

BENEFITS AND PITFALLS OF ELECTRONIC KNOWLEDGE TESTING

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Abstract

Electronic testing offers many advantages over traditional paper-and-pencil testing, such as a more natural testing environment for today's students, immediate feedback, more effortless organization and logistics, and immediate data analysis. On the other hand, there is a higher risk of students cheating on electronic tests. Electronic testing can improve the educational process, but it is essential to be aware of the potential drawbacks and take steps to mitigate them. Electronic testing of knowledge is a new trend in higher education. It is important to remember, however, that didactic tests are only one of many ways to assess students, and they should be combined with other forms of assessment to obtain a comprehensive picture of student knowledge and skills.

Keywords

Advantages and disadvantages of e-testing; Academic dishonesty in e-testing; Authenticity and security of e-testing; E-testing in foreign language education.

Introduction

Distance education is a valuable addition to traditional teaching. The positive experiences gained during the pandemic with distance education should be considered in traditional education. They should be implemented in legislation and standards for accreditation in higher education. Electronic testing is a shining example of effective teaching, whether it is done in person or remotely by external experts in academia, research, art, architecture, or corporate practice. Additionally, the situation may arise when the academic responsible for teaching is working but still be able to provide remote synchronous teaching. Last but not least, the academic might be unwell but can nevertheless provide teaching in a remote synchronous way.

1 Comparison of Electronic and Traditional Tests

Electronic tests are administered on computers or electronic devices, questions are displayed on a screen, and answers are usually selected or typed electronically, evoking the natural environment in which the current generation of learners commonly operate. Traditional tests, where questions and answers are usually handwritten, are becoming an outdated testing format. On the other hand, it is necessary to take into account the warnings of experts ([1], [2], [3] and others) about the adverse effects of the use of electronic devices on cognitive processes. Excessive use of electronic media can lead to a reduction in the ability to maintain attention and concentration on a single task. Electronic communication is often asynchronous and less dependent on nonverbal communication, which can result in a loss of ability to read

and interpret emotional signals during face-to-face communication. An overabundance of digital learning can reduce the need to remember information, leading to a decline in the ability to recall information.

The recent pandemic has accelerated digitalization, a change often seen as a temporary response to the pandemic. Many of these changes may have significant long-term implications for how tertiary education is delivered and integrated with information technology. Some authors [4] have highlighted that electronic tests offer more flexibility regarding the time and place where they can be taken. Test takers can often choose the time and place that best suits them. However, the distance form of electronic testing may be more prone to cheating and unauthorized access if not properly secured. The measures often used, such as online surveillance and secure browsers, are insufficient. Nevertheless, it is crucial for the other attributes of e-testing, which will be discussed in later sections of this article, to incorporate e-testing, especially in face-to-face form, into tertiary education.

Commonly used online testing systems provide instant feedback, allowing test takers to see their results and correct answers immediately after completing the test. Instant feedback allows immediate recognition of errors in a relevant context and increases learning efficiency. Traditional tests typically require manual scoring, which means test takers must wait for their results, and error awareness occurs in a time-weakened context. Most universities in the Czech Republic [5] use two types of e-learning platforms for knowledge testing: MOODLE (open-source) and INSIS (proprietary software). The choice of platform then determines the assurance of authenticity of testing and avoidance of cheating; technical problems with the equipment and software errors that can affect the testing process; data protection; automatic assessment that saves time and facilitates the process of evaluating results; statistics and analysis; and above all, different types of test questions.

Traditional testing, which requires the printing and distributing of physical test materials to large numbers of test takers, often presents challenges in organization and logistics. Printing and distributing printed tests can be not only resource-intensive but also time-consuming. This can be problematic, especially when large-scale testing at the institutional level is involved. In this context, electronic testing is an efficient and environmentally friendly alternative. Electronic tests administered online eliminate the need for printing and physical distribution. In addition, electronic tests save on printing materials and transportation costs, resulting in economic savings. Electronic testing makes adjusting the number of test takers easier without printing additional test materials.

