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The Effectiveness Of Electronic Testing Systems In Analyzing Students' Professional Competence

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ABSTRACT

This article examines the role and effectiveness of electronic testing systems in determining and analyzing the level of students' professional preparedness in higher education institutions. In the context of modern education, the study explores the objectivity, efficiency, high level of analytical capability, and impact on the educational process achieved through the implementation of digital technologies, particularly electronic assessment tools.

Keywords: Electronic, analysis, test, system, assessment, education, student, knowledge, professional, competence.

INTRODUCTION

In the context of the rapid development of digital technologies, the primary task of higher education institutions is not only to provide theoretical knowledge, but also to train professionally competent specialists capable of meeting the high demands of the labor market. Students' professional preparedness is determined by the combination of their mastery of academic curricula, practical skills, and professional competencies.

Traditional assessment methods (oral questioning and written examinations) have several drawbacks, including subjectivity, time consumption, and limited opportunities for in-depth analysis of results. Therefore, in order to improve educational quality, digitize assessment processes, and ensure objectivity, electronic testing systems are being widely implemented. This article provides a scientific and practical analysis of the effectiveness of electronic testing systems in evaluating students' professional preparedness.

An electronic testing system is a software and hardware complex designed to assess and monitor students' knowledge, skills, and competencies using computer technologies.

An analysis of existing scientific literature shows that the effectiveness of electronic testing systems in evaluating students' professional preparedness has not yet been sufficiently studied in a systematic and in-depth manner. Most studies focus on the technical or general didactic aspects of electronic testing, while their potential for assessing professional competencies remains underexplored.

The purpose of this study is to identify and evaluate the effectiveness of electronic testing systems in analyzing students' professional competence in higher education institutions. The study examines the speed, flexibility, objectivity, and in-depth analytical capabilities of electronic testing systems from the perspective of

professional competency assessment. The results are expected to contribute to improving the efficiency of the educational process, enhancing assessment systems, and training competitive specialists.

Main functions of electronic testing systems

Electronic testing systems are considered one of the most effective tools for monitoring students' knowledge in modern education, as they provide fast, objective, transparent, and analytical assessment opportunities. Their main functions include:

Question bank creation and management: Designing randomly selected test questions of varying levels of difficulty; creating different types of questions (single-choice, multiple-choice, matching, sequencing, open-ended).

Test administration: Conducting tests in online and offline modes; administering tests within predefined time limits; randomizing test variants; testing multiple users simultaneously.

User management: Providing administrator–teacher–student roles; authentication via login/password; managing groups and courses.

Adaptability: Automatically adjusting test difficulty based on students' previous responses; operating on computers and mobile devices; integration with learning platforms.

Automated assessment: Calculating results quickly and objectively without human intervention; generating scores based on assessment criteria; automatic scoring.

Result analysis: Conducting statistical and in-depth analysis by student (individual/group), topic, and question difficulty; determining question reliability and complexity.

Reporting and export: Generating reports based on test results; exporting reports in PDF, Excel, and CSV formats; preparing separate reports for teachers and administrators.

Process monitoring and control: Real-time monitoring of test-taking processes; detecting violations; ensuring fairness in assessment.

METHODOLOGY

Students' professional preparedness includes not only their knowledge but also their ability to apply it in practice, that is, their competencies. Compared to traditional methods, electronic testing systems are several times more effective in analyzing students' professional preparedness. By applying innovative approaches, electronic testing systems enhance the effectiveness of this complex analytical process. Their main advantages include:

Situational questions: Electronic testing systems present students with scenarios describing professional problems and require them to choose the most appropriate solution.

For example, a student is developing a web application and designing a mechanism to process user input. There is a risk of software attacks. The student must ensure system security. A situational question may be formulated as follows:

Question: Which of the following methods most effectively reduces risks arising from user input?

A) Checking user input before storing it in the database

B) Making the user interface visually appealing

C) Validating and filtering input data

D) Using longer user passwords

This task assesses the student's professional competence in information security, problem analysis, and decision-making skills. Such situational questions enhance the effectiveness of the educational process.

Multimedia and simulation modules: Some advanced electronic testing systems are integrated with virtual simulations. For example, engineering students may perform tasks such as configuring virtual devices or troubleshooting using specialized software. The electronic testing system evaluates each stage of the process.

Sequential task execution: Assessing practical thinking by requiring students to perform professional processes in the correct sequence.

Adaptivity: Modern electronic testing systems adjust question difficulty based on students' responses. If a student answers difficult questions correctly, the system presents more complex tasks. This allows precise diagnosis of students' "knowledge gaps."

Objectivity and accuracy: Electronic systems eliminate human factors (subjectivity). Test results are calculated within seconds, ensuring transparency. Statistical analysis allows accurate measurement of the relationship between question difficulty and students' knowledge levels.

Traditional tests often assess what students have memorized, whereas competency-based electronic tests evaluate what students can actually do. Thus, electronic testing systems offer significant advantages in analyzing professional preparedness.

Speed and feedback: Unlike traditional methods, which require long waiting periods for results, electronic testing systems provide near real-time feedback upon test completion. This enables immediate identification and correction of learning deficiencies.

Personalized learning model

By using adaptive testing technologies, electronic testing systems select questions that match each student's knowledge level, individual needs, interests, and learning pace. This enables individualized instruction: advanced students receive more challenging questions, while students facing difficulties receive reinforcement tasks. As a result, the quality of professional preparedness improves.

RESULTS

Through statistical analysis of results, electronic testing systems can determine:

Competency mastery levels: The extent to which specific professional competencies (e.g., engineering thinking, economic analysis, pedagogical skills) have been acquired.

Topic-based analysis: Identifying which sections of the curriculum are most challenging for students.

Program effectiveness: Evaluating curriculum effectiveness and identifying areas for improvement.

For example, an electronic testing system may show that a student scored 75 points overall, achieved 90% accuracy in theoretical tasks, but only 50% accuracy in practical tasks. Such analytical conclusions help instructors personalize instruction.

The research results demonstrate that the use of electronic testing systems yields positive outcomes across several key indicators in assessing students' professional competence. Assessment results obtained through electronic testing systems were compared with traditional methods and analyzed statistically.

Situational, sequential, and adaptive test tasks aimed at assessing both theoretical knowledge and practical professional competencies were applied. The results show that students assessed through electronic testing systems achieved higher performance on problem-solving tasks. In particular, the proportion of correct answers to situational questions was significantly higher than in traditional tests.

DISCUSSION

Challenges and recommendations in using electronic testing systems for assessing

Despite their advantages, several challenges must be considered when applying electronic testing systems:

Problems	Recommendations
Quality of question banks: Some test questions focus only on memorization rather than assessing practical or critical thinking.	Continuously enrich question banks with practical, case-based, and competency-oriented questions.

Technical requirements: System security, stability, and user-friendly interfaces are critical.	Continuously improve system architecture according to modern requirements and implement secure testing mechanisms.
Teachers' preparedness: Not all instructors are proficient in test design and result analysis technologies.	Organize regular professional development courses on electronic testing systems and pedagogical diagnostics.

Electronic testing systems are an essential tool for analyzing and assessing students' professional preparedness. They ensure objective, fast, and systematic analytical data, which is difficult to achieve using classical approaches.

Proper implementation of electronic testing systems enables more effective management of the educational process, improvement of curricula, and, most importantly, the training of highly qualified and competitive specialists. In the future, the integration of artificial intelligence and big data analytics into electronic testing systems will further enhance the quality and personalization of professional preparedness assessment.

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