

## A Scoping Review of the Quality of e-assessment in Higher Education

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### Abstract

*The pandemic lockdowns led to a massive shift to digital learning for HEIs worldwide. Additionally, there was an increased focus on e-assessment and its potential role in motivating and enhancing student learning. However, despite this growing interest, there have been concerns from university stakeholders that e-assessment has brought with it several challenges. These are related to the technological tools used for assessment, students' experiences, and perceptions of e-assessment as well as the outcome of these assessments. Considering the importance of quality in maintaining the integrity of e-assessment, this conceptual paper explores how the quality of e-assessment practices can be achieved in promoting the quality of learning. We employed Arksey and O'Malley's (2005) scoping review methodology, which allowed us to rapidly map the interplay between quality and e-assessment in the higher education landscape. The findings of the study point to the importance of contextualising the design of e-assessment, the potential of e-assessment to replace paper-based assessment and the under-development of e-assessment capabilities. Recommendations regarding the improvement of e-assessment have also been drawn from the scoping review articles.*

### Keywords

*E-assessment, e-learning, quality, quality assurance, conceptual review, higher education.*

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## **1. Introduction**

The adoption of educational technology in higher education has enabled the introduction of novel approaches to teaching, learning, and consequently, (e)assessment. Researchers have documented a wide range of benefits of e-assessment in higher education, including the following: 1) accessibility, which allows for the participation of distance students; 2) flexibility, allowing students to complete assessments at their own pace, time and place; 3) personalised, which helps to manage large and/or diverse classes; 4) speed, which speaks to the functionality that can give feedback quickly to both the lecturer and the student on learning; 5) the combination of interactivity and multimedia in designing improves question types and styles (Amelung et al., 2010; Butler & van Wyk, 2021; Jordan, 2013; Koneru, 2017; Perera, 2023; Rapanta et al., 2020; Sarigoz, 2013). Some authors have also asserted that students can assess their strengths and weaknesses in real time to continuously improve on their weaknesses, which can be done through frequent assessment (Hettiarachchi et al., 2013; Ras et al., 2016).

Despite these advantages, effective assessment is complex to attain. As observed by Boud (1995) there are numerous issues and ignorance about assessment, more than with any other teaching and learning practices. These are often aggravated with e-assessment, with most critics making the case that it does not promote critical thinking, as most questions are usually multiple-choice, true or false, fill-in questions and drag and drop (Rolim & Isaias, 2019). In addition, the use of e-assessment is said to promote guesswork, which provides no sufficient means to measure how well students have met learning outcomes and what skills and knowledge they have developed (Rolim & Isaias, 2019). As noted by Boud (1995)“students can, with difficulty, escape from the effects of bad teaching, [but unfortunately] they cannot (by definition if they want to graduate) escape from the effects of bad assessment”.

One thing that researchers agree on is that e-assessment has the potential to enhance and transform teaching and learning, as students' experiences in higher education. This has opened conversations on how to ensure the quality of e-assessment to mitigate or, if possible, eradicate the challenges and ignorance that surround its usage. This article, therefore, explores how the quality of e-assessment is promoted and achieved in higher education.

## **2. Literature review**

### ***2.1 Nature and purpose of assessment in higher education***

Assessment is a complex term that has varied meanings in higher education, with the most common of these being 1) the measurement of student learning against some pre-determined outcomes, 2) the evaluation of both teaching and courses and 3) assessing the quality of institutions and their programmes (Heywood, 2000; Taras, 2010). While each of these concepts speaks to an aspect of the quality of education, the use of one word to refer to all of them has led to contextual differences in our understandings of the purposes and approaches to assessment, which affect the policies and practices of assessment within institutions (Heywood, 2000). This paper is concerned with the first aspect, the assessment of student learning. In their attempt to provide a definition of assessment that goes beyond the measurement of how well students meet the learning outcomes, and the critical role of exams and marks in the assessment process, Boud and colleagues (2018) provide a practice-based definition that also considers the individuals involved in the assessment process and the context within which they work. As such, they see the assessment of student learning as a complex mix of curriculum practices that influence how both students and staff engage with learning as well as providing valuable information about students' work (Boud et. al, 2018).

The above definition signals the complex relationship between assessment and learning (Schellekens, et. al, 2021) and embraces the varied conceptions of assessment between students and their lecturers (Fletcher et. al, 2012). This complex relationship has been unpacked under the banner of 'purposes of assessment.' These are loosely grouped as assessment of learning (summative), which aims to measure what learning has taken place, and assessment for learning (formative), which seeks to improve learning (Dolin et al., 2018; Schellekens, et. al, 2021). Additionally, literature refers to assessment as learning which denotes self-directed assessment activities that are part of the learning process – and consequently closely resembles formative assessment in its characteristics (Schellekens, et. al, 2021). While the purposes and functions of summative and formative assessment in the learning process are presented as distinct, research shows that lecturers have a poor understanding of the differences between the two approaches and how the two are connected or support and complement each other (Dolin et. al, 2018; Taras, 2008). This is further compounded by the fact that extant literature has created a false dichotomy between the two and promoted formative

assessment as ‘good’ or the desirable option while summative assessment is painted as ‘bad’ and should ideally be avoided (Lau, 2016). These dichotomies fail to acknowledge that formative and summative assessments are not as distinctive as we are led to believe. This is because the definitions and practices related to these constructs are inconsistent in educational research, and summative assessment can be used for formative purposes and vice versa (Dunn & Mulvenon, 2019; Schellekens, et. al, 2021).

## ***2.2 E-assessment in higher education***

The growing use of technology-enhanced learning (TEL) in higher education has opened up new possibilities for teaching, learning, and assessment. Just as with TEL, e-assessment has varied names in the literature, including online assessment, digital assessment and computer-based assessment. The definitions of e-assessment also vary, with some indicating that it refers to all assessments that use digital technology, from the design and administering of assessments up to the marking and storing of results (JISC, 2007; Stödberg, 2012). On the other hand, Oduntan et al. (2015) provide a narrower view of e-assessments as tests conducted on a digital device, which is enabled by a network or the internet. The first definition is quite a broad, catch-all explanation, which signals the majority of assessments today as e-assessments, as some aspect of digital technology is utilised in their design or implementation. The latter definition specifies both the type of assessment and the importance of network connectivity, which may signal a ‘summative’ mindset, but also the importance of drawing on other resources for the assessment.