Data from electronic tests can be easily stored and analyzed, providing information not only about the performance of the test-takers but also about the test items themselves. Statistical summaries allow for better item selection in subsequent use. Advanced testing systems can incorporate adaptive methods [6] which means that the next question is chosen based on the result of the previous question. This adaptive testing allows for a more comprehensive assessment of knowledge. Statistical methods can be employed to evaluate the difficulty level of each test item. Data from traditional tests take significant time to process. Electronic tests provide a convenient way of collecting data, and built-in statistical methods allow for the evaluation of the difficulty of each test item. This ensures that the test items are well-balanced. Electronic tests keep track of the time taken by test-takers to answer individual questions. This data can be used to analyze whether the items are too easy or too difficult.

Available testing systems offer a wide variety of testing tasks [7], which can be classified into the following categories:

- a) Multiple-choice tasks
 - Drag and drop into the text

- Drag and drop markers
 - Drag and drop onto the image
 - Drag-and-Drop Matching
 - Embedded answers (Cloze)
 - Calculated multichoice
 - Matching
 - Multiple choice
 - Ordering
 - Random short-answer matching
 - Select missing words
 - True/False
- b) Open tasks
- Essay
 - Short answer
 - Formulas
- c) Other types of test tasks
- Calculated
 - Calculated simple
 - Numerical

Standardized test tasks can be a limitation for some areas of natural and technical sciences, such as geometry, trigonometry, differential geometry, constructive geometry, machine and equipment design, and visualization in architecture and design. In general, the type of knowledge and skills that require creative capture (drawing) can be considered problematic for electronic testing. A solution is to use specialized software on a personal computer to solve the task and then insert the results as an image into the testing system. Alternatively, use a tablet that offers a variety of drawing tools and features. The tablet's touch pen allows for precise drawing and allows for creating different effects. A computer is better if we need access to a broader range of tools and features and more precise control. A tablet is a good choice if we are looking for a portable and easy-to-use device.

Tab. 1: *Suitable test tasks for language skills and knowledge*

Language skills:	Categories of test tasks
Speaking	(not included in the written exam)
Reading comprehension	Multiple choice tasks, partially Open tasks (Short answers)
Writing	Open tasks (Essay)
Listening.	Multiple choice tasks, partially Open tasks (Short answers)
Commonly tested language skills:	Categories of test tasks
Grammar	Multiple choice tasks, partially Open tasks (Short answers)
Vocabulary	Multiple choice tasks, partially Open tasks (Short answers)
Pronunciation	(not included in the written exam)
Spelling	Multiple choice tasks, Open tasks (Short answers, Essay)
Phrases and idiomatic	Multiple choice tasks, Open tasks (Short answers, Essay)
Syntax.	Multiple choice tasks (best suited Drag and drop into text, Ordering, Select missing words)

Source: Own

Test tasks are perfectly suitable for the humanities and social sciences. Table 1 illustrates how to choose test tasks for individual language skills and knowledge in foreign languages. Foreign language didactics work with traditional language skills: speaking, reading comprehension, writing, and listening. The language skills usually tested are grammar, vocabulary, pronunciation, spelling, phrases and idiomatic expressions, and syntax. Table 1 also demonstrates that typologically testable tasks allow for the testing of language skills and knowledge in the case of foreign languages.

2 Assessing the Authenticity and Security of Electronic Testing

The previous chapter outlined the reasons for including e-testing as an effective assessment tool in tertiary education. However, with the growth of e-testing, entirely new issues have emerged (e.g. [8]) which the author believes should be addressed:

- student identification and authentication,
- prevention of cheating,
- security of testing platforms,
- data security,
- development of anti-plagiarism mechanisms,
- ethical and pedagogical aspects.

Education theorists, even in the case of traditional tests, have discussed some of the mentioned topics. However, they have gained new attributes in the new era of electronic testing. To illustrate, it is worth noting that instances of cheating occurred even in traditional paper-based tests, where a different student could write the test instead of the genuine one. One measure is to perform mandatory or random student identification in the teaching space. We prefer the in-person form of electronic tests to make the best use of the advantages and minimize the risks of electronic testing. Despite identifying students in the educational space, it cannot be guaranteed that the person taking the test in the in-person format of electronic tests is a genuine student. A student could provide their authentication information to another person, who may complete the test despite the student's presence in the room.

