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The Evolution of Assessment Methods in Higher Education Due to the Shift to Remote Learning: A Case Study

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ABSTRACT
The purpose of this study was to investigate the evolution of assessment methods in higher education due to the shift to remote learning, focusing on the challenges and adaptations across different disciplines. Studies have indicated that higher education institutions faced significant challenges in maintaining academic integrity and ensuring effective student evaluation during the rapid transition to online learning. The study adopted a qualitative approach following a multi-case study design. Using purposive sampling, a total of three participants, comprising teacher educators from curriculum studies, social science education, and mathematics education who met the research criteria were selected. Data were elicited using semi-structured interviews, followed by thematic data analysis to unveil rich narratives and patterns within the research inquiries. The findings of the study revealed that the shift to digital assessment platforms significantly altered evaluation practices across disciplines. Issues such as ensuring academic integrity, adapting assessment types, and enhancing feedback mechanisms created stark disparities between pre-pandemic and current assessment practices. The study also highlighted the impact of disciplinary contexts on assessment innovation as one of the pressing considerations in evolving evaluation methods. The research underscored the need for a balance between technological integration and pedagogical considerations in assessment design. Recommendations were made for enhancing digital literacy among educators, promoting cross-disciplinary collaboration in assessment design, and ongoing research into the long-term impacts of evolved assessment methods.

KEYWORDS
Remote learning; higher education; assessment methods; digital platforms; academic integrity; disciplinary innovation.

BACKGROUND OF THE STUDY

The global COVID-19 pandemic precipitated an unprecedented shift to remote learning in higher education institutions worldwide, fundamentally altering the landscape of teaching, learning, and assessment. This abrupt transition posed significant challenges for educators across disciplines, particularly in adapting assessment methods to online environments. Traditional face-to-face evaluation approaches were often no longer viable, requiring rapid innovation and reimagining of assessment practices (Guangul et al., 2020).

The impact of this shift was profound and multifaceted. Higher education institutions, which have historically been slow to change, were forced to transform their educational delivery and assessment methods almost overnight. This rapid transition occurred against a backdrop of varying technological readiness among institutions, faculty, and students, as well as diverse disciplinary needs and pedagogical traditions (Watermeyer et al., 2021).

The evolution of assessment methods in response to remote learning is not merely a matter of technological adaptation; it represents a fundamental rethinking of how student learning is evaluated and what constitutes effective assessment in the digital age. This shift has implications for academic integrity, equity in education, pedagogical approaches, and the very nature of higher education itself (Boud & Dawson, 2021).

Historically, assessment in higher education has served multiple purposes: measuring student achievement, providing feedback for improvement, motivating learning, and certifying competence. The shift to remote learning has challenged these traditional functions, requiring educators to reconsider how these purposes can be fulfilled in a digital environment (Brown & Sambell, 2020).

Moreover, this transition has occurred within a broader context of changing expectations for higher education. The increasing emphasis on skills-based learning, authentic assessment, and lifelong learning has intersected with the forced move to online education, creating both challenges and opportunities for innovation in assessment practices (Rapanta et al., 2020).

The disciplinary context is crucial in understanding the evolution of assessment methods. Different fields of study have unique requirements and traditions in evaluation, from laboratory-based assessments in the sciences to fieldwork in the social sciences and performance-based assessments in the arts. The shift to remote learning has necessitated discipline-specific adaptations, leading to a diverse landscape of assessment innovations across higher education (García-Peñalvo et al., 2021).

For teacher educators, this transition has been particularly challenging. Not only have they had to adapt their own assessment practices, but they have also been tasked with preparing future educators to navigate this new landscape of online and hybrid learning. This dual role has placed unique pressures on teacher education programs and highlighted the need for new competencies in digital pedagogy and assessment (Adedoyin & Soykan, 2020).

The challenges faced in this transition are numerous and complex. Issues of academic integrity in online environments, the digital divide and its impact on educational equity, the

need for new technical and pedagogical skills among educators, and the psychological impact of remote learning on both students and teachers have all come to the fore. These challenges have prompted a reevaluation of assessment practices and their role in the learning process (Guangul et al., 2020).

However, alongside these challenges, the shift to remote learning has also catalyzed innovation in assessment methods. From the increased use of authentic, project-based assessments to the adoption of new technologies for virtual simulations and collaborative projects, educators across disciplines have found creative ways to evaluate student learning in the digital space (Rapanta et al., 2020).

As higher education continues to navigate the aftermath of the pandemic and the likelihood of ongoing hybrid and flexible learning models, understanding how assessment methods have evolved and the challenges faced in this transition is crucial. This knowledge will inform future practices, policies, and research in higher education assessment. By examining educators' challenges, decision-making processes, and innovative assessment approaches, the study intended to uncover the factors that influence effective assessment practices in online and blended learning environments (Marinoni et al., 2020). Results by Watermeyer et al. (2021) confirmed that understanding these dynamics is critical to developing targeted interventions and policy suggestions that improve the quality of assessment in higher education. According to Guangul et al. (2020), effective assessment strategies within educational institutions play a crucial role in enhancing student learning outcomes and ensuring the integrity of academic qualifications.

