Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.15, No.4, 2024

Investigating How Pre-service Primary School Teachers at The University of Botswana Interpret Video-Based Assessments in Mathematics Education

End Salani* Amantle Mico Sekgoma
Department of Primary Education, University of Botswana,
Private Bag 00702, Gaborone, Botswana
* E-mail of the corresponding author: salanie@ub.ac.bw

The research is financed by the Authors through their savings.

Abstract
In the rapidly evolving landscape of educational technology, the integration of online assessments has garnered global attention. This study focuses on video-based assessments, in the context of pre-service primary school teachers at the University of Botswana. Against the backdrop of the University of Botswana's efforts to adapt to digital platforms post-COVID-19, the study investigates the readiness and challenges faced by both students and instructors. The University of Botswana, traditionally employing limited ICT, initiated e-learning in 2001, a venture met with underutilization due to resource constraints. While the recent shift to e-learning during the pandemic highlighted challenges, such as poor infrastructure and internet accessibility, it also revealed potential benefits, emphasizing the need for effective technology integration. To address the dearth of research on pre-service teachers' perceptions in the Botswana context, this mixed-method case study employs surveys and semi-structured interviews. Findings indicate a moderate familiarity with video-based assessments, high participation rates, but a lower frequency of exposure among pre-service teachers. Positive perceptions regarding the impact on learning and academic performance are observed, with a moderate level of satisfaction. Thematic analysis identifies key areas for improvement, notably in feedback provision, technical support, and clarity of instructions. Recommendations encompass increased awareness, active student engagement, and strategic enhancements to frequency and integration. Professional development initiatives should focus on comprehensive feedback, self-reflection, clear instructions, and technical support. The study contributes to understanding pre-service teachers' perspectives, guiding policy decisions, curriculum development, and teacher training to effectively integrate online assessments into the Botswana education system.
Keywords: Online assessments, Video-based assessments, Pre-service teachers, Educational Technology, Digital learning platforms
DOI: 10.7176/JEP/15-4-05
Publication date: March 31st 2024

1. Background information

In recent years, the integration of technology in education has gained significant attention worldwide. With the increasing availability of digital resources and online platforms, educators have explored various strategies to enhance teaching and assessment practices. In the context of Botswana, the use of online assessments, particularly those involving videos, has emerged as a promising approach to evaluate student learning outcomes. This section provides an overview of the use of online assessments with a focus on video-based assessments in Botswana, highlighting the benefits and challenges associated with this pedagogical approach.

Several research were conducted in Botswana following COVID-19 to establish readiness on use of online platforms. For example, Hondonga et al. (2021) conducted a study on preparedness of training systems and the availability of digital technologies for online teaching. The study presented findings concerning the readiness and prevalence of Botswana Private Tertiary institutions. They found that many students encountered challenges to engaging in e-learning owing to lack of internet connectivity, lack of a computer or laptop, and inadequate training in the use of their college' online learning platform. This is critical to the current study as inadequate skills and lack of technology resources could have a negative impact on acceptance of online platforms, including online assessments, which is the area of focus. It was further revealed that the Private training institutions were not prepared in terms of having e-learning platforms in place, whilst most lecturers lacked preparation and training in using the online platforms to deliver emergency remote teaching. This as a result calls for a paradigm shift in ensuring that both students and educators are taken on board for the realization of effective implementation of online platforms.

University of Botswana is an institution of higher education training opened in 1982 and has been over the years largely employing traditional approaches, where the use of ICT was limited to use of projectors for lesson presentation. In 2001, the University of Botswana introduced an eLearning initiative which research has shown that it has been underutilized due to resource challenges. For example, Ntshwarang et al.'s (2021) study revealed