Research literature has traditionally identified two main modes of e-assessment delivery, according to Appiah and Tonder (2018). These are: web-based, where the internet is used by students to gain access to and complete the task, and download delivery, where the assessment is accessible for download onto a student’s computer from a specific date and time. Three main types of e-assessment came up often in our review of literature for this paper, with diagnostic e-assessment as an additional type in addition to formative and summative e-assessments discussed earlier (Huda et al., 2020; Jantos, 2021; Okada et al., 2019). Formative and diagnostic assessments seem more focused on teaching and learning to motivate student learning, while summative assessment seems more focused on the end of the teaching and learning process and the grading of students. Diagnostic e-assessment, according to Gupta et al. (2019), is specifically concerned with assessing students’ preparedness for a course of study.

### **2.3 Quality of e-assessment**

E-assessment is a complex exercise, and according to Huda et al. (2020), all the factors that impact e-assessment are unknown and largely still being researched. However, it is still crucial to strive towards the quality of e-assessment to maintain the integrity and authenticity of the learning process. Quality is defined within the higher education domain as the degree to which educational systems, institutions, and practices fulfil their intended purpose while promoting continuous improvement (Harvey & Green, 1993). Tinoca et al. (2014) view the quality of e-assessment as going beyond an assessment culture, where assessing is about measuring how well students' reproduced knowledge meets a set of criteria. They proposed that assessment must be integrated into teaching and learning, and students engaged in the design of their assessment. They also highlight the importance of assessing both the product and the learning process, using diverse non-standardised formats that are linked to experienced instructional practice, the use of assessment tasks that are identical to real-life context, giving complex tasks and research, emphasising students' reflection on their learning, and placing value on qualitative and valuable feedback. They added that the quality of e-assessment can be measured or validated through four dimensions: 1) authenticity, where assessment is based on competence, 2) consistency in the development of the learning process or curricula, 3) transparency based on the engagement of students in the learning process, and 4) practicality, which deals with the institutional complexities affecting teaching and assessment practices.

According to Crisp et al. (2017), most quality assurance agencies state that the quality of e-assessment must consider the adoption of student-centred approaches with the potential to engage students in authentic assessment tasks, where students are required in an assessment to perform real-life tasks demonstrating a practical application of knowledge and skills. Huda et al. (2020) posit that e-assessment must not only be to test knowledge but also be critical for the assessment of competencies in measuring its validity. Winstone and Careless (2021) are of the view that quality assurance processes should be more focused on the response of students to their feedback and less focused on the academics' input. The Bologna Process and the Standard and Guidelines for Quality Assurance in European Higher Education (ESG Framework), have one of their key focus areas as outcomes-based approaches, making them ideal for consideration in e-assessment design (Adam, 2008; Smidt, 2015). This is

because these frameworks highlight issues of validity and reliability, transparency, formative assessment and feedback, fairness and accessibility, authentication and academic integrity and evidence-based practice (Sursock, 2015; Smidt, 2015). So, although they were developed mainly for the European context, they do have some elements that may be applicable for different African contexts.

Another author identified 6 factors that, according to them, are principles on which e-assessment can be built to ensure its reliability, quality, and validity. These 6 factors are 1) accreditation – which ensures valid and reliable assessment of student performance, 2) accountability- to ensure that students, peers, and academics have clarity on their responsibilities before and post assessment, 3) articulation – e-assessments must highlight their expected deliverables by stating the when, how, why and what to the parties involved, 4) authenticity- the e-assessment must be credible with the expected deliverables transferable to real-life situations and futuristic, 5) affordance – immense benefit must be derived from the e-assessment as compared to the traditional assessment method, and 6) alignment -e-assessment must align with pre-planned learning outcomes (de Villiers et al., 2016). The effectiveness of e-assessment hinges on how well educators align assessment techniques with intended learning outcomes and core pedagogical principles. As Falcão and Soeiro (2019) emphasise, meaningful alignment ensures that e-assessments are not only credible and transparent but also educationally impactful, supporting learners in achieving the competencies they are meant to develop. Therefore, the quality of e-assessment can be attributed to a multiplicity of factors that are highlighted in the findings of this article.

#### ***2.4 Technological advancement in e-assessment***

There have been debates on how higher education institutions can use new technologies to improve the quality of e-assessment, including artificial intelligence (AI) technologies, e-proctoring or v-proctoring. The use of AI technologies in higher education can aid in tracking student performance to identify at-risk students, provide predictive models, as well as designing and implementing personalised lesson plans (Bagunaid et al., 2022). Additionally, the use of e-proctoring to monitor e-assessment has grown substantially over the last two decades. Studies have shown that over 50% of higher education institutions have adopted e-proctoring for assessment purposes due to the ease and convenience it provides (Chinaza, 2021). While there have been concerns expressed about its credibility, e-proctoring is said to allow auditory and visual

surveillance during e-assessment (Chinaza, 2021). One of its main features is the LockDown Browser, which attempts to manage cheating and plagiarism during assessment by preventing students from using search engines for answers to assessment questions (Chinaza, 2021). It also includes video capabilities that check the authenticity of the assessment taker's identity to maintain the validity of high-stakes testing (Guney et al., 2021). Although proctoring has some capabilities that are geared towards reducing cheating and plagiarism during e-assessments, there are still gaps in our understanding of how to attain the needed quality goals.

The following section discusses the methodology for this study, followed by a presentation of the results of the review.

### **3. Methodology**

#### ***3.1 Scoping review***

Until quite recently scoping reviews were used mainly in health research (Arksey & O'Malley, 2005; Davis et al., 2009), but a growing number of studies are now being carried out in educational programmes (Caron et al., 2015). Researchers use scoping reviews to rapidly map out the breadth and depth of knowledge about a particular research topic to identify gaps in our understanding and potentially inform future research and policy (Arksey & O'Malley, 2005). Scoping reviews have been found most useful in fields with emerging ideas, such as the focus of this paper.