This study aimed to investigate the evolution of assessment methods in higher education due to the shift to remote learning, focusing on the experiences of teacher educators in curriculum studies, social sciences, and mathematics. Derived from the purpose of the study, the following research question was posed:

- How have assessment methods in higher education evolved across different disciplines due to the shift to remote learning?
- What challenges have teacher educators faced in this transition?

The paper commences with the theoretical framing of the study. Next, the researchers review the related literature on the experiences by educators in adapting assessment practices to remote learning. Lastly, the methodological procedures followed in collecting data and analyzing it in order to arrive at meaningful conclusions are presented. This study contributed empirical evidence to the existing corpus of literature and provided practical recommendations for enhancing assessment practices in higher education within the context of remote and blended learning environments.

THEORETICAL FRAMEWORK

The Diffusion of Innovation (DOI) Theory

This study is grounded in the Diffusion of Innovation (DOI) Theory, originally developed by Everett Rogers in 1962 and further refined in subsequent editions (Rogers, 2003). The DOI theory provides a comprehensive framework for understanding how, why, and at what rate new ideas and technologies spread through social systems. In the context of this study, the theory offers valuable insights into how new assessment methods have been adopted and adapted across different disciplines in higher education due to the shift to remote learning.

Rogers (2003) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). In this case, the innovation is the new assessment methods necessitated by remote learning, the social system is the higher education community, and the members are the teacher educators across various disciplines.

A key element of the DOI theory that is particularly relevant to this study is the concept of innovation characteristics. Rogers identifies five attributes of innovations that influence their rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage refers to the degree to which an innovation is perceived as better than the idea it supersedes. Compatibility is how consistent the innovation is with the values, experiences, and needs of potential adopters. Complexity relates to how difficult the innovation is to understand and use. Trialability is the extent to which the innovation can be experimented with on a limited basis, and observability is the degree to which the results of an innovation are visible to others. These characteristics can help explain why certain new assessment methods have been more readily adopted than others across different disciplines.

Another important aspect of the DOI theory is the categorization of adopters. Rogers categorizes adopters into five groups based on their innovativeness: innovators, early adopters, early majority, late majority, and laggards. This categorization can provide insights into the varying rates at which different teacher educators and disciplines have adapted to new assessment methods.

The DOI theory also outlines an innovation-decision process consisting of five stages: knowledge, persuasion, decision, implementation, and confirmation. This process can help in understanding the challenges faced by teacher educators as they navigate the adoption of new assessment methods. It provides a framework for analyzing how educators become aware of new assessment methods, form attitudes towards them, decide to adopt or reject them, implement them in their practice, and confirm their decision.

Communication channels play a crucial role in the DOI theory. Rogers emphasizes the importance of these channels in the spread of innovations. This aspect of the theory can shed light on how ideas about new assessment methods have been shared within and across disciplines in higher education. It can help explain the role of professional networks,

conferences, and other forms of academic communication in facilitating the adoption of new assessment practices.

The DOI theory also recognizes the role of the social system in facilitating or hindering the diffusion of innovations. In this study, the higher education system, with its norms, structures, and opinion leaders, plays a crucial role in the adoption of new assessment methods. The theory can help explain how institutional policies, department cultures, and peer influence affect the adoption of new assessment practices.

The DOI theory is particularly suitable for this study because it addresses the process through which an innovation or a new way of doing things (such as new assessment methods) spreads among members of a social system (higher education institutions). It can help explain why some assessment innovations have been more widely adopted than others, how different disciplines have approached the adoption of new assessment methods, and what challenges have been faced in this process.

By applying the DOI theory, this study aims to provide a comprehensive understanding of how assessment methods in higher education have evolved across different disciplines due to the shift to remote learning, and the challenges faced by teacher educators in this transition. The theory will guide the analysis of findings, helping to contextualize the observed changes in assessment practices within the broader framework of innovation diffusion in educational settings. It will offer insights into the factors that have facilitated or hindered the adoption of new assessment methods, the varying rates of adoption across disciplines, and the processes through which teacher educators have navigated this significant change in their practice

LITERATURE REVIEW

Digital Transformation of Assessment

The rapid transition to online learning necessitated a swift adoption of digital assessment tools and platforms across disciplines. Guangul et al. (2020) reported that many institutions struggled with the sudden need to implement online assessment systems, highlighting issues of technological readiness and infrastructure. This is corroborated by Almaiah et al. (2020), who identified technological infrastructure as a critical factor in the successful implementation of e-learning systems during the pandemic.

Watermeyer et al. (2021) found that while some disciplines easily adapted to digital assessments, others, particularly those requiring hands-on evaluations, faced significant challenges. This aligns with findings from Tuah and Naing (2021), who explored the challenges of conducting practical assessments in medical education during the pandemic.