that the era of COVID 19, saw the University of Botswana making efforts to shift to the use of eLearning platforms, which posed a challenge to both the students and instructors due to poor infrastructural development and poor access to the internet on campus. On the contrary Mathew and Iloanya's (2016) study on the use of technology in ODL mode in Botswana Higher Education context, found it to be beneficial in terms of interaction and student engagement; access to latest information; content sharing and communication. Although the study was based on Open distance learning (model), the findings are relevant to this research as online platforms including assessments can benefit both the instructor and the learners as social networking platforms bring both academic and social interactions simultaneously. The study, however, noted challenges, which seem to be common among different research conducted and this included access to technology, affordability, and technophobia. These challenges have a negative bearing as online assessments demand efficient technologies and skills to administer reliable assessments. Moreover, the University of Botswana, through the Centre of Academic Development (CAD) department have a training course running through the year which is intended to equip both students and lecturers with planning, developing, and running eLearning activities. It is on this backdrop that online assessments are not alien to both students and instructors thus making this research viable to explore students' interpretation of online assessments, which could inform and direct full implementation of technology in teaching and learning.

The integration of online assessment methods in education has become increasingly prevalent in many countries, including Botswana. The University of Botswana has embraced the use of online assessments as a valuable tool to enhance teaching and learning experiences. The flexibility, scalability, and immediate feedback provided by online assessments offer numerous advantages for instructors and students. However, challenges such as technological readiness, ensuring assessment integrity, and designing valid assessments need to be carefully addressed to ensure the successful implementation of online assessments at the University of Botswana. In addition, limited research has been conducted to explore the perceptions and experiences of pre-service teachers regarding the use of online assessments in the Botswana educational context. Therefore, this study aims to address the following problem: There is a lack of understanding regarding pre-service primary school teachers' perceptions and interpretations of online assessment strategies in Botswana, specifically focusing on the use of video-based assessments.

Understanding pre-service teachers' perceptions and interpretations of online assessment strategies is crucial for several reasons. Firstly, it provides insights into the effectiveness and appropriateness of these strategies within the Botswana educational system. By exploring pre-service teachers' perspectives, the study can identify potential barriers or challenges that may arise during the implementation of online assessments in tertiary education institutions. This knowledge can contribute to the development of targeted training programs and support mechanisms to enhance teacher educators' competence in utilizing online assessment methods effectively. Secondly, investigating pre-service teachers' perceptions can inform teacher education programs and curriculum design in Botswana. By uncovering their attitudes and experiences with online assessments, the study can provide valuable input for designing relevant and comprehensive teacher training programs that adequately prepare future educators to use online assessment strategies in their classrooms. This can contribute to the overall quality of education in Botswana by ensuring that pre-service teachers possess the necessary skills and knowledge to leverage digital tools for effective assessment practices.

1.1. Research questions.

The following research questions guides the study:

1.1.1. How do mathematics education pre-service primary school teachers at the University of Botswana interpret and experience challenges with video-based online assessment strategies?

1.1.2. What are the implications of mathematics education pre-service primary school teachers' interpretations of video-based online assessment strategies for their future teaching practices, and what experiences and challenges do they encounter during implementation?

1.1.3. What suggestions can be identified for improving the effectiveness of video-based assessments and addressing challenges faced by mathematics education pre-service primary school teachers in their use of these assessment strategies?

By addressing these research questions, this study aims to bridge the gap in knowledge and provide valuable insights into mathematics education pre-service teachers' perceptions of online assessment strategies at the University of Botswana. Ultimately, the findings can inform policy decisions, curriculum development, and teacher training initiatives to enhance the effective integration of online assessments in the department of primary education and largely the entire Botswana education system.

1.2. Theoretical Framework

The theoretical framework underpinning this study draws on several key concepts and models related to online assessment in education. The Technology Acceptance Model (TAM) proposed by Davis (1989) serves as a foundational framework to understand pre-service teachers' acceptance and utilization of online assessment

strategies. TAM posits that perceived ease of use and perceived usefulness influence individuals' intentions to use technology. In the context of this study, pre-service teachers' perceptions of the ease of incorporating video-based online assessments and their perceived usefulness in enhancing teaching and learning experiences will be explored. Additionally, Chickering and Gamson's (1987) Seven Principles for Good Practice in Undergraduate Education provide a lens for evaluating the effectiveness of online assessments in promoting active learning and student engagement. The challenges identified, such as technological readiness and assessment integrity, align with the Diffusion of Innovations theory (Rogers, 2003; Rogers et al., 2014), which emphasizes the importance of addressing barriers to successful implementation. The study will also draw on existing literature on online assessment in higher education, particularly within the African context, to inform the investigation of the unique challenges and opportunities faced by pre-service teachers in Botswana (e.g., Asino, 2018; Nleya et al., 2020). This theoretical framework guided the exploration of pre-service teachers' perceptions, experiences, and challenges in using video-based online assessments, offering a comprehensive understanding that can inform policy and practice in Botswana's education system.

