

Trends and Challenges in the World of Online Examinations

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Abstract—Online examinations have become an important form of assessment in higher education over the past decade, driven by the digitalization of education and the growing demand for flexible, remotely accessible testing solutions. The COVID-19 pandemic further accelerated this process, as institutions were widely forced to implement digital examination solutions. This shift has raised numerous technical, security, ethical, and psychological issues, necessitating a comprehensive examination. This recognition motivated the present literature review, which aims to highlight the main research directions in online examination studies. Based on the analysis of 1412 studies published in the Scopus database between 2015 and 2025, four main research areas emerge. The first addresses technical solutions and exam organization, with a particular focus on learning management systems and dedicated proctoring platforms. The second deals with security challenges and fraud prevention, where camera monitoring, browser lockdowns, and behavior analysis are emphasized, alongside data privacy concerns. The third research direction examines student experience and perception, highlighting convenience while also addressing increased stress, anxiety, and uncertainty. The fourth area concerns the integration of artificial intelligence, which plays a key role both in proctoring systems and in automated task generation and evaluation, while also raising new ethical dilemmas, particularly with the advent of generative AI. The literature on online examinations identifies three phases: technical experimentation (2015–2019), mass adoption (2020–2021), and critical reassessment (2022–2025). Based on the findings, future challenges include AI-based fraud prevention, addressing data privacy dilemmas, and restoring student trust.

Keywords—online examination, academic integrity, exam security, student experience, artificial intelligence, digital assessment

I. INTRODUCTION

Online examinations have now become one of the key forms of assessment in higher education. The digital transition was first driven by the spread of e-learning and LMS systems, and later made widespread by the COVID-19 pandemic, which forced institutions to shift to online examinations within a short period of time [1, 2, 3]. The digitalization of exams is not merely a technical development but also raises numerous pedagogical and ethical issues. Research highlights that online examinations simultaneously offer flexibility and accessibility, yet challenges related to security, integrity, and student experience remain significant [4, 5, 6].

This study is based on a literature review conducted using the international scientific database Scopus. During the data collection, the period between 2015 and August 30, 2025 was examined, and 1412 relevant publications were identified that address various aspects of online examinations. The following

review was prepared through the systematization and thematic analysis of these studies.

In the literature, several definitions of online examinations can be found; let us consider one of them [7].

„Online examination is an integral part of E-learning solutions for the genuine and fair assessment of students' performance. The design and execution of online examinations are the most challenging aspects in E-learning. Particularly, online examinations are usually conducted on E-learning platforms without the physical presence of students and instructors at the same place. This creates several loopholes in terms of integrity and security, of online examinations.”

This definition highlights that online examinations represent an independent educational and security system, bringing new challenges from both pedagogical and ethical perspectives [8, 9, 10]. The design and implementation of online examinations are particularly difficult since students and instructors are not in the same physical location, which creates challenges related to security and integrity [7, 11, 12, 13].

II. DEMOGRAPHIC OVERVIEW OF THE LITERATURE

Based on the 1412 studies identified in Scopus between 2015 and 2025 using the search term “online examination” the literature on online examinations can be analyzed according to the following demographic characteristics:

- Annual distribution of the number of studies
- Most frequent keywords
- Distribution by academic disciplines
- Distribution by countries
- Distribution by languages
- Distribution by source types

A. Annual Distribution of Studies

Figure 1 illustrates the number of studies published in the Scopus database on the topic of “online examinations” between 2015 and 2025, with a total of 1412 studies identified.

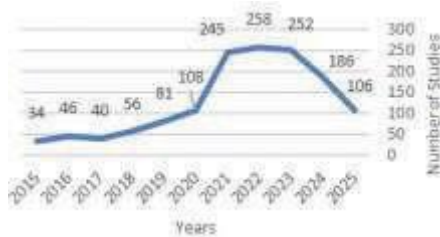


Fig. 1. The evolution in the number of studies published on the topic of “online examinations” between 2015 and 2025.