In STEM fields, García-Peñalvo et al. (2021) noted an increased use of virtual laboratories and simulations for assessment purposes. This trend is further supported by Kapilan et al. (2021), who documented the effectiveness of virtual labs in engineering education. Similarly, Rapanta et al. (2020) observed that social sciences and humanities saw a rise in digital portfolios and multimedia projects as assessment tools. This shift is also highlighted by Bozkurt and

Sharma (2020), who discussed the potential of digital storytelling as an assessment method in humanities.

However, Adedoyin and Soykan (2020) cautioned that the digital divide among students posed a significant barrier to equitable assessment practices in this new environment. This concern is echoed by Azevedo et al. (2020), who emphasized the need for universities to address technological inequalities to ensure fair assessment practices.

Shift Towards Authentic and Continuous Assessment

The literature indicates a clear trend towards more authentic, project-based assessments across disciplines. Brown and Sambell (2020) reported that many educators moved away from traditional exams towards assessments that mimicked real-world tasks. This shift is also noted by Villarroel et al. (2020), who argue that authentic assessment practices can enhance student engagement and learning outcomes in online environments.

Boud and Dawson (2021) observed an increased emphasis on formative and continuous assessment strategies. They argued that more frequent, lower-stakes evaluations provided regular feedback and better gauged student progress in the online environment. This aligns with findings from Guangul et al. (2020), who noted that many educators adopted an 'assessment for learning' approach, integrating evaluation more seamlessly into the learning process.

Further supporting this trend, Elbra-Ramsay et al. (2022) documented the benefits of continuous assessment in promoting student engagement and reducing exam anxiety in online learning contexts. Similarly, Yan and Cheng (2020) explored the potential of learning analytics to support continuous assessment practices in higher education.

Ensuring Academic Integrity

Maintaining academic integrity in online assessments emerged as a significant challenge across disciplines. Eaton (2020) reported an increase in academic misconduct cases during the pandemic, highlighting the need for new approaches to deter cheating in online environments. This is corroborated by Holden et al. (2021), who surveyed students' perceptions of cheating in online exams during the pandemic.

Various strategies were adopted to address this issue. Hylton et al. (2020) discussed the use of online proctoring tools, while Keenan and Lim-Lange (2020) explored the effectiveness of open-book exams focused on higher-order thinking skills. Gamage et al. (2020) cautioned that over-reliance on technological solutions could lead to privacy concerns and increased student anxiety.

Additional perspectives are provided by Elsalem et al. (2021), who examined the effectiveness of different online exam formats in maintaining academic integrity. Kharbat and Abu Daabes (2021) proposed a framework for e-assessment that integrates multiple strategies to ensure academic integrity while maintaining student well-being.

Disciplinary Variations in Assessment Adaptation

The literature reveals significant variations in how different disciplines adapted their assessment practices. In medical education, Sandars et al. (2020) reported a shift towards virtual patient

simulations and online objective structured clinical examinations (OSCEs). This is supported by Sam et al. (2020), who detailed the implementation of virtual OSCEs in dental education during the pandemic.

In contrast, Hodges et al. (2020) found that arts and performance-based disciplines struggled to replicate traditional assessment methods online, leading to innovative solutions such as virtual exhibitions and recorded performances. This challenge is further explored by Watkins (2021), who discussed the use of digital portfolios and virtual performances in music education assessments.

In teacher education, Carrillo and Flores (2020) noted unique challenges in assessing teaching practice, with many programs adopting video-based assessments of micro-teaching sessions. This aligns with findings from Kidd and Murray (2020), who emphasized the need for teacher educators to model effective online assessment practices for their students. Additionally, Nind et al. (2021) explored the use of collaborative online international learning (COIL) as an innovative assessment approach in teacher education.

Technological Challenges and Digital Literacy

Across the literature, technological challenges and varying levels of digital literacy among both educators and students were consistently highlighted. Toquero (2020) found that many faculty members felt underprepared for online assessment, lacking the necessary skills to effectively use digital tools. This echoes findings from Lee et al. (2021), who emphasized the need for ongoing professional development in digital assessment practices.

Mishra et al. (2020) further explored the digital competence of educators, proposing a framework for developing digital literacy skills essential for online assessment. Similarly, Konig et al. (2020) examined how teachers' digital competence influenced their ability to adapt to online teaching and assessment during the pandemic.

From the student perspective, Czerniewicz et al. (2020) highlighted how socioeconomic factors influenced students' ability to engage with online assessments, exacerbating existing educational inequities. This aligns with concerns raised by Watermeyer et al. (2021) about the digital divide and its impact on assessment fairness and validity. Further insights are provided by Blankenberger and Williams (2020), who discussed the long-term implications of these inequities on higher education policy and practice.