2. Literature review

The University of Botswana, in alignment with global higher education trends, has actively incorporated online assessment methods to elevate the quality of teaching and learning experiences. This strategic adoption is motivated by the multifaceted benefits associated with online assessments, such as increased flexibility, scalability, and the provision of immediate feedback. In this context, our focus is on exploring the specific dynamics of how pre-service primary school teachers at the University of Botswana interpret video-based assessments in the realm of Mathematics Education. This section provides an overview of the use of online assessments at the University of Botswana, highlighting its benefits, challenges, and the strategies employed to ensure their successful implementation.

2.1. Benefits of Video-Based Online Assessments

Online assessments at the University of Botswana have several benefits for both instructors and students. Firstly, they provide flexibility in terms of timing and location, allowing students to complete assessments at their convenience, which is particularly advantageous for distance learning or blended learning environments (Ivashkina et al., 2022). Furthermore, online assessments offer scalability, enabling the evaluation of large cohorts of students efficiently and effectively (Rust, 2002; Donnelli-Sallee, 2018). Instructors can create and administer quizzes, tests, assignments, and even performance-based assessments using various online platforms and learning management systems (LMS) such as Moodle.

Video-based online assessments offer several advantages over traditional assessment methods. Firstly, videos can provide a richer and more authentic assessment experience by allowing students to demonstrate their understanding through multimedia presentations, oral explanations, or practical demonstrations (Lam et al., 2019). This form of assessment promotes student engagement and active learning, as students can actively participate in the creation and analysis of videos (Gikandi et al., 2011). Moreover, video-based assessments have the potential to foster creativity and critical thinking skills by requiring students to analyze, interpret, and synthesize information in a dynamic and visually appealing format (Speed et al., 2018; Lopes & Bettoni, 2020).

2.2. Enhanced Feedback and Formative Assessment

Another significant advantage of online assessments is the potential for immediate feedback. Instructors can design automated feedback systems that provide students with instant information on their performance, enabling timely identification of strengths and areas for improvement (Gikandi et al., 2011). This prompt feedback helps students to reflect on their understanding, identify misconceptions, and take corrective actions, fostering a more personalized and self-directed learning experience (Nicol & Macfarlane-Dick, 2006; Henderson et al., 2019).

Online video assessments also enable timely and personalized feedback, facilitating formative assessment practices. Teachers and educators can provide targeted feedback to students, identifying their strengths and areas for improvement, thereby supporting their learning process (Garrison & Ehringhaus, 2007; Ormaza & Nataly, 2019). Additionally, video-based assessments allow for self-reflection and self-assessment, as students can review their own videos, identify their learning gaps, and set goals for improvement (Liao & Wang, 2020). This self-assessment component empowers students to take ownership of their learning and fosters metacognitive skills.

2.3. Challenges and opportunities

While video-based online assessments offer numerous benefits, there are several challenges and opportunities that educators in Botswana need to address. Firstly, ensuring equitable access to technology and internet connectivity is crucial, as disparities in access may hinder the implementation of video-based assessments for all students (Valladares-Celis & Timmis, 2022). Moreover, educators may require professional development and support to effectively design and implement video-based assessments, including technical skills to create, upload, and

evaluate videos (Dawadi et al., 2021). Additionally, maintaining the authenticity and integrity of assessments in an online environment is essential to prevent plagiarism and ensure fair evaluation of student performance (Kocdar et al., 2018; Peytcheva-Forsythet al., 2018).