Based on the data, it can be observed that between 2015 and 2018, the number of publications was relatively low, with 34–56 studies published annually. This period reflects the early research on the topic, when online examinations were not yet widely adopted. Between 2019 and 2022, the number of publications increased significantly, reaching a peak in 2022 (258 studies). This growth was likely due to the expansion of digital education and especially the impact of the COVID-19 pandemic, which led to a sharp rise in interest and research demand for online examinations. Between 2023 and 2025, the numbers show a decreasing trend: 252 studies in 2023, 186 in 2024, and 106 in 2025. This suggests that the major wave of research in the field has concluded, and the number of publications has moderated, although it still remains higher than in the 2015–2018 period. Overall, the figures clearly indicate that the most intensive phase of online examination research occurred during the pandemic (2020–2022), and since then, the number of published studies has gradually normalized.

B. Most Frequent Keywords

Based on the keywords of studies on the topic of “online examinations” in the Scopus database, the following trends can be observed (Figure 2): The most frequent keyword is “Online Exams” (841 occurrences), which is natural since it is the main topic. “E-learning” (483) and “Online Learning” (102) are also common, indicating that research on online examination is closely linked to studies on digital and distance education. “Students” (333) and “Human / People” (127/88) refer to the subjects studied, i.e., students and human factors. “COVID-19” (198) and “Pandemic” (72) highlight the reason for the notable publication surge between 2020 and 2022, when the pandemic accelerated the adoption and study of online examinations. “Teaching” (117), “Education” (89), “Higher Education” (76), “Engineering Education” (82) reflect research focused on different levels and fields of education. “Electronic Assessment” (103), “Examination System” (71), “Academic Integrity” (78), “Cheating” (72) point to the technical and ethical aspects of exam administration. “Face Recognition” (92), “Online Systems” (88), “Machine Learning” (67), “Artificial Intelligence” (67) indicate the use of modern technological tools and solutions in online examinations, for example to prevent cheating or automate exam processes. Overall, the keywords reflect the main directions of the topic: the pandemic-related surge, research on digital education and exam systems, human factors, and the technological and ethical challenges in online examinations.

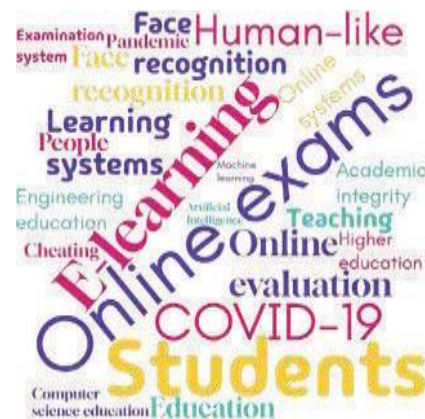


Fig. 2. Keywords of studies published on the topic of “online examinations”

C. Distribution by Academic Fields

The academic fields of studies on the topic of “online examinations” are distributed as follows (Figure 3): Computer Science (799 studies) is the most dominant field, indicating that research on online examinations primarily focuses on technological solutions, software, systems, and data management. Social Sciences (530) also represent a significant number of studies, reflecting research on human factors, pedagogical methods, student behavior, and ethical issues. Engineering (445) highlights the focus on engineering education and practical examination systems. Decision Sciences (171) and Mathematics (167) refer to the analysis of exam systems, the application of algorithms, assessment methods, and modeling. Pharmacy (156) and Physics and Astronomy (121) indicate research on online examinations in specific scientific fields. Business, Management and Accounting (75), Energy (62), and Psychology (50) are smaller but relevant fields, examining professional and psychological aspects as well as different applications of exam systems. Overall, the distribution of academic fields reflects that online examination research is multidimensional, with technological development, human and pedagogical aspects, and the needs of specific scientific disciplines all playing significant roles.

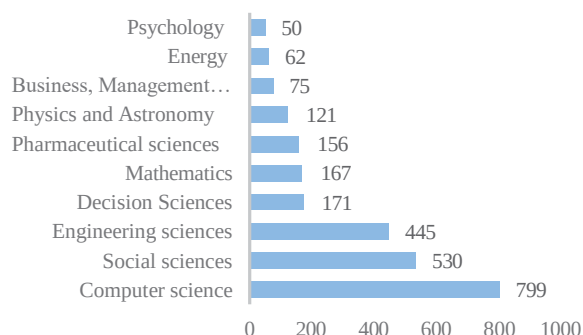


Fig. 3. Disciplinary distribution of studies published on the topic of “online examinations”