Identifying and authenticating students during e-testing is critical to ensuring the authenticity of testing and protecting against academic cheating. The choice of the appropriate identification and authentication method depends on several factors, including the type of exam, whether it is an entrance exam or a standard end-of-semester test, and the level of security required. The available methods of identification and authentication in electronic testing are [8]:

- username and password authentication,
- token authentication, and
- biometric authentication.

Authentication using a username and password is the most simple and commonly used method for allowing access to an e-test. The student's username and password are stored in a database and they are prompted to enter them during testing. However, this method is not very secure as students may share their login credentials with others, which can lead to cheating.

A more reliable method is authentication using a unique token, which the student must enter once during the e-test. This method provides better protection against cheating than login and password authentication.

Another highly reliable method of identification is biometrics. It is based on an individual's unique biological characteristics, such as fingerprint or retinal scans. Since it is challenging to deceive, this method is considered highly secure.

Ways to **prevent cheating on electronic tests**, including using unauthorized materials or collaborating with other students, include [9]:

- the use of randomly generated questions,
- the use of tracking and monitoring tools,
- the use of testing environments with limited features.

The use of randomly generated questions can make it more challenging for students to collaborate during tests. However, tracking and monitoring tools can help to keep an eye on students' activities during the test, such as their screen movements or use of unauthorized electronic resources. Another method is to use test environments with limited features, which can prevent students from quickly accessing unauthorized resources and limit opportunities for collaboration. It is important to note, however, that no method is entirely foolproof in preventing cheating. Nevertheless, the above mentioned approaches represent measures that can significantly reduce the risk of academic cheating.

The security of test platforms is primarily the responsibility of the developers and test platform operators. The e-testing (e-learning) system is susceptible to various forms of attacks, including hacking and misuse. If hackers gain access to an e-learning platform, they can damage or attack other critical information systems such as student administration systems, financial and accounting systems, human resource management systems, project and research management systems, document management, and archiving systems. It is important to compare the security of test platforms for proprietary and open-source software [10]. Proprietary software is more secure because only a few people have access to the source code. The publisher is responsible for the security of the software by providing updates and repairing vulnerabilities. However, open-source software can be challenging to secure since the source code is accessible to anyone. Preventive tools such as secure password management, backup, and software updates are typically sufficient for regular users (test item authors and administrators) to protect test data (**data security**), including questions and answers, from loss or leakage. It is crucial to manage passwords securely to prevent unauthorized access. All accounts that have access to the data must have strong and unique passwords. Regular backups are essential for restoring lost data, including questions and answers, in case of any disaster. Keeping computer software and web browsers up-to-date and secure using antivirus programs is another important step towards ensuring data security.

Developing **anti-plagiarism mechanisms** must include developing both software tools for plagiarism detection and software tools for content protection [11], which can monitor student activity, detect text matches, and alert plagiarism. These advanced software modules of testing platforms can track student activities during a test and thus help identify students' moral failure. Testing software can assist in identifying text similarities among students' exams and identifying students who have copied their texts from other sources. Content protection tools must be able to safeguard electronic exams against copying.

The ethical and pedagogical aspects open an academic debate ([12], [13], [14], and others) on how to maintain the delicate harmony between imposing strict rules and sanctions for cheating and maintaining trust between students and teachers. On the one hand, ensuring that tests are objective and that cheating is avoided is essential. However, it is also crucial that students feel that they are trusted. The testing environment must be designed to minimize the risk of cheating. In addition, it is crucial to educate students about ethical behavior in the

university environment. This can be achieved through various means, such as organizing ethics seminars, workshops, disseminating the university's ethical principles outlined in the code of ethics, and promotion of zero tolerance for plagiarism and cheating. Students should be told with sufficient clarity what unethical behaviors involve and what the consequences of such behavior are. The goal is to create a university culture where academic honesty becomes the norm and trust between all stakeholders in education is upheld and protected.