In conducting a scoping review, it is important to document each step in detail for other researchers to be able to replicate the process, which contributes to the rigour of the study and the reliability of the research findings (Mays et al., 2001). With the scoping review, the researchers are concerned with identifying relevant literature as guided by a broad research question, irrespective of the study design used in that literature. They are also not obliged to keep to strictly limited research terms, and identification or selection of studies on the onset. Because of the iterative nature of scoping reviews, researchers are required to engage with each stage of the study in a reflexive manner and repeat processes to ensure all literature is comprehensively covered. The five stages of the scoping review approach are detailed in Table 1.

Stage 1: Identifying the research question	The question should be broad to allow for a wide selection of studies	<i>Research question: How is the quality of e-assessment promoted and achieved in higher education?</i>
Stage 2: Identifying relevant studies	A comprehensive search of available databases	Databases searched: Web of Science, Scopus, and Google Scholar  Search terms: <i>'quality of e-assessment in higher education', 'quality assurance e-assessment', 'e-assessment in higher education', current e-assessment practices', academics' capabilities in using the e-assessment platforms', the availability of technological tools to maintain the quality of the assessment', and 'the systems put in place to ensure the integrity of the assessment'.</i>
Stage 3: Study selection	Application of selection criteria	The following inclusion criteria were used: -Type of article: peer-reviewed journal article. -Period: January 2012 – December 2022. -Language: English articles only. -Type of study: empirical (academics or students)
Stage 4: Charting the data	Mapping out the data from the articles on a pre-designed table	The full charting table is in Appendix A and the summarised version is presented under findings and discussion.
Stage 5: Collating, summarising, and reporting the findings	The mapped data is then collated and put into a presentable format	This paper is the result of this final process.

Table 1: Framework used in the conduct of the scoping review.

In identifying the broad research question, we also set parameters during the iterative review process which helped us to better identify studies that were relevant to answering the research question. These parameters were: quality of e-assessment in higher education; quality assurance e-assessment; e-assessment in higher education; current e-assessment practices; academics' capabilities in using the e-assessment platforms; the availability of technological tools to maintain the quality of the assessment; and the systems put in place to ensure the integrity of the assessment. A comprehensive database search of articles was performed, and, as indicated in Figure 1 below, 1705 articles were initially identified. The inclusion criteria included, among others, the period from January 2012 to December 2022. This was because, while we were specifically interested in the shift to e-assessment during the pandemic, we also

wanted to map out the progression of the phenomenon before that period. This would allow us to make reliable deductions from the review which would reflect the importance or value of concepts about e-assessments. A total of 35 articles were selected after the application of the inclusion criteria, and they were logged on the charting table. The final stage involved the final collation and writing up of the findings.

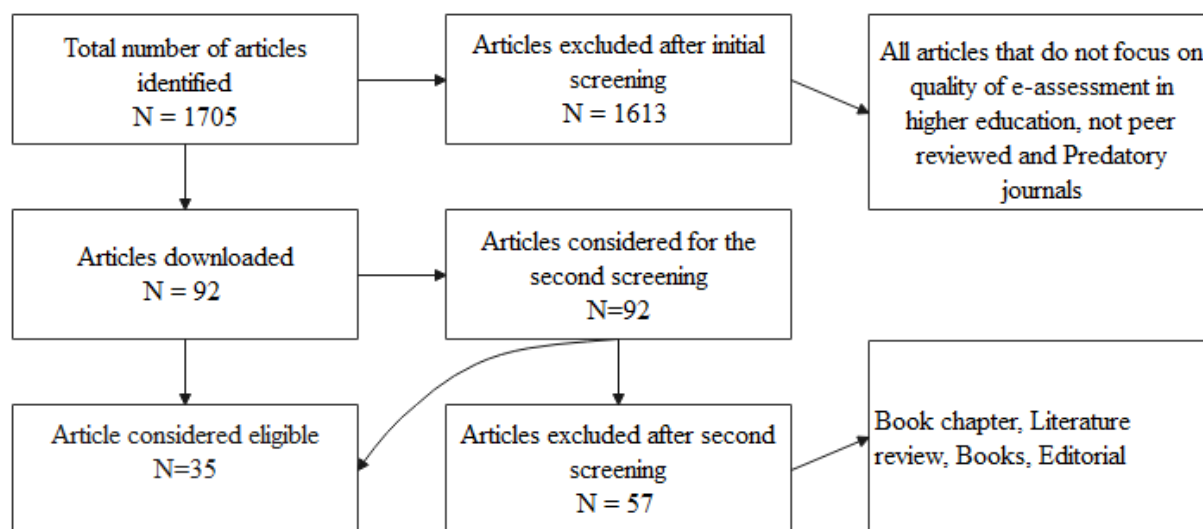


Figure 1 diagram for inclusion and exclusion criteria

The articles used in this study as summarised in Figure 1 are presented in the next section under findings.

#### 4. Findings and discussions

The total number of empirical articles used in this study was 35 peer-reviewed empirical research articles. The articles were written across 22 countries with the vast majority mainly from Europe. Articles from North and South America were largely missing from the results. The largest number of articles – 10 in total – were written in Spain. Three each came from the UK and the United Arab Emirates, while two each were from Portugal, Hong Kong, and Malaysia. The following countries had one article each: Israel, Egypt, Finland, India, Nigeria, Latvia, Canada, and Palestine. Three of the articles were written with data from across different countries: one from Germany and Austria, one from Finland and Spain, and the final one from the UK, Norway, New Zealand, Ireland, and the Netherlands. Unfortunately, no empirical articles were identified from the global south for this scoping review.

This paper identified seven main themes as stated in Table 2 below (cf Appendix).

Theme	Numbers of articles
Effective e-assessment policy	19
Design of e-assessment	27
Blended learning for validity	31
Self-regulated learning and self/peer assessment	6
Acceptance and satisfaction of e-assessment	7
Expertise in using e-assessment	5
Students' engagement	2

The seven main themes highlighted what the participants from the various articles considered as pros and cons, what should constitute e-assessment design, why blended learning is critical in the learning process for positive effects on e-assessment, acceptance rate and satisfaction of e-assessment by stakeholders, the expertise needed to use e-assessment and students' engagement.