D. Distribution by Country

Based on Scopus data, studies on the topic of “online examinations” are distributed by country as follows (Figure 4): India (272 studies) leads the list, indicating that research and implementation of online examinations are particularly active there. This is likely driven by the rapidly growing higher education sector, the expansion of digital education,

and distance learning due to COVID-19. China (179) and the United States (148) also show significant publication activity, reflecting a combination of technological developments, e-learning systems, and the impact of the pandemic. The United Kingdom (73) and Australia (64) represent smaller but active research communities, where digitalization of higher education and online examination research are emphasized. Indonesia (55), Turkey (44), Saudi Arabia (44), Germany (41), and Malaysia (37) are other active countries where online examination systems are studied and implemented, albeit at a smaller scale compared to the top three. Overall, the distribution of publications shows that the topic of online examinations is globally relevant, but the most intensive research has been conducted in Asia (India, China) and North America (USA). The list also includes other countries, highlighting the international impact of the pandemic and digital education.

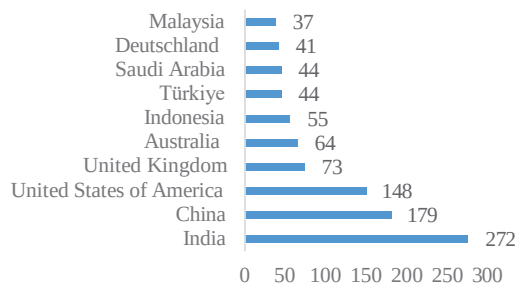


Fig. 4. Geographical distribution of publications on “online examinations” by country

E. Language Distribution

The language distribution of studies on the topic of “online examinations” is as follows: English (1385 studies) dominates, reflecting its role as the main language of international scientific communication and publication. This means that most research is globally accessible, and English-language publications ensure broad scientific visibility. Chinese (10), German (7), Turkish (4), Spanish (4), Persian (2), Russian (1), Italian (1), and Croatian (1) represent significantly smaller shares. This indicates that while research is conducted internationally, the volume of non-English publications is low, and the majority of scientific discourse occurs in English. The language data show that research on online exams is heavily English-centric, with other languages playing only a marginal role, which is a common phenomenon in international scientific publications.

F. Distribution by Source Type

The types of sources for studies on the topic of “online examinations” are distributed as follows (Figure 5): Articles (653 studies) are the most common source type, indicating that research is primarily published in scientific journals. This type of publication reflects high-quality and reliable results due to peer review. Conference papers (614) also represent a significant proportion, suggesting that research on online examinations is actively presented at conferences, where new findings can be shared quickly and technological developments are frequently showcased. Book chapters (63) and books (12) account for a smaller share; these are generally comprehensive, summarizing works that address deeper theoretical aspects of the topic. Conference reviews (33), editorials (23), and notes (5) are supplementary elements of the research discourse, providing critical or summarizing

information, but they do not constitute the majority of publications. The distribution of source types shows that research on online examination is active both in journal and conference publications, while books and review works play a smaller but important complementary role.

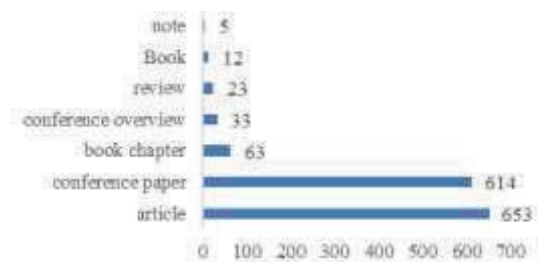


Fig. 5. Evolution of source types in publications related to “online examinations”

III. MAIN RESEARCH DIRECTIONS

Based on 1412 articles in the Scopus database from 2015 to 2025, the literature on online examinations can be divided into four main research directions:

- Technical solutions and exam administration
- Security and cheating prevention
- Student experience and perception
- Artificial intelligence and ethical issues

A. Technical solutions and exam administration

The quality of technological infrastructure is a determining factor. The initial LMS platforms (Moodle) offered advantages such as automated grading and question banks [14, 15, 16]. During the pandemic, institutions often switched to dedicated exam platforms, which provided greater reliability and scalability [17, 18, 19]. Several studies highlight that the main causes of student dissatisfaction are unstable connections and system failures [9, 20, 21]. Other research sees the future in adaptive exam systems, which offer more personalized assessment methods [22]. Technological innovations also include cloud-based examination [23] and the development of exam systems that can run on mobile devices [24, 25].