The integration of video-based online assessments at the University of Botswana has the potential to enhance teaching and assessment practices in the department of primary education. By leveraging the benefits of videos, such assessments can promote student engagement, creativity, and critical thinking skills while enabling personalized feedback and formative assessment. However, addressing challenges related to access, teacher professional development, and assessment integrity is vital for the successful implementation of video-based online assessments in the Botswana educational context. Maintaining the integrity and security of online assessments is another critical concern. Preventing cheating and plagiarism requires the implementation of various strategies such as randomized question pools, timed assessments, and the use of plagiarism detection software (Kocdar et al., 2018; Peytcheva-Forsythet al., 2018). Additionally, cheating detection and prevention in examination systems is a must and the design of well-constructed and valid online assessments that align with the learning outcomes and curriculum is essential for accurate evaluation of student performance (Alkalbani, 2023).

One of the primary challenges is ensuring the technological readiness of both instructors and students. This includes providing training and support for instructors to effectively design and administer online assessments and ensuring that students have access to the necessary devices and reliable internet connectivity (Nleya & Chirikure, 2018).

3. Methodology

This study employed a mixed-method case study design to comprehensively investigate the research questions, utilizing both quantitative and qualitative approaches for a more holistic understanding. The research paradigm guiding this investigation was pragmatism, as it allowed for the flexibility to combine various methods to address the complexity of the research questions (Creswell & Creswell, 2017). The research design was a case study, focusing specifically on fourth-year Bachelor of Primary Education (BPE) students with a specialization in mathematics education. The purposeful selection of participants ensured diversity in terms of their prior experience with online assessment, contributing to a richer exploration of perspectives (Creswell & Creswell, 2017). The population under consideration consisted of pre-service students pursuing a Bachelor of Primary Education, specializing in mathematics education. The sample included all 13 students enrolled in the geometry course for primary school teachers, providing a targeted group relevant to the study's objectives. The sampling procedure involved purposive sampling, a non-random selection of participants based on specific criteria relevant to the research questions (Palinkas et al., 2015). In this case, students were chosen deliberately to ensure representation from the fourth year BPE cohort specializing in mathematics education. For data collection, a closed-ended questionnaire was administered to gather quantitative insights into participants' perceptions of online video-based assessments. Additionally, semi-structured interviews were conducted to delve into a more nuanced and qualitative understanding of their interpretations. These instruments aimed to triangulate the data and provide a comprehensive view of participants' perspectives (Creswell & Creswell, 2017). The data collection procedure involved administering the questionnaire to all 13 participants and conducting semi-structured interviews to explore their experiences and challenges with online video-based assessments. The utilization of SPSS for descriptive analysis of the questionnaire responses facilitated a quantitative interpretation of participants' perceptions, while thematic analysis was applied to the interview data to extract meaningful insights (Braun & Clarke, 2006). Ethical considerations were paramount throughout the research process. Informed consent was obtained from all participants, clarifying the nature and purpose of the study, their right to withdraw, and the confidentiality of their responses. The study adhered to ethical guidelines, ensuring the protection and well-being of the participants (Creswell & Creswell, 2017). Additionally, pseudonyms were used to anonymize participant identities in the reporting of findings, further safeguarding confidentiality.

4. Discussion of results analysis

The results were presented according to descriptive statistics that emerged from SPSS analysis and themes from analysis of semi-structured interviews. The descriptive analysis is presented in Table 1 below and research questions 1 and 2 are discussed based on the analysis.

Table 1. Summary of respondents' descriptive statistics about interpretation of video-based online assessment strategies.

Questionnaire items	N	Minimum	Maximum	Mean	Std. Deviation	Variance
1.How familiar are you with video-based assessments?	13	1	3	2.69	.630	.397
2.Have you ever participated in video-based assessments as part of your coursework?	13	1	2	1.08	.277	.077
3.If yes, how many video-based assessments have you completed so far?	13	1	2	1.54	.519	.269
7.How do you perceive the impact of video-based assessments on your learning and academic performance?	13	4	5	4.31	.480	.231
9.How satisfied are you with the use of video-based assessments in your coursework?	13	3	5	3.77	.725	.526

4.1. Research question 1: How do mathematics education pre-service primary school teachers at the University of Botswana interpret and experience challenges with video-based online assessment strategies?