The next sections discussed the identified themes in detail.

#### ***4.1 Effective e-assessment system***

The quality of an e-assessment system depends primarily on how higher education institutions (HEIs) design systems that rigorously evaluate whether assessment practices are aligned with the university's educational objectives and enhance students' learning experiences. HEIs should be capable of anticipating the outcomes of their e-assessment processes. Approximately 19 articles included in this scoping review describe the key elements that constitute high-quality e-assessment practices.

##### ***4.1.1 Challenges to the implementation of e-assessment in higher education***

The quality of e-assessment for its effective implementation requires a policy that documents how HEIs can deal with the challenges posed by e-assessment as identified in the review. The review highlights several challenges that a well-developed quality policy should address. The review identified challenges such as participants preferring paper-based assessment over e-assessment, especially in summative evaluations, because it allowed them to read more comfortably and make notes. The issues related to

plagiarism, fake identity when others write on behalf of the candidate, heavy workload on academics, unavailability of resources, academics struggling to keep up with educational innovations, heavy marking load, negative effect of technical issues like internet connectivity, the need to ensure fully inclusive for a diverse group of students, submitted assessments cannot be revised, and there is no face-to-face feedback from instructors are issues that are still prevalent over the period.

Other challenges that HEIs have not found solutions for to ensure the validity of e-assessments over the period are students engaging in cheating in the form of ghost-writing and copying from or communicating with others during summative assessments. There are also issues related to late, low, and non-submissions of e-assessments, lack of technological and pedagogical knowledge of teachers, and discomfort among academics in replacing face-to-face tests with e-assessments. Students struggle with technological skills and accessibility of appropriate technology at home, with some relying on mobile devices, which unfortunately do not have appropriate screen sizes to complete the e-assessments or keep up with the timer.

Despite the advanced evolution of technology, these challenges hit hardest in sub-Saharan Africa, as highlighted in the review, which is said to threaten the success of the entire educational system in the areas of educational dimension (content and presentation), economic dimension (cost for licensing) and technological dimension (reliability, security, interface, accessibility, and maintenance). What is interesting in the studies is academics' continuous distrust of technology as a primary means to address cheating and plagiarism, but it can be used with other elements, such as the design of assessment and effective sanctions to deal with the shortfalls of e-assessment. The data further revealed that academic integrity is seen as deficient despite the high level of precautionary measures taken by academics and universities on e-assessments, stating that the disadvantages of e-assessments far outweigh the benefits. This is one of the leading reasons for the call for a blended environment where assessment is done face-to-face to solve the issues with e-assessment.

The findings on the challenges of e-assessment to its effective implementation pose a threat to the integrity of assessment in higher education if critical attention is not given to its adaptation and use (St-Onge et al., 2022). Other studies from diverse countries show similar cases confronting the increasing use of e-assessment, with some calling for academics to be innovative and stakeholders to find a suitable solution that preserves the integrity of higher education (Kundu & Bej, 2021).

#### *4.1.2 E-assessment enhancing teaching and learning experiences*

These studies reported numerous ways in which e-assessment system design with high standards provides teaching and learning with the needed quality if implemented well—the convenience of keeping track of previous exams, the provision of useful information to improve teaching approaches, and the development of course materials, students receiving rapid feedback, flexibility in terms of having access to their exam anytime both prior and also after grading, neat and organised answers, an increase in grading accuracy, as well as an improvement in technology skills of both students and lecturers are recorded. E-assessment tools also allow for summative and formative assessment, which promotes fairness because students can check the coherence of their lecturers' corrections, comments, and explanations.

The data shows that e-assessment is perceived to have a positive effect on the reliability and security of assessments. Additionally, because the relative cost of e-assessment is minimal, the approach can be used effectively in large classes even when there are limited resources. They are also said to place less demand on lecturers and their time in comparison to other types of assessment because of their automated nature. To achieve the quality of e-assessment, the instructional designs should provide students with opportunities to make mistakes without fear of failure or reprimand. E-assessment as identified in the data, offers educators the chance to be creative in solving some problems relating to assessment if done correctly. The authors also pointed out that adopting technology for students' assessment is a better fit for students' future professional practices than paper-based exams, allowing them to develop technological expertise in line with 21st-century skills.

Some of the studies reviewed in this paper explored the advantages of e-assessment in higher education identified findings similar to this scoping review (Appiah & Tonder, 2018; Osuji, 2012; Shalatska et al., 2020). Most concluded that if e-assessment is done correctly, it can help educators meet 21st-century skills while having positive effects on student experiences, academic experiences, and the universities in achieving quality education.

#### ***4.2 Design of e-assessment***

On the design of e-assessment in higher education, 27 of the articles reviewed considered this as a critical element in ensuring the quality of e-assessment. In the

design of e-assessment, the priority must be on the context, although trust, atmosphere, and emotions involved are also key in determining the process and the outcomes of the quality of e-assessment. E-assessment instructions must be understandable use clear criteria and eliminate the possibility of including knowledge considered relevant to student's needs. Some studies suggested the need for careful design of e-assessment if educators are to increase student engagement and learning which can contribute to the overall quality of students' experiences. For most of the researchers, e-assessment must be designed as a learning opportunity to improve and promote meaningful learning. This means that assessment must be considered as part of the learning process and not just something done at the end of the semester.

In the design of e-assessment, the data shows the criticality for e-assessment to have a combination of two or more of the three types of assessment – formative, diagnostic, and summative e-assessment to obtain the desired learning outcome. It was revealed that summative assessment and automatic feedback are useful for large classes but must be done in combination with formative assessment if learning outcomes are to be improved. Feedback in remote assessment aids in mitigating student dropout. E-assessment must be formative (awareness of errors and ability to self-correct) using motivational elements, coherence, and flexibility in designing grading criteria, as well as integration of assessment in the teaching and learning process. There is a need to pay attention to the competencies to be assessed and integrated in the teaching and learning process, coupled with constant and continuous communication.

The data indicated the use of Multiple-Choice Questions (MCQs), continuous assessment, and open questions as most used in conducting e-assessment. MCQs is found to be the most popular form of e-assessment largely due to the prompt feedback which has a positive effect on students' satisfaction (Alruwais et al., 2018). However, some made the point that MCQs need to be balanced with other types of questions as well as putting restrictions on the layout and structure of MCQ e-assessments. This is because there are some disadvantages with MCQs such as 'the sheer luck factor', unfairness due to question banks where questions are randomly selected thereby favouring some students and not others, difficulties in developing good MCQs, patent limitations, the fact that MCQs do not encourage soft-skills and problem-based skills as they promote recall and memorisation. The findings on the overuse of MCQs and their advantages to assessment are highlighted in the research (Nicol, 2007). These shortfalls

have led to the call for MCQs to be done in supervised computer rooms and laboratories to mitigate cheating (Appiah & Tonder, 2018).

These shortfalls most of the authors argue require the need for higher education to identify alternative sources of assessment, such as the use of open questions to allow for direct personal feedback from instructors as compared with closed questions. This is key because feedback is a powerful element in improving student learning in higher education. Some students find video assignments valuable in contributing to their learning as compared to discussion forums. Video conferencing is claimed to be an effective resource for guaranteeing the credibility of educational e-assessment. These results reflect other studies that touched on the design of video conferencing tools to make up for the shortfall of e-assessment (Prendes-Espinosa et al., 2021).

Another area highlighted to be critical in the design of e-assessment is the emphasis placed on feedback - detecting students' errors and giving them timely feedback, as well as students' behaviour towards and interaction with e-assessment. Feedback must influence the design of assessment and the tools lecturers decide to use in setting e-assessment questions, making sure that e-assessments are integrated into a coherent course design. In addition, the lecturers must explore the features of existing assessment tools and understand the relationships of these tools to assessment objectives and to discipline-specific skills and knowledge before choosing those tools.

Some of the reviewed articles implemented model systems to assess their effect on the quality of teaching, such as the authentic assessment, the use of privacy screen filters, the 360° model, the tutoring systems, the TeSLA model, the Technology Acceptance Model, and the alignment of student-centred learning to competency-based learning. The data indicated that higher education institutions should ideally invest in providing authentic assessment tasks for improvement and adjustment purposes for e-assessment. The results also show that students accepted the use of privacy screen filters in taking summative e-assessments as contributing to fairness in the test. These also make it easier to read the screen and prevent cheating while promoting confidence in the computer-based delivery of assessment. However, some thought privacy screen filters bring no improvements to e-assessment.

The implementation of the models mentioned above showed that the use of quality criteria (strategic, integral, holistic, transversal, assessment criteria, indicators, feedback, and coherence) in learning activities has helped students to be in the learning process contributing to the high rating of online continuous evaluation model. They also

contributed to student learning and engagement with the discipline. Another angle is that the implementation of such models aids academics and students to better understand competency-based learning and its usefulness for formative assessment which helps students in attaining the desired competency levels. For higher education to analyse the satisfaction of users of e-assessment, these models can be used.

Furthermore, the results indicated that the perceived usefulness and perceived ease of use of the e-assessment have a positive impact on the usage intention of the e-assessment. This is because most students cared more about the functionalities of e-assessment systems than the effort of shifting from paper-based to e-assessment. Also, student perceptions of the value of e-assessment changes as the surrounding environment changes. In short, the functionalities of e-assessment tools and platforms, the ability of the tool to provide alternative assessments, and the ability of the e-assessment tools to reduce errors during marking and grading procedures are all considered critical factors in measuring the quality of e-assessment.

In the design of e-assessments, educators must think about the need for device ownership since not all students have access to laptops but tend to use their phones. In essence, in the design of e-assessment, it is critical to consider diversity, equity, and inclusion. Otherwise, these factors can impede the gains made by higher education due to unpreparedness on the part of the universities, the teachers, and the students for online learning. Learning Management System (LMSs) such as Moodle are seen as providing multiple opportunities for formative e-assessment and accommodating varied question formats; therefore, it is important to select the most suitable types for a particular e-assessment task.

### ***4.3 Blended assessment for validity***

A thematic area that came up strongly in all 31 articles reviewed is the need for higher education institutions to adopt blended assessment if the quality of assessment is to be assured. Here, most of the academics who were participants in the studies reviewed made a case for computer-based assessment to be combined with paper-based assessment for quality outcomes. Most of the lecturers view blended e-assessment as useful to manage errors by helping to ensure coherence of grading and revision processes in assessment. There was also a call for the use of both synchronous and asynchronous learning appropriately in assessment to achieve quality learning outcomes. The data indicated that blended e-assessment allows for a combination of

different exam practices, thereby giving students and lecturers an advantage over new technologies for assessment while maintaining the integrity of more traditional forms of assessment. The data also shows that students, on the other hand, view paper-based assessments as being expensive, time-consuming, and not a better fit for instant feedback. Therefore, stating their preference for e-assessment and its ability to fully replace paper-based assessment acknowledges that e-assessment might eventually fully replace paper-based assessment.

The data is also explicit about the high level of transparency yielded by blended forms of assessment, such as discussion platforms, which promote peer-to-peer communications. High transparency is said to be achieved by tools that provide the potential for asynchronous and bidirectional communications through text-based messages. However, some are of the view that higher levels of transparency do not necessarily improve instructor feedback but can help in comprehensive students' need analysis, which can lead to adjustment in timely support.

#### ***4.4 Self-regulated learning, self & peer assessment***

Students' self-regulation, self-assessment, and peer assessment are other thematic areas identified in the scoping review in six of the articles. The research studies show a promotion in active and self-directed learning mainly using formative e-assessment, interactive and multimedia content, as well as low-stakes examinations that are noted to contribute to independent study and student attendance. The data shows that students view their active role in assessment such as self-assessment, peer assessment, and interactive assessment as key factors in successful e-assessment. Students can evaluate their performances using the progress bar and competence module to promote quality outcomes. The use of peer review in e-assessment allows for the achievement of highly different cognitive learning levels as well as high-level competency. It also allows for differentiation into target groups and learning levels and not a one-size-fits-all. Peer assessments allow for the inclusion of students in the assessment process through active participation to enhance the motivation of students (Panadero et al, 2022; Prendes-Espinosa et al., 2021). Peer e-assessment requires extensive supervision and support from teachers because it can be time-consuming for teachers and may result in tension, disputes, and resentment over the grades provided. Despite the challenges with peer assessment, the feedback from colleagues can be used to improve work before uploading. To mitigate the challenges with peer assessment, clear work instructions and task descriptions are critical, without which there would be frustration, confusion, and

lots of queries. The use of collaborative activities in the digital environment facilitates the gathering of evidence of interactions, shared construction of knowledge and is considered to give students interesting experiences.

#### ***4.5 Acceptance and satisfaction of e-assessment***

Acceptance and satisfaction of e-assessment by students, academics and experts are mentioned by seven of the articles in the scoping review. The results show some level of satisfaction with the e-assessment process among students, teachers, and experts, with students expressing a higher positive perception about various types of e-assessment. This is because students consider e-assessment to be a highly motivating approach due to the different tools and techniques used. In the design, adoption and implementation of e-assessment, the human factors are a critical element to consider as a factor that influences the acceptance of an e-assessment system. If the users of the systems do not accept and derive satisfaction from the e-assessment system, quality teaching, and learning outcomes might not be attainable. This evidence aligns with a study by Chen et al. (2023) a strong support for technology assessment due to its ability to improve engagement, measurement precision, and communication among stakeholders.

Other factors that were considered in the scoping review to influence the acceptance and satisfaction of the e-assessment system had to do with appropriate information security knowledge. Quality elements such as information quality, systems quality, trust, service quality, quality technical dimension, ethical behaviours, and expected usefulness, are important to consider for e-assessment systems for all educational contexts. A correlation between students' levels of technology competence and their perception of e-assessment influences improves students' performance and achievement. The study also found that the cost and effectiveness of the e-assessment system influence user satisfaction. The quality of the examination questions (content and presentation) has been identified to significantly influence user satisfaction with e-assessment.

#### ***4.6 Expertise in using e-assessment to ensure credibility***

The need for expertise for users of e-assessment tools is considered in five of the articles as critical to the quality of e-assessment. The data indicates the need for e-assessment literacy enhancement, technical literacy, and training in using e-assessment,

which all have a positive effect on lecturers' perceptions and use of e-assessment tools. Comprehensive planning training programmes for academics is also required to develop curriculum that helps students prepare for the rest of their academic studies, but also life beyond university (lifelong learning). The need for workshops and training for not only academics but also students on the use of e-assessment tools is important. Other studies are in direct support of the findings of this scoping review on the need for expertise in the implementation of e-assessment for both academics and students (Buzzetto-More & Alade, 2006).

#### ***4.7 Student engagement***

Student engagement as a critical thematic area was highlighted in two of the articles in the scoping review as necessary for ensuring the quality of e-assessment (Jiao, 2015). The data indicated that engaging students in the learning process is seen to positively improve their performance in e-assessments. Furthermore, for academics to promote student engagement using e-assessment, teamwork, and peer assessment must be adopted. The data reveal that an increase in student engagement has a positive impact on the marketing of the university, and student retention which are necessary to enhance the quality of student experiences.

### **5. Conclusion**

The findings of this scoping review highlight many issues that have implications for the adoption, implementation, and use of e-assessment in higher education. The scoping review identified gaps like the need to design e-assessment systems based on the context within which it will be used if quality is to be assured. It also highlights the future of e-assessment which might totally replace paper-based assessments and therefore must be critically explored further. The under-utilisation of e-assessments in higher education and the under-development of the capabilities needed to effectively use e-assessment systems by both students and academics all highlight the need to focus on the acceptance and satisfaction of e-assessment tools by users to promote quality learning outcomes. Stakeholders of higher education and researchers should ideally explore these factors further before the adoption of e-assessment tools. Context-specific frameworks can be developed for e-assessment through stakeholder engagement and research.

It is also important that e-assessment systems are designed to promote the giving of feedback (Cavalcanti et al., 2021), student engagement and interaction, as well as the development of soft skills, critical thinking, problem-solving skills, with rubrics or guidelines for evaluating assessments for transparency and accountability (Herzog & Katzlinger, 2017; Rodríguez-Gómez et al., 2016). E-assessment must be developed to combine both synchronous and asynchronous (blended) assessment (Lafuente Martínez et al., 2015) based on the needs of the context (Rodríguez-Gómez et al., 2016) or discipline of study. Stakeholders in the implementation of e-assessment tools must consider the well-being of the users without compromising on assessment standards (Basilio, 2021).

Policies must be developed that should ideally align with the future needs of students, and prevent cheating, plagiarism, impersonation, as well as other security and ethical issues. High-stakes assessments can be used to promote critical thinking. Additionally, academic and student support, the use of authorship and authentication checks, instructional support, and self-regulated and participative learning are ideal teaching and learning tools to ensure the quality of e-assessment. The universities can have policies that will require different rubrics for different types of e-assessments such as oral presentations, case studies analysis critical thinking, and writing assessments.

E-assessment must be driven by continuous improvement and innovation to cater for diverse contexts and student groups, while effectively assessing and measuring the competence of students and how well they meet the requirements as laid out in the learning outcomes. In the redesign of e-assessment curricula, the universities can put in place strategies that match e-assessments to 21<sup>st</sup>-century requirements. Academics require better knowledge in the design of e-assessment and its implementation. This means that academics must enhance their skills in self-regulated learning with institutional aid. E-assessment by itself can be considered an innovator, therefore, academics can use it to meet the unique learning needs of all students appropriately and ethically.

### **Declaration of interest statement**

The author(s) of this research declare that there are no competing interests.