B. Security and cheating prevention

Cheating prevention is a central research question [26, 27, 28]. Some studies emphasize the advantages of secure browsers and proctoring systems [17, 29, 30]. Proctoring technologies include camera monitoring [31], microphone recording, screen sharing, and biometric identification [32, 33, 34]. Students often respond to these with resistance due to privacy concerns [35]. Other research highlights the use of behavior analysis algorithms, which can detect rule violations based on eye-tracking or background movements [36, 37]. Students themselves often acknowledge that the possibility of cheating is higher during online examinations [27].

C. Student experience and perception

For students, online examinations represent both an advantage and a source of stress [38, 39]. Many appreciate the flexibility and immediate feedback. At the same time, they report that during the sudden transition, students experienced increased stress [38, 39], making their recognition and measurement an important issue as well [40, 41].

Psychological pressure can be reduced through transparent regulations and student-friendly exam design [42]. For Generation Z, the online environment is often more natural, but issues of fairness and transparency remain crucial [43]. Another study found that students feel safer when they can practice with mock exams, which reduces exam anxiety [44].

D. Artificial intelligence and ethical issues

AI-based proctoring systems are capable of automatically detecting suspicious behavior [45, 46, 47, 48]. Automated question generation and adaptive systems supported by artificial intelligence enable more accurate assessment [49, 50]. Some researchers warn that AI systems may have biases and transparency issues [51]. Generative AI, particularly ChatGPT, creates new methods of cheating, prompting educational institutions to reconsider their online examination systems [52, 53]. Additionally, several studies examine AI-assisted automatic grading and feedback [54, 55, 56]. Privacy and ethical dilemmas are among the most important topics of debate [57]. The handling of biometric data requires enhanced regulation [58, 59]. Some researchers advocate for alternative assessment methods that are less invasive [60]. Excessively strict technological control can be counterproductive, as it undermines student trust [61]. Ethical issues include the transparency of AI algorithms and the respect for student rights [62].

IV. CONCLUSION

Over the past decade, online examination has become one of the most significant areas of innovation in education, offering new opportunities as an alternative to traditional assessment methods while also introducing new challenges. Based on the literature, three main developmental phases can be identified: the initial period of experimentation and technological trials (2015–2019), the mass transition forced by the COVID-19 pandemic (2020–2021), and the period of critical reflection and the integration of new technologies, particularly artificial intelligence (2022–2025).

The studies reviewed emphasize that the success of online examinations largely depends on the reliability of the technical infrastructure and the design of a user-friendly exam environment. At the same time, maintaining security and academic integrity remains a central issue, which can be partly addressed through the use of proctoring technologies, biometric identification, and behavior analysis, while also raising privacy and ethical dilemmas.

Research on the student experience shows that while online examinations provide flexibility and accessibility, excessive monitoring, technical failures, and lack of transparency can cause stress and mistrust. Therefore, a key task for the future is to consider student well-being and psychological safety when designing exam systems.

The rise of artificial intelligence represents both a promising development direction and a significant challenge. AI can support automated assessment, adaptive testing, and cheating prevention, while generative models, such as ChatGPT, also introduce new opportunities for cheating that could radically reshape how assessment is approached.

Online examination is not merely a technological innovation but also a complex pedagogical, psychological, and ethical issue. Future research and development could focus on the following key areas:

- the development of transparent and ethical AI-based systems,
- strengthening student trust and satisfaction,
- integrating alternative assessment forms such as open-book exams and project-based tasks,
- tightening data protection and legal regulations,
- examining students' psychological impacts (stress, anxiety, uncertainty) under different assessment methods,
- exploring the relationship between AI tools and students' propensity to cheat,
- investigating instructors' attitudes and experiences across generations and disciplines, and
- developing ethical frameworks to support the responsible integration of AI into online examination practices.

The future of online examination is therefore not only a technological issue but also a social and educational policy matter, which could fundamentally reshape the assessment culture in higher education in the long term.

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