The findings of the survey results as per table 1 indicate a moderate level of familiarity with video-based assessments among the respondents, with a mean of 2.69 and a standard deviation of 0.630. This suggests that participants generally fall within the "somewhat familiar to very familiar" range, showcasing a reasonable level of awareness or exposure to this assessment method. Literature on the integration of video-based assessments in education supports the idea that familiarity with such tools is crucial for effective implementation. Studies emphasize that students need to be sufficiently acquainted with the format and technology involved in video assessments to optimize their learning experience (Alotaibi & Federico, 2017). The moderate familiarity reported aligns with findings in other educational contexts, emphasizing the need for ongoing efforts to enhance awareness and comfort with video-based assessments (Weller, 2011).

Regarding participation in video-based assessments as part of coursework, the respondents exhibit a high mean of 1.08 and a low standard deviation of 0.277, indicating a strong affirmative response. Most participants have indeed engaged in video-based assessments as part of their coursework. Literature on the incorporation of video-based assessments in education supports the notion that hands-on experience with this method is valuable for students. Research highlights the positive impact of engaging in video assignments on student learning outcomes and skill development (Betihavas et al., 2016; Ramly et al., 2023). The high participation rate aligns with the literature, affirming the integration and acceptance of video-based assessments in coursework.

For the frequency of participation, respondents who have experienced video-based assessments report a mean of 1.54, with a standard deviation of 0.519, indicating that the majority have completed less than five video-based assessments. This suggests a relatively low frequency of exposure to this assessment method. Literature exploring the frequency of video-based assessments in coursework is limited, but research on the impact of repeated exposure to this format emphasizes its potential for enhancing student skills and comfort (Alotaibi & Federico, 2017). The lower mean in this case may suggest that there is room for increased integration of video assessments or that the course lecturer is still in the early stages of incorporating this method more frequently.

4.2. Research question 2: What are the implications of mathematics education pre-service primary school teachers' interpretations of video-based online assessment strategies for their future teaching practices, and what experiences and challenges do they encounter during implementation?

Regarding the perception of the impact of video-based assessments on learning and academic performance, respondents report a mean of 4.31, with a standard deviation of 0.480, indicating a generally positive perception. This suggests that participants believe video-based assessments have a positive to very positive impact on their learning. Literature exploring student perceptions of video-based assessments echoes the positive sentiment expressed by the respondents. Studies highlight the benefits of video assessments in promoting deeper learning, enhancing critical thinking skills, and providing a more authentic assessment experience (Betihavas et al., 2016; Noraliza Ramly et al., 2023).). The positive perception reported aligns with the existing literature, emphasizing the potential advantages of video-based assessments in fostering positive learning experiences.

Finally, when asked about satisfaction with the use of video-based assessments in coursework, respondents report a mean of 3.77 and a standard deviation of 0.526. This falls within the "Not sure to somewhat satisfied" range, indicating a moderate level of satisfaction. Literature examining student satisfaction with video-based assessments emphasizes the importance of clear guidelines, technical support, and alignment with learning objectives, thus providing real spaces of co-creation of knowledge (Weller, 2011; Liu et al., 2015; Chiappe et al., 2020; Erduran et al., 2021). The moderate satisfaction reported suggests that while there may be positive

perceptions, there are areas where improvements or clarifications may be needed to enhance overall satisfaction.

4.3. Research question 3: What suggestions can be identified for improving the effectiveness of video-based assessments and addressing challenges faced by mathematics education pre-service primary school teachers in their use of these assessment strategies?

The thematic analysis of students' responses suggested areas of improvement which had been categorized into three main themes: Feedback and Preparation, Technical Support, and Clarity of Instructions. These themes were drawn from students' responses to questions 4 (preferred assessment methods), 5 (potential benefits of online assessment videos), 6 (main challenges of online assessment videos), 8 (type of feedback helpful in online video assessments) and 10 (suggestions for improvements).