## References

- Adam, S. (2008). Learning outcomes current developments in Europe: Update on the issues and applications of learning outcomes associated with the Bologna Process. In *Bologna Seminar: Learning outcomes based higher education: the Scottish experience* (Vol. 21, No. 22.02, p. 2008).
- Alruwais, N., Wills, G., & Wald, M. (2018). Advantages and challenges of using e-assessment. *International Journal of Information and Education Technology*, 8(1), 34–37.  
[https://faculty.ksu.edu.sa/sites/default/files/advantages\\_and\\_challenges\\_of\\_using\\_e-assessment.pdf](https://faculty.ksu.edu.sa/sites/default/files/advantages_and_challenges_of_using_e-assessment.pdf).
- Amelung, M., Krieger, K., & Rösner, D. (2010). E-Assessment as a Service. *IEEE Transactions on Learning Technologies*, 4(2), 162–174.  
<https://doi.org/10.1109/TLT.2010.24>.
- Appiah, M., & Tonder, F. van. (2018). E-Assessment in Higher Education: A Review. *International Journal of Business Management and Economic Research*, 9(6), 1454–1460.  
<https://www.researchgate.net/profile/Martin-Appiah/publication/329775612>.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32.  
[/doi/abs/10.1080/1364557032000119616](https://doi.org/10.1080/1364557032000119616).
- Bagunaid, W., Meccawy, M., Meccawy, Z., & Allinjawi, A. A. (2022). Tracking English language learners' progress through a gamified social visualisation tool to increase motivation and performance. *International Journal of Technology Enhanced Learning*, 14(3), 286-306.
- Basilio, M. B. (2021). Instructional supervision and assessment in the 21 st-century and beyond. *Institutional Multidisciplinary Research and Development Journal (IMRaD Journal)*, 4(February), 1–8.
- Boud, D. (1995). Assessment and learning: contradictory or complementary? In P. Knight (Ed.), *Assessment for Learning in Higher Education* (pp. 35–48). Kogan Page.
- Boud, D., Dawson, P., Bearman, M., Bennett, S., Joughin, G. & Molloy, E. (2018) Reframing assessment research: through a practice perspective. *Studies in Higher Education*, 43(7), 1107-1118.

- Butler, M., & van Wyk, S. (2021). Are e-Assessments Testing Subject-Specific Learning Outcomes, or Digital Proficiency? *DigiTAL 2021*, 56–67.
- Buzzetto-More, N. A., & Alade, A. J. (2006). Best practices in e-assessment. *Journal of Information Technology Education: Research*, 5(1), 251–269.
- Caron, J. G., Bloom, G. A., Falcão, W. R., & Sweet, S. N. (2015). An examination of concussion education programmes: a scoping review methodology. *Injury Prevention*, 21(5), 301–308.
- Cavalcanti, A. P., Barbosa, A., Carvalho, R., Freitas, F., Tsai, Y. S., Gašević, D., & Mello, R. F., (2021). Automatic feedback in online learning environments: A systematic literature review. *Computers and Education: Artificial Intelligence*, 2.
- Chen, D., Jeng, A., Sun, S., & Kaptur, B. (2023). Use of technology-based assessment: a systematic review covering over 30 countries. *Assessment in Education: Principles, Policy & Practice*, 30(5-6), 396-428.
- Chinaza, I. (2021). Perceived efficacy of e-proctoring software for emergency remote online based assessment: perceptions of proctored examinations. In *European Distance and E-Learning Network (EDEN) Conference Proceedings* (No. 1, pp. 265-282). European Distance and E-Learning Network.
- Crisp, G., Guàrdia, L., & Hillier, M. (2016). Using e-Assessment to enhance student learning and evidence learning outcomes. *International Journal of Educational Technology in Higher Education*, 13(1), 18.
- Davis, K., Drey, N., & Gould, D. (2009). What are scoping studies? A review of the nursing literature. *International Journal of Nursing Studies*, 46(10), 1386–1400.
- De Villiers, R., Scott-Kennel, J., & Larke, R. (2016). Principles of effective e-assessment: A proposed framework. *Journal of International Business Education*, 11, 65-92.
- Dolin, J., Black, P., Harlen, W. & Tiberghien, A. (2018). Exploring Relations Between Formative and Summative Assessment. In J. Dolin & R. Evans (Ed), *Transforming Assessment*, pp. 53-80, Springer International Publishing.
- Dunn, K.E. and Mulvenon, S.W. (2019) "A Critical Review of Research on Formative Assessments: The Limited Scientific Evidence of the Impact of Formative Assessments in Education. *Practical Assessment, Research, and Evaluation*, 14(
- Falcao, R., & Soeiro, A. (2019). Aligning E-assessment with learning outcomes. In *Handbook of research on E-assessment in higher education* (pp. 243-267). IGI Global Scientific Publishing.

- Fletcher, R.B., Meyer, L.H., Anderson, H., Johnston, P. & Rees, M. (2012). Faculty and Students Conceptions of Assessment in Higher Education. *High Educ* **64**, 119–133.
- Guney, C., Akinci, O., & Çamoğlu, K. (2021). Artificial Learning-Based Proctoring Solution for Remote Online Assessments: “VPROCTOR”. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *46*, 235-238.
- Gupta, A., Gupta, K., Joshi, A., & Sharma, D. (2019). Tools for e-assessment techniques in education: a review. *In Handbook of Research on E-Assessment in Higher Education* (pp. 28–52). IGI Global.
- Harvey, L., & Green, D. (1993). Defining quality. *Assessment & evaluation in higher education*, *18*(1), 9-34.
- Herzog, M. A., & Katzlinger, E. (2017). The multiple faces of peer review in higher education. Five learning scenarios developed for digital business. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(4), 1121–1143.
- Hettiarachchi, E., Huertas, M. A., & Mor, E. (2013). Skill and Knowledge e-assessment: A Review of the State of the Art. In IDoctoral Working Paper Series; DWP13-002) IN3 Working Paper Series.
- Heywood, J. (2000). *Assessment in higher education: Student learning, teaching, programmes and institutions*. Jessica Kingsley Publishers.
- Huda, S. S. M., Kabir, M. D., & Siddiq, T. (2020). E-Assessment in Higher Education: Students’ Perspective. *International Journal of Education and Development Using Information and Communication Technology*, *16*(2), 250–258.
- Jantos, A. (2021). Motives for cheating in summative e-assessment in higher education—a quantitative analysis. *In EDULEARN21 Proceedings*, 8766–8776.
- Jiao, H. (2015). Enhancing students’ engagement in learning through a formative e-assessment tool that motivates students to take action on feedback. *Australasian Journal of Engineering Education*, *20*(1), 9–18.
- JISC (2007). Effective practice with e-assessment: an overview of technologies, policies and practices in further and higher education. Available at: <http://www.jisc.ac.uk/media/documents/themes/elearning/effpraceassess.pdf>
- Jordan, S. (2013). E-assessment: Past, present and future. *New Directions in the Teaching of Physical Sciences*, *9*(1), 87–106.
- Koneru, I. (2017). Exploring Moodle functionality for managing Open Distance Learning e-assessments. *Turkish Online Journal of Distance Education*, *18*(4),

129–141.