Conclusion

Electronic tests are in line with modern trends in higher education pedagogy. Electronic testing provides many benefits that can enhance the educational process through easier tracking of student performance and more accessible data analysis to improve the process's quality.

The article outlined aspects of electronic knowledge testing in the tertiary education environment. As a new phenomenon of higher education pedagogy, it offers several other topics for further research, such as the design of test tasks in electronic testing, prevention and detection of cheating in electronic testing, the search for other types of tasks (for example, open-book testing), and more.

It is essential to realize that didactic tests are only one of many ways to assess students. Combining didactic tests with other forms of assessment, such as oral exams, seminar projects and papers, and presentations, is essential to obtain a comprehensive picture of students' knowledge and skills.

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VÝHODY A ÚSKALÍ ELEKTRONICKÉHO TESTOVÁNÍ ZNALOSTÍ

Elektronické testování má řadu výhod oproti tradičním testům jako je přirozenější prostředí testování pro současnou generaci studentů, okamžitá zpětná vazba, snazší organizace a logistiky testování a bezprostřední analýza dat. Na druhou stranu existuje také nebezpečí vyššího sklonu k podvádění ze strany studentů při psaní elektronických testů. Elektronické testování má potenciál zlepšit samotný proces vzdělávání, je však důležité si uvědomit potenciální nevýhody a hledat opatření k jejich minimalizaci. Elektronické testování znalostí je novým trendem ve vysokoškolském vzdělávání. Avšak je důležité mít na paměti, že didaktické testy jsou pouze jedním z mnoha způsobů, jak hodnotit studenty, a je třeba je kombinovat s jinými formami hodnocení, aby bylo možné získat komplexní obraz o znalostech a dovednostech studentů.

VORTEILE UND FALLSTRICKE ELEKTRONISCHER WISSENSTESTS

Elektronische Tests bieten eine Reihe von Vorteilen gegenüber herkömmlichen Papier- und Bleistifttests, z. B. eine natürlichere Testumgebung für die Studenten von heute, sofortiges Feedback, einfachere Organisation und Logistik sowie sofortige Datenanalyse. Andererseits besteht auch die Gefahr, dass Studenten bei elektronischem Testen eher zum Schummeln neigen. Elektronisches Testen hat das Potenzial, den Bildungsprozess zu verbessern, aber es ist wichtig, sich der potenziellen Nachteile bewusst zu sein und Maßnahmen zu ergreifen, um diese abzumildern. Elektronische Wissenstests sind ein neuer Trend in der Hochschulbildung. Es ist jedoch wichtig, daran zu denken, dass didaktische Tests nur eine von vielen Möglichkeiten sind, Studierende zu bewerten, und dass sie mit anderen Formen der Bewertung kombiniert werden sollten, um ein umfassendes Bild der Kenntnisse und Fähigkeiten der Studierenden zu erhalten.

ZALETY I MANKAMENTY ELEKTRONICZNYCH TESTÓW WIEDZY

Testy elektroniczne mają wiele zalet w porównaniu z tradycyjnymi testami, takich jak bardziej naturalne środowisko testowe dla współczesnego pokolenia studentów, natychmiastowa informacja zwrotna, łatwiejsza organizacja i logistyka przeprowadzania testów oraz bezpośrednia analiza danych. Z drugiej strony, istnieje również niebezpieczeństwo większej skłonności studentów do oszukiwania podczas rozwiązywania testów elektronicznych. Testy elektroniczne mogą potencjalnie usprawnić sam proces kształcenia, ale ważne jest, aby zdawać sobie sprawę z potencjalnych mankamentów i szukać środków, aby je zminimalizować. Elektroniczne testy wiedzy to nowy trend w edukacji akademickiej. Należy jednak pamiętać, że testy dydaktyczne są tylko jednym z wielu sposobów oceny studentów i należy je łączyć z innymi formami oceny, aby można było uzyskać kompleksowy obraz wiedzy i umiejętności studentów.