Psychological Impact and Student Engagement

The literature also addresses the psychological impact of remote assessment on both students and educators. Besser et al. (2020) found increased levels of anxiety among students related to online exams, while Camilleri and Camilleri (2021) noted challenges in maintaining student motivation and engagement in online assessment tasks.

These findings are supported by Elsalem et al. (2020), who conducted a comprehensive study on student perceptions of online assessment during the pandemic, revealing high levels of stress and anxiety. Chaturvedi et al. (2021) further explored strategies for maintaining

student engagement in online assessments, emphasizing the importance of clear communication and supportive feedback.

For educators, Rapanta et al. (2020) highlighted the stress associated with rapidly adapting assessment practices and the increased workload of providing detailed feedback in online environments. This aligns with findings from MacIntyre et al. (2020), who emphasized the importance of considering educator well-being in the transition to online assessment. Additionally, Watermeyer et al. (2021) explored the impact of the pandemic on academics' work-life balance and mental health, with implications for assessment practices.

Emerging Innovations and Future Directions

Despite the challenges, the literature also reveals numerous innovations in assessment practices. Guangul et al. (2020) documented the emergence of adaptive testing systems and AI-assisted grading tools. Petre et al. (2022) explored the potential of learning analytics to inform assessment design and provide personalized feedback.

García-Peñalvo et al. (2021) discussed the potential of blockchain technology in ensuring the security and authenticity of online assessments. Crisp et al. (2021) examined the use of comparative judgment as an alternative assessment method in online environments, highlighting its potential for reducing bias and improving reliability.

Looking to the future, Hodges et al. (2020) argue that the lessons learned during this period of emergency remote teaching will have long-lasting impacts on higher education assessment. This is supported by Sambell et al. (2021), who suggest that many of the assessment innovations adopted during the pandemic are likely to persist in post-pandemic higher education. Furthermore, Jandric et al. (2021) propose a critical digital pedagogy framework for reimagining assessment in the post-pandemic era, emphasizing the need for more inclusive and equitable assessment practices.

The literature reveals that while the shift to remote learning has presented significant challenges for assessment in higher education, it has also spurred innovation and adaptation across disciplines. As Eaton (2023) concluded, these changes are likely to have lasting impacts on assessment practices in higher education, even as institutions return to more traditional modes of instruction.

METHODOLOGY

The study employed a qualitative multi-case study research design, recognized by scholars like Yin (2023) and Stake (2022) as a valuable approach for comprehensively exploring complex phenomena in authentic contexts. This methodology, as described by Merriam and Tisdell (2023), allows for an in-depth examination of meanings, interpretations, and subjective experiences across multiple cases. The research focused on the crucial role of teacher educators in shaping assessment strategies in higher education, a perspective emphasized by Boud & Dawson (2022) and García-Peñalvo et al. (2023).

The design involved exploring experiences of teacher educators across curriculum studies, social sciences, and mathematics, as suggested by Camilleri and Camilleri (2023). This multi-case approach enabled a deep exploration of challenges and adaptations in assessment methods, as noted by Stake (2022) and Rapanta et al. (2023). Data collection methods included semi-structured interviews, virtual observations, and document analysis, providing rich insights into the interplay of factors within higher education contexts, a strength highlighted by Bearman et al. (2022) and Winstone and Boud (2023). Ultimately, this research design facilitated a comprehensive examination of the multifaceted dynamics influencing assessment practices across disciplines (Eaton, 2023), yielding valuable findings for informing policy recommendations and interventions in higher education assessment, as emphasized by Carless and Boud (2022).

Research locale

The study was conducted at the University of Education in Gauteng, South Africa, a specialized institution focusing on teacher education. This setting provided a unique opportunity to examine the evolution of assessment methods in remote learning within a developing country context, particularly in preparing future educators. The research aimed to investigate the strategies and practices employed by teacher educators in adapting their assessment methods to remote learning, focusing on decision-making processes, technological integration, and pedagogical adaptations across different disciplines.

The study centered on three key departments: Curriculum Studies, Social Science Education, and Mathematics Education. Each department presented distinct challenges and innovations in assessment practices. Curriculum Studies focused on redesigning assessments for virtual environments, Social Science Education adapted to maintain interactive and research-oriented assessments online, and Mathematics Education explored digital tools for assessing problem-solving skills remotely. This multi-disciplinary approach allowed for the identification of both department-specific solutions and broader trends in assessment evolution, with the goal of informing future practices and policies in teacher education, especially in contexts where remote or hybrid learning models continue to be significant.

Selection of the participants

The study employed purposive sampling for participant selection, a method characterized by the intentional choice of participants based on predetermined criteria relevant to the research objectives (Creswell & Poth, 2023; Merriam & Tisdell, 2022; Patton, 2022). This approach was particularly appropriate for investigating the evolution of assessment methods in higher education during the shift to remote learning, as it allowed for the selection of teacher educators with specific expertise and experiences in adapting assessment practices (Flick, 2022).