Kundu, A., & Bej, T. (2021). Experiencing e-assessment during COVID-19: an analysis of Indian students' perception. *Higher Education Evaluation and Development*, 15(2), 114–134.

Lafuente Martínez, M., Álvarez Valdivia, I. M., & Remesal Ortiz, A. (2015). Making learning more visible through e-assessment: implications for feedback. *Journal of Computing in Higher Education*, 27(1), 10–27.

Lau, A.M.S. (2016). 'Formative good, summative bad?' – A review of the dichotomy in assessment literature. *Journal of Further and Higher Education*, 40(4), 509-525.

Mays, N., Roberts, E., & Popay, J. (2001). Synthesising research evidence. In N. Fulop, P. Allen, A. Clarke, & N. Black (Eds.), *Studying the organisation and delivery of health services: Research Methods*. Routledge.

Nicol, D. (2007). E-assessment by design: using multiple-choice tests to good effect. *Journal of Further and Higher Education*, 31(1), 53–64.

Oduntan, O., Ojuawo, O. O., & Odutan, E. A. (2015). A comparative analysis of students' performance in paper/pencil test (PPT) and computer-based test (CBT) Examination system. *Research Journal of Education Studies and Review*, 1, 24–29.

Okada, A., Noguera, I., Alexieva, L., Rozeva, A., Kocdar, S., Brouns, F., & Guerrero-Roldán, A. E. (2019). Pedagogical approaches for e-assessment with authentication and authorship verification in Higher Education. *British Journal of Educational Technology*, 50(6), 3264–3282.

Osuji, U. S. . (2012). The Use of e-Assessments in the Nigerian Higher Education System. *Turkish Online Journal of Distance Education*, 13(4), 140–152.

Panadero, E., Fraile, J., Pinedo, L., Rodriquez-Hernandez, C., & Diez, F. (2022). Changes in classroom assessment practices during emergency remote teaching due to COVID-19. *Assessment in Education: Principle, Policy & Practices*, 29(3), 361-382.

Perera, J. A. P. H. (2023). Multiparameter-based evaluation to identify the trustworthiness of the examinee during e-assessments. Dissertation.

Prendes-Espinosa, M. P. Gutiérrez-Portlán, I., & García-Tudela, P. A. (2021). Collaborative work in higher education: tools and strategies to implement the e-assessment. In: Babo, R., Dey, N., Ashour, A.S. (eds) *Workgroups eAssessment: Planning, Implementing and Analysing Frameworks. Intelligent System Reference Library*, 199.

- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, 2, 923–945.
- Ras, E., Whitelock, D., & Kalz, M. (2016). The promise and potential of e-assessment for learning. In P. Reimann, S. Bull, M. D. Kickmeier-Rust, R. Vatrappu, & B. Wasson (Eds.), *Measuring and Visualising Learning in the Information-Rich Classroom*, (pp. 21–40). Routledge.
- Rodríguez-Gómez, G., Quesada-Serra, V., & Ibarra-Sáiz, M. S. (2016). Learning-oriented e-assessment: the effects of a training and guidance programme on lecturers' perceptions. *Assessment and Evaluation in Higher Education*, 41(1), 35–52.
- Rolim, C., & Isaias, P. (2019). Examining the Use of E-assessment in Higher Education: Teachers and Students' Viewpoints. *British Journal of Educational Technology*, 50(4), 1785–1800.
- Sarigoz, O. (2013). Teacher's opinions on using web-based e-assessment and evaluation applications in education. *Scientia Socialis, UAB*, 1, 117–129.
- Schellekens, L.H., Bok, H.G.J., de Jong, L.H., van der Schaaf, M.F., Kremer, W.D.J. & van der Vleuten, C.P.M. (2021). A scoping review on the notions of Assessment as Learning (AaL), Assessment for Learning (AfL), and Assessment of Learning (AoL). *Studies in Educational Evaluation*, 71.
- Shalatska, H., Zotova-Sadylo, O., Makarenko, O., D., & Zevytska, L. (2020). Implementation of E-assessment in Higher Education. CEUR Workshop Proceedings.
- Smidt, H. (2015). European quality assurance - A European higher education area success story [overview paper]. In *The European higher education area: Between critical reflections and future policies* (pp. 625-637). Cham: Springer International Publishing.
- St-Onge, C., Ouellet, K., Lakhali, S., Dubé, T., & Marceau, M. (2022). COVID-19 as the tipping point for integrating e-assessment in higher education practices. *British Journal of Educational Technology*, 53(2), 349.
- Stöberg, U. (2012). A research review of e-assessment. *Assessment & Evaluation in Higher Education*, 37:5, 591-604.
- Sursock, A. (2015). Trends 2015: Learning and Teaching in European Universities. *European university association*.

- Taras, M. (2010). Back to basics: Definitions and processes of assessments. *Práxis Educativa, Ponta Grossa*, 5(2), 123-130.
- Taras, M. (2008). Summative and formative assessment: Perceptions and realities. *Active Learning in Higher Education*, 9(2), 179-192.
- Tinoca, L., Pereira, A., & Oliveira, I. (2014). A conceptual framework for e-assessment in higher education: Authenticity, consistency, transparency, and practicability. In *Handbook of research on transnational higher education*. IGI Global Scientific Publishing, pp. 652-673. .
- Winstone, N. E., & Careless, D., (2021). Who is feedback for? The influence of accountability and quality assurance agendas on the enactment of feedback processes. *Assessment in Education: Principles, Policy & Practice*, 28(3), 261-278.