) and other issues to understand the comprehensive ability of teachers.

Evaluation of the School Leaders

Whether the teacher completes the prescribed teaching task, whether the teacher meets the school required attendance rate and subject research, so as to investigate the comprehensive performance of the teacher.

Students' Learning

Students are allowed to fill in data in their private profile, access their disciplines and received assessments, respond to formative assessments, record significant events for their education, check and compare their performance with their cohort, register extracurricular activities, and consult critical incidents recorded.

Teachers can use electronic portfolios to help students track the evaluations and feedback they receive, identify their strengths and weaknesses, and develop next learning goals and plans. Diagram 1 and 2 illustrates two pictures showing the medical student's profile and performance report in an electronic portfolio (e-portfolio).

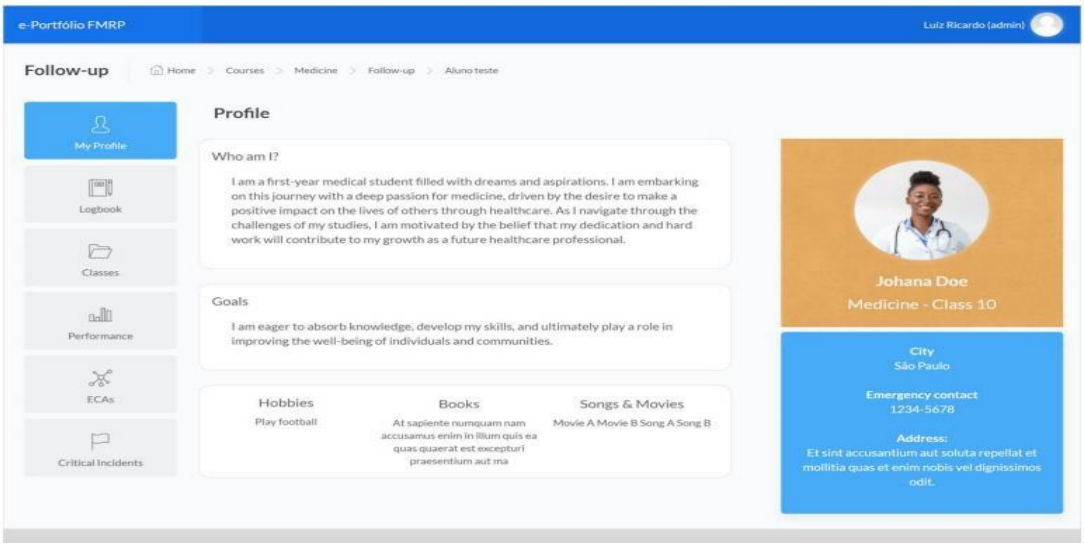

Diagram 1: Profile created by the student in the e-portfolio

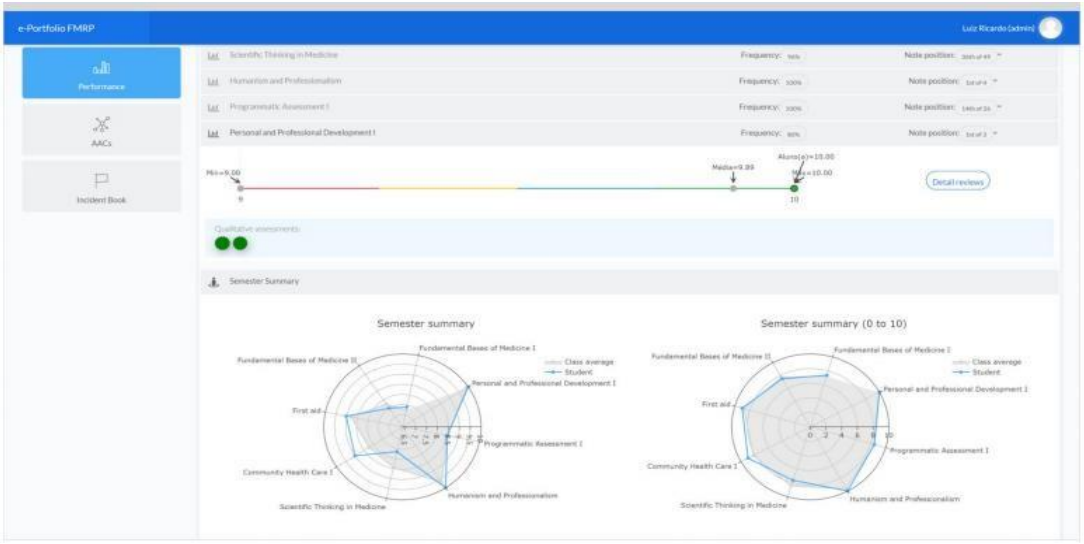

Diagram 2: Student's performance in various subjects is presented in relation to the radar chart: the blue line represents a comparison with the cohort mean (depicted by the gray area).

The advantage of electronic portfolio is that it can overcome the deficiency of core competitiveness by attracting learners and motivating students to learn. The use of similar tools has been recognized for stimulating personal reflection, fostering collaboration, and strengthening digital literacy among students, encouraging active participation in the learning process (Mudau & Modise ,2022).

Incorporating Technology-Enhanced Assessment into Instructional Practices

This chapter mainly explains in detail how to integrate online questionnaires into teaching practice. Online questionnaires are commonly used tools in educational assessment and are of great significance to student learning and teacher teaching. For students, online questionnaires give students the opportunity to reflect on their learning methods and results, thereby improving their ability to self-awareness and self-improvement. Students can express their views and suggestions on classroom content, teaching methods and learning resources through questionnaires, making teaching closer to actual needs. For teachers, online questionnaires can reveal potential problems in teaching, such as students' difficulty in understanding and weak grasp of knowledge points, which helps teachers make targeted adjustments. Online questionnaires provide a communication channel, promote understanding and interaction between students and teachers, and thus establish a more harmonious teaching relationship.

The following is a snippet of the online questionnaire of the teacher's evaluation of students' learning:

1. Do students actively participate in class discussions? (Always, Often, Sometimes, Rarely)
2. Do students take the initiative to review and preview after class? (Always, Often, Sometimes, Rarely)
3. Can students take the initiative to ask questions and answer questions? (Always, Often, Sometimes, Rarely)
4. Are students good at using various learning resources, such as textbooks, the

Internet, etc.?
(Very good, Good, Average, Not good)
5. How focused are students in class?
(Very focused, Focused, Average, Not focused)
6. Can students cooperate with classmates to learn effectively? (Very good, Good, Average, Needs improvement)
7. Can students make improvements based on the teacher's feedback? (Always, Often, Sometimes, Rarely)

The following is a snippet of an online questionnaire on students' evaluation of teachers' teaching

1. Is the teacher's explanation clear and easy to understand?
(Very clear, Relatively clear, Average, Relatively vague, Very vague)
2. Is the course content organized in a logical order to help understanding and learning?
(Very organized,Relatively organized, Average, Relatively disordered, Very disordered)
3. Does the teacher use a variety of teaching methods, such as demonstration, discussion, group activities, etc.?
(Always, Often, Sometimes, Rarely, Never)
4. Does the teacher's teaching method help you understand and master the course content?
(Very effective, Relatively effective, Average, Relatively ineffective, Very ineffective)
5. Does the teacher encourage students to ask questions and participate in discussions in class?
(Always, Often, Sometimes, Rarely, Never)
6. Does the teacher provide enough tutoring and help after class? (Always, Often, Sometimes, Rarely, Never)
7. Is the teacher's feedback on homework and exams timely and constructive? (Very timely and constructive, Relatively timely and constructive, Average, Relatively untimely and unconstructive, Very untimely and unconstructive)

Overall, online questionnaires, as an assessment method, connect students' learning with teachers' teaching, thereby improving learning and teaching outcomes and promoting the overall improvement of education quality.

Conclusion

In conclusion, unlike traditional paper-and-pencil tests, technology-enhanced assessments offer amazing benefits to both students and teachers. These benefits include reducing testing costs, improving the scoring process, providing a flexible testing schedule, and providing timely diagnostic reports.In other words, the transition from traditional assessments to technology -enhanced assessment. Bennet (2015) divided the technology-enhanced evaluation into three stages. The first stage is an evaluation of presenting only traditional questions (such as multiple-choice questions) on a computer screen. The second stage system often presents innovative types of questions to maximize the quantity and quality of interactions between students and the questions. For example, problems can be presented in multiple formats, such as using video or hypermedia or analog environments. These questions are designed to provide a realistic assessment environment, providing students with the opportunity to apply their knowledge to real-life scenarios. In the final stage, decisions about the assessment design, content, and format are determined by the learner

model (or the student model), so we can provide a more interactive assessment environment for students. Technology Enhanced Assessment uses a wide range of technologies to provide problems (e. g., through computers and smartphones), allow students to interact with problems (e. g., watching videos), and provide timely feedback and score reports (e. g., automated paper scoring).For a broad range of educational assessment aspects and purposes, various types of technology-enhanced assessments such as formative or summative assessments, classroom or large-scale assessments, and self- or peer assessments have been developed. I not only know the category of TEA but also master the application of TEA through this article system. Before the initiation of TEA, teaching objectives and evaluation objectives were defined. Select appropriate technology tools and platforms such as Moodle, Quizlet, Canvas, and automatic scoring system, and use technology tools to design a variety of evaluation activities to comprehensively evaluate students' learning. Finally, the automatic scoring tool was used to let students get feedback immediately after submitting their answers to help them quickly understand their learning.

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