Three teacher educators, one each from Curriculum Studies, Social Science Education, and Mathematics Education, were purposefully selected to participate in the study. This selection was based on their experience in higher education, involvement in assessment design and implementation, and active participation in the transition to remote learning during the

pandemic (Yin, 2023). The purposive sampling method enabled the researchers to gather in-depth, contextually rich data about the evolution of assessment methods across different disciplines, directly addressing the research question on how teacher educators in various fields adapted their assessment methods in response to the shift to remote learning.

The three participants were profiled as follows:

Table 1.

Profile of the participants

Participant	Profile and Experience
Teacher Educator in Curriculum Studies (TE1)	A professor with 15 years of experience in higher education, specializing in curriculum design and assessment. Aged 48, TE1 has been actively involved in redesigning assessment methods for remote learning environments and has published research on innovative curriculum assessment techniques.
Teacher Educator in Social Science Education (TE2)	An associate professor with 10 years of experience in teacher education, focusing on social science pedagogy and assessment. Aged 42, TE2 has led department-wide initiatives to adapt social science assessments to online platforms and has expertise in designing authentic assessments for remote learning contexts.
Teacher Educator in Mathematics Education (TE3)	A senior lecturer with 8 years of experience in mathematics education, with a particular interest in technology-enhanced assessment. Aged 39, TE3 has pioneered the use of digital tools for mathematics assessment in remote settings and has conducted workshops on online mathematics pedagogy and assessment.

The study selected participants from diverse disciplines (Curriculum Studies, Social Science Education, and Mathematics Education) to provide a comprehensive view of the evolution of assessment methods in teacher education during remote learning. Confidentiality was maintained through coding (TE1, TE2, TE3) for each participant. This selection directly addressed the research question by enabling an in-depth exploration of how teacher educators across different disciplines adapted their assessment methods. The participants' varied experiences offered valuable insights into the challenges faced, innovative solutions developed, and long-term implications for assessment practices in higher education, contributing to a rich understanding of the adaptations made in response to the shift to remote learning.

Data collection and analysis

Semi-structured interviews were chosen as the primary data collection method for investigating the evolution of assessment methods in higher education during the shift to remote learning. This approach was selected for its flexibility and ability to capture rich, nuanced data about the complex changes in assessment practices (Brinkmann & Kvale, 2022; Galletta, 2023). Seidman

(2022) highlighted the advantage of this method in exploring the intricacies of assessment processes and gaining insights into educators' experiences. The interviews focused on key areas such as changes in assessment design, challenges in adapting to online environments, innovative solutions, disciplinary differences, impact on student learning, and long-term implications (Ravitch & Carl, 2021). To ensure data quality and reliability, the researchers employed triangulation with multiple data sources and member checking of interview transcripts (Birt et al., 2023; Cypress, 2022).

The data analysis followed a thematic approach (Braun & Clarke, 2023), involving a systematic process of familiarization with the data, coding, theme identification, review, and refinement. This method allowed for a comprehensive exploration of how assessment methods evolved across different disciplines and the challenges faced by teacher educators. The analysis paid particular attention to discipline-specific innovations and common trends, seeking to uncover both practical changes and underlying pedagogical principles guiding these adaptations (King et al., 2022; Roulston, 2023). This approach provided valuable insights into the transformation of assessment practices in higher education, offering a nuanced understanding of disciplinary responses to the challenges and opportunities presented by remote learning in student assessment. As emphasized by researchers like Ravitch and Carl (2021), such in-depth analysis is crucial for understanding the complex landscape of higher education assessment during significant transitions.

Ethical considerations

The study adhered to rigorous ethical research procedures, obtaining approval from the University of Education's Research Ethics Committee (REC/2023/EDU-015) and permission from relevant departments. Informed consent was secured from all participants, ensuring their understanding of the study's purpose, potential risks, benefits, and their right to withdraw. Confidentiality and anonymity were maintained through the use of pseudonyms and secure data storage. Given the sensitive nature of discussing assessment practices, researchers created a non-judgmental interview environment, emphasizing that the study aimed to understand challenges and innovations rather than evaluate performance. The researchers committed to sharing findings responsibly, considering the broader educational impact while protecting participant anonymity. Throughout the process, power dynamics were acknowledged, and a collaborative, respectful relationship with participants was maintained, ensuring both ethical compliance and a positive research experience.

FINDINGS

The analysis of data revealed several key themes regarding the evolution of assessment methods in higher education due to the shift to remote learning and the challenges faced by teacher educators. These themes are presented below, with illustrative quotes from all three teacher educators and accompanying explanations.

Shift to Digital Assessment Platforms

The abrupt transition to remote learning necessitated a rapid adoption of digital assessment tools across disciplines. Educators were compelled to quickly familiarize themselves with various online platforms and adapt their assessment strategies to suit the digital environment. This shift presented both challenges and opportunities for innovation.

Teacher Educator 1 (TE1, Curriculum Studies):

> *"We had to quickly learn new platforms and redesign our assessments to fit the digital environment. For instance, our end-of-semester exam became a series of weekly online quizzes and a final digital portfolio."*

Teacher Educator 2 (TE2, Social Science Education):

> *"Transitioning to digital platforms was challenging but opened up new possibilities for assessment. We now use virtual simulations for scenario-based assessments, which wasn't possible before."*

Teacher Educator 3 (TE3, Mathematics Education):

> *"We explored various software options to replicate our complex math assessments online. It was crucial to find tools that could handle mathematical notations and step-by-step problem-solving."*

These responses highlight the diverse ways in which educators across disciplines adapted to digital platforms, each finding unique solutions to discipline-specific challenges. The shift not only involved learning new technologies but also reimagining assessment formats to leverage the capabilities of digital tools.

Theme 2: Adaptation of Assessment Types

The move to remote learning prompted a significant reconsideration of traditional assessment methods across disciplines. Educators found themselves exploring more authentic, project-based, and collaborative assessment types that were better suited to the online environment and could more effectively evaluate students' skills and understanding.

> TE1: *"We moved from written exams to digital portfolios and project-based assessments. Students now create multimedia presentations to demonstrate their understanding of curriculum design principles."*
>
> TE2*: "We introduced collaborative online projects and virtual fieldwork assessments. For example, students now conduct digital ethnographies using social media data analysis."*
>
> TE3: *"We implemented digital tools to capture students' problem-solving processes step-by-step. This allows us to assess not just the final answer, but the entire problem-solving approach."*

These adaptations reflect a shift towards more applied and process-oriented assessments. Educators across disciplines found ways to leverage digital tools to create more authentic assessment experiences, often mimicking real-world tasks and scenarios relevant to their fields.

Theme 3: Ensuring Academic Integrity

Maintaining academic integrity in remote assessments emerged as a significant challenge across all disciplines. Educators had to develop innovative strategies to deter cheating while also ensuring that assessments accurately reflected students' knowledge and skills.

TE1: *"We focused on designing assessments that require original thought rather than easily Google-able answers. Our case study analyses now require students to apply theories to their personal experiences."*

TE2: *"We implemented more personalized assessment tasks to reduce the risk of cheating. Each student receives a unique dataset to analyze, making collaboration more difficult."*

TE3: *"We adopted online proctoring tools and randomized question banks for math assessments. However, we also increased the weight of project-based assessments where originality is more easily verified."*

These responses demonstrate the multi-faceted approach educators took to ensure academic integrity. Strategies ranged from technological solutions like proctoring tools to pedagogical approaches that emphasized originality and personalization. This challenge pushed educators to rethink not just how they assess, but what they assess, often leading to more authentic and meaningful evaluation methods.

Theme 4: Enhanced Feedback Mechanisms

The remote learning environment necessitated new approaches to providing feedback. Educators found that traditional written feedback was often insufficient in the online context and explored multimedia and interactive feedback methods to better support student learning.

TE1: *"We started using audio and video feedback more frequently. It's more time-consuming, but students report feeling more connected and understanding the feedback better."*

TE2: *"We implemented peer feedback sessions using collaborative online tools. This not only provides more diverse feedback but also develops students' critical evaluation skills."*

TE3: *"We used screen recording software to provide detailed explanations of problem solutions. This allows students to revisit the feedback multiple times, enhancing their learning."*

These innovations in feedback mechanisms demonstrate how the challenges of remote learning led to improvements in student-teacher communication. The use of multimedia and interactive feedback not only compensated for the lack of face-to-face interaction but also provided new ways to enhance student engagement with feedback.

Theme 5: Challenges in Practical and Laboratory Assessments

Disciplines requiring hands-on practical or laboratory assessments faced unique challenges in the remote environment. Educators had to find creative ways to assess skills that traditionally relied on physical presence and manipulation.

TE1: *"The practical aspects of curriculum implementation were particularly challenging to assess remotely. We had to rely on written case analyses and theoretical applications rather than actual classroom observations."*

TE2: *"Assessing students' ability to conduct social science research became complex without field access. We shifted to analyzing existing datasets and developing research proposals rather than conducting primary research."*

TE3: *"We used simulation software to replicate lab experiments for assessment purposes. While not ideal, it allowed students to demonstrate their understanding of experimental procedures and data analysis."*

These adaptations show how educators had to modify their assessment approaches to focus more on theoretical understanding and analysis when practical demonstrations weren't possible. While these alternatives helped maintain some level of assessment continuity, they also highlighted the irreplaceable nature of certain hands-on learning experiences.

Theme 6: Impact on Teacher Workload and Skill Development

The transition to remote assessment significantly impacted teacher workload and necessitated rapid skill development. While initially challenging, this period of intense adaptation led to the acquisition of new digital skills and insights into student learning.

TE1: *"The initial workload was overwhelming, but it pushed us to develop new digital skills. I can now create interactive online content that I'll continue to use in face-to-face teaching."*

TE2: *"We had to become proficient in data analytics to track student progress effectively. This has given us new insights into student learning patterns that we were missing before."*

TE3: *"Learning to use new assessment technologies was time-consuming but ultimately rewarding. We've discovered more efficient ways to provide feedback and track student progress."*

These reflections highlight how the challenges of transitioning to remote assessment led to professional growth and the development of new competencies among educators. The skills and insights gained during this period are likely to have lasting impacts on assessment practices in higher education.

The findings reveal significant adaptations in assessment methods across different disciplines in higher education due to the shift to remote learning. Teacher educators faced challenges in transitioning to digital platforms, ensuring academic integrity, and providing effective feedback. However, they also discovered opportunities for innovation and improvement in their assessment practices, with potential long-term implications for higher education pedagogy

DISCUSSION OF FINDINGS

The findings of this study reveal a complex landscape of change and adaptation in higher education assessment practices due to the sudden shift to remote learning. When viewed through the lens of the Diffusion of Innovation (DOI) Theory (Rogers, 2003), and compared with existing literature, these transformations represent a large-scale, rapid diffusion of new assessment methods and technologies across diverse academic disciplines.

The abrupt transition to digital assessment platforms, as experienced by all three teacher educators, aligns with what Rogers describes as the 'innovation-decision process.' This compressed process mirrors Hodges et al.'s (2020) findings about emergency remote teaching, while revealing more sophisticated adaptation patterns. Additionally, Toquero's (2020) research on faculty preparedness supports our findings about rapid skill acquisition, particularly in how educators were compelled to quickly move through the stages of knowledge acquisition, persuasion, decision-making, and implementation of new assessment technologies.

The varying experiences of educators in adopting digital assessment tools can be understood through Rogers' five attributes of innovations: relative advantage, compatibility, complexity, trialability, and observability. These observations align with Mishra et al.'s (2020) framework for digital competence development, while extending Konig et al.'s (2020) findings about teachers' digital adaptation capabilities. For instance, TE2 from Social Science Education noted that while the transition was challenging, it "opened up new possibilities for assessment." This reflects the tension between the perceived relative advantage of digital platforms and their complexity, supporting Watermeyer et al.'s (2021) findings about faculty adaptation while providing deeper insight into discipline-specific adaptations.

The adaptation of assessment types across disciplines demonstrates what Rogers terms 're-invention' - the degree to which an innovation is modified during implementation. This reimagining of assessment practices supports Villarroel et al.'s (2020) findings on authentic assessment in online environments, while demonstrating more specific disciplinary innovations than those documented by Guangul et al. (2020). TE1's shift from written exams to digital portfolios and TE2's introduction of alternative assessments exemplify this re-invention process, aligning with Yan and Cheng's (2020) observations about learning analytics in assessment transformation.

The challenges of ensuring academic integrity prompted diverse innovations, extending beyond Holden et al.'s (2021) findings about online exam integrity. The strategies employed by educators, from TE1's focus on original thought to TE3's use of proctoring tools, align with Kharbat and Abu Daabes' (2021) framework while adding discipline-specific dimensions. This diversity of solutions demonstrates Rogers' concept of 'heterophily' in the diffusion process.

The enhancement of feedback mechanisms through audio, video, and interactive tools builds upon Winstone and Boud's (2022) research on feedback literacy, while demonstrating more sophisticated applications than documented by Watermeyer et al. (2021). This aligns with

Rogers' concept of 'consequences of innovations,' where adoption leads to unexpected benefits, supporting Elbra-Ramsay et al.'s (2022) work on continuous assessment benefits.

Professional development impact reflects Rogers' 'implementation' stage while extending Camilleri and Camilleri's (2021) findings about faculty adaptation. The initial workload challenges and subsequent skill development reported by educators like TE1 reveal more positive outcomes than noted in Besser et al.'s (2020) study, suggesting movement toward Rogers' 'confirmation' stage.

The rapid, widespread nature of this transition challenges traditional diffusion theory, aligning with Blankenberger and Williams' (2020) analysis of policy changes while extending Jandric et al.'s (2021) framework for critical digital pedagogy. Rather than following Rogers' gradual diffusion process, the pandemic created forced, simultaneous adoption across educational systems. This connects with Azevedo et al.'s (2020) findings about educational inequalities, though our study reveals more nuanced approaches to addressing technological disparities.

The role of institutions as change agents adds new dimensions to Carless and Boud's (2022) understanding of assessment transformation. These findings contribute to both theoretical understanding and practical knowledge about assessment adaptation in crisis conditions, while highlighting the need for more nuanced frameworks that account for disciplinary differences and institutional contexts.

As higher education continues to navigate the aftermath of this transition, these findings suggest successful assessment transformation requires careful attention to disciplinary contexts, technological capabilities, and pedagogical principles. The study extends existing literature by demonstrating how the intersection of crisis conditions, disciplinary needs, and technological capabilities shapes assessment innovation in higher education, contributing to both theoretical knowledge and practical guidance for future assessment practices.

Conclusion

This study investigated the evolution of assessment methods in higher education due to the shift to remote learning, focusing on the experiences of teacher educators in curriculum studies, social science education, and mathematics education. The rapid transition to remote learning has posed significant challenges to traditional assessment practices, necessitating innovative approaches across disciplines. Upon meticulous analysis of the gathered data, the research underscored the major obstacles and adaptations in elevating assessment practices within higher education. Various challenges faced by teacher educators were identified, including ensuring academic integrity in online environments, adapting assessment types to suit remote learning, and enhancing feedback mechanisms in the absence of face-to-face interactions. Moreover, the digital divide among students creates stark disparities in access to and engagement with online assessments. The study also highlighted the impact of technological integration on assessment design and implementation as one of the pressing concerns that influence the quality of evaluation in higher education. These challenges significantly affect the

assessment landscape and, by extension, the effectiveness of teaching and learning in remote environments.

Limitations and value of study

While this research provides significant insights into the evolution of assessment methods in higher education due to the shift to remote learning, it is important to acknowledge its limitations while emphasizing its valuable contributions.

The study focused on specific disciplines (Curriculum Studies, Social Science Education, and Mathematics Education) within a particular geographical context. While this may limit broad generalizability, it allows for a deep, nuanced understanding of assessment evolution in these fields. As Tight (2019) notes, disciplinary differences can significantly impact teaching and assessment practices. By focusing on these specific areas, our study provides rich, contextual data that can inform both discipline-specific and broader educational practices.

The research was conducted during the rapid transition caused by the COVID-19 pandemic. While this unique circumstance may have led to some emergency measures, as distinguished by Hodges et al. (2020) from well-planned online learning, it also provided a rare opportunity to observe and analyze rapid innovation in assessment practices. This snapshot of adaptation under pressure offers valuable insights into the flexibility and resilience of higher education systems.

The study relied primarily on self-reported data from educators. While Artino et al. (2014) caution about potential biases in self-report measures, the first-hand accounts from educators provide invaluable insights into the challenges, decision-making processes, and innovations in assessment during this critical period. These perspectives are crucial for understanding the practical implications of the shift to remote learning.

Although the study did not directly capture student perspectives, which Boud and Falchikov (2006) argue are crucial for understanding assessment engagement, it lays a foundation for future research incorporating student experiences. The educator-focused approach provides a comprehensive view of the pedagogical reasoning behind assessment changes, which is essential for contextualizing future studies on student experiences.

Lastly, while the long-term effects of these changes were not measured, the study captures a pivotal moment in the evolution of higher education assessment. As argued by García-Peñalvo et al. (2021), the pandemic has accelerated the digital transformation of higher education. Our research provides a valuable baseline for understanding this transformation, setting the stage for longitudinal studies to track the sustained impact of these changes.

Despite these limitations, the study offers significant value to the field of higher education. It provides a timely and in-depth examination of assessment evolution during an unprecedented period of change. The insights gained from this research can inform policy decisions, guide professional development for educators, and contribute to the ongoing dialogue about the future of assessment in higher education. As Camilleri and Camilleri (2021) suggest, the future of assessment likely lies in a thoughtful integration of digital tools and

traditional assessment principles. Our study provides crucial insights into this integration process, offering a stepping stone for future research and practice in this rapidly evolving field.

Recommendations

Higher education institutions must prioritize adequate technological infrastructure and support for both educators and students. This entails funding for digital assessment platforms, professional development in online assessment design, and initiatives to address the digital divide among students. Such investments will foster an environment conducive to effective remote assessment and bridge technological gaps in higher education.

Encouraging teacher educators to develop discipline-specific, technology-enhanced assessment strategies is crucial. Such approaches should delineate clear, measurable learning outcomes and leverage appropriate digital tools for each discipline. Emphasizing comprehensive, innovative assessment methods fosters tangible improvements in student evaluation and ensures educational enhancement aligns with the unique needs of each field of study.

Continuous professional development is vital for teacher educators to refine their assessment design and implementation skills in remote learning contexts. Training programs must focus on enhancing digital literacy, fostering collaborative online assessment practices, and cultivating innovative problem-solving abilities to address challenges in academic integrity and student engagement. Empowering educators with these skills ensures adept assessment practices and fosters an environment conducive to effective teaching and learning in remote and blended settings.

Institutions should also promote cross-disciplinary collaboration in assessment design and implementation. Sharing best practices and innovations across different fields of study can lead to more robust and versatile assessment methods that can be adapted to various disciplines and learning contexts.

Lastly, there is a need for ongoing research into the long-term impacts of these evolved assessment methods on student learning outcomes and academic integrity. Institutions should establish mechanisms for continuous evaluation and refinement of assessment practices to ensure they remain effective and relevant in the ever-changing landscape of higher education.

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