4.3.1. Feedback and Preparation

The results from students' semi structured interviews suggested that the lecturer should provide comprehensive feedback on video online based assessment. This is what one of the respondents, Kose said, "Improve the type of feedback given so that students have an overall interpretation of themselves because marks do not highlight the key points where they can improve." This is supported by Hattie and Timperley (2007) and Wisniewski at al. (2020) who noted that effective feedback was essential in enhancing student learning. Furthermore, they emphasized the importance of feedback as it provided students with a clear understanding of their performance and guidance on how to improve. The thematic analysis further revealed that students felt that the lecturer should offer Feedback and Self-reflection opportunities to benefit from online assessments. This was emphasized by one of the respondents, Jongwe who said, "Provision of feedback will be very helpful to allow students to make amendments where needed and to avoid making the same mistakes on other future video assessments." This finding is supported by Nicol and Macfarlane-Dick (2006), who underscored that feedback combined with opportunities for self-reflection, as suggested by the students, can lead to improved learning outcomes. The work of Nico and Macfarlane-Dick (2006) clearly highlights the significance of self-regulation and feedback for effective learning. Students' responses stressed the provision of Rubrics for Assessment by the lecturer, and in their own words they said, "Provide a Rubrics for assessment." It is undoubtedly an undisputed fact that the use of rubrics is a widely recognized practice in assessment. Research by Jonsson and Svingby (2007) supports the use of rubrics as a tool for clarifying expectations and promoting consistent grading in assessments. Lastly, students' responses advocated for Pre-assessment Training and Seminars, and this is what they said in this regard, "Equipping students with knowledge and skills on video-based assessments and what is expected of them beforehand" and "Providing Video-based assessment seminar for students is key to their effective learning." It is worth noting that Pre-assessment training and seminars can enhance students' understanding and confidence. Research by Andrews et al. (2018) suggests that providing clear guidelines and training in the assessment format can lead to improved performance.

4.3.2. Technical Support

The students in their responses of the semi structured interviews emphasized the need to have the lecturer assist or facilitate Video Uploading as it seemed to be a challenge for them. In their own words, the students said, "Lecturer should allow students to send the videos using CD to avoid technical problems and the lecturer should also orientate students on how to send the videos" and "Since the main problem mostly is uploading the videos, there should be a way to help students upload videos easily." This finding aligns with literature acknowledging that technical issues with video uploading were a common concern. Providing alternative submission methods and technical support aligns with best practices. This is in support of research by Dennen (2008) which acknowledges the importance of technical support in online assessments.

4.3.3. Clarity of Instructions

The thematic analysis revealed students decry on clear Instructions and this is what they said, "Instructions should be made clear so as it's easy for learners to follow suit." It is important for lecturers to provide students with clear and unambiguous instructions which are essential for effective assessment. This is supported by Bolkan's (2015) research that highlighted the importance of clear communication of expectations in improving student performance. Incorporating these suggestions and best practices into video-based assessments can lead to more effective and less challenging assessment experiences for both students and educators. Effective feedback, pre-assessment training, technical support, and clear instructions are critical elements for success.

5. Conclusions and recommendations

The theoretical framework for this study, grounded in Davis's (1989) Technology Acceptance Model (TAM), Chickering and Gamson's (1987) Seven Principles for Good Practice in Undergraduate Education, and Rogers's (2003) Diffusion of Innovations theory, provided a robust foundation for examining how pre-service teachers at the University of Botswana accept and utilize video-based online assessments. The survey results revealed a moderate familiarity with video-based assessments among pre-service mathematics education primary school teachers in the department of Primary Education, University of Botswana. Despite high participation rates, the limited exposure to this assessment method underscored the necessity for increased integration. While positive

perceptions regarding the impact of video-based assessments on learning aligned with existing literature, moderate satisfaction levels highlighted areas for improvement, emphasizing the need for targeted interventions to optimize the integration of online assessments within the Botswana education system. The coherence between the theoretical framework and survey results underscores the significance of the chosen theoretical perspectives in comprehending and addressing challenges and opportunities linked to the adoption of video-based assessments in Botswana's educational landscape.

Based on these findings, several recommendations have been made. For practice, educators should focus on increasing awareness and comfort with video-based assessments, considering the moderate familiarity reported. Students are encouraged to actively engage with video assignments, leveraging the positive impact highlighted in the literature. Instructors should explore opportunities to enhance the frequency of video-based assessments, potentially through increased integration into coursework.

In terms of research, further exploration of the factors influencing satisfaction and ways to improve it would contribute to a more comprehensive understanding of the challenges and benefits associated with video-based assessments. Additionally, investigating the long-term impact of pre-service teachers' experiences with video assessments on their future teaching practices would be valuable.

Professional development efforts should prioritize addressing the themes identified in the thematic analysis. Providing comprehensive feedback, opportunities for self-reflection, clear instructions, and technical support can significantly improve effectiveness and satisfaction levels with video-based assessments. Educators should consider incorporating rubrics and pre-assessment training to enhance students' understanding.

6. Expected Contribution

The findings of this research provide valuable insights into the interpretation, attitudes, and experiences of pre-service primary school teachers in utilizing video-based online assessment strategies. The study's outcomes can inform teacher education programs and contribute to enhancing the integration of effective assessment practices in preparing future primary school teachers. Furthermore, the research findings shed light on the challenges faced by pre-service teachers in utilizing video-based online assessments and facilitate the development of support mechanisms to address these challenges effectively.

References

Alkalbani, A. S. (2023). Cheating Detection in Online Exams Based on Captured Video Using Deep Learning. Theses. 1060. [Online] https://scholarworks.uaeu.ac.ae/all_theses/1060 [accessed 15 October 2023].

Alotaibi, Y.K., & Federico, F. (2017). The impact of health information technology on patient safety. *Saudi Medical Journal. [Online] 38*(12), 1173–1180. Available from: https://doi: 10.15537/smj.2017.12.20631 [accessed 14 May 2023].

Andrews, M., Brown, R., & Mesher, L. (2018). Engaging students with assessment and feedback: improving satisfaction and attainment with students as co-designers. *Practitioner Research in Higher Education. [Online] 11*(1), 32-46. Available from: http://ojs.cumbria.ac.uk/index.php/prhe/article/view/460 [accessed 20 June 2023].

Asino, T. I. (2018). E-learning readiness of students in Botswana: A case study of the University of Botswana. *International Journal of Education and Development using Information and Communication Technology. [Online] 14*(3), 111-128. Available from: https://doi.org/10.3991/ijet.v14i3.8108 [accessed 14 June 2023].

Betihavas, V., Bridgman, H., Kornhaber, R., & Cross, M. (2016). The evidence for 'Flipping out': A systematic review of the flipped classroom in nursing education. *Nurse Education Today. [Online] 38*, 15-21. Available from: https://doi.org/10.1016/j.nedt.2015.12.010 [accessed 6 August 2023].

Bolkan, S. (2015). The Importance of Instructor Clarity and Its Effect on Student Learning*: Facilitating Elaboration by Reducing Cognitive Load. 29*(3):1-11. Available from: https://doi: 10.1080/08934215.2015.1067708 [accessed 6 August 2023].

Chiappe, A., Ibarra, H. C., & Lizasoain, L. (2020). Learning in the openness: the lost way of the MOOC. *Digital Education Review. [Online] 38*, 42-60. Available from: https://doi.org/10.1344/der.2020.38.42-60 [accessed 6 August 2023].

Chickering, A. W., Gamson, Z. F., (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin. [Online]* 39(7), 3-7. Available from: https:// doi:10.1002/tl.37219914708 [accessed 6 August 2023].

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. [Online] 13(3), 319-340. Available from: https://doi.org/10.2307/249008 [accessed 6 August 2023].

Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-Methods Research: A Discussion on its Types, Challenges, and Criticisms. *Journal of Practical Studies in Education*. [Online] 2(2), 25-36 https://doi.org/10.46809/jpse.v2i2.20 [accessed 6 August 2023].

Dennen, V. P. (2008). Pedagogical lurking: Student engagement in non-posting discussion behavior. *Computers*

in Human Behavior. [Online] 24(4), 1624–1633. Available from: https://doi.org/10.1016/j.chb.2007.06.003 [accessed 6 August 2023].

Donnelli-Sallee, E. (2018). Supporting online teaching effectiveness at scale: Achieving efficiency and effectiveness through peer review. *Journal of Educators.* [Online] 15(3), 1-17. https://api.semanticscholar.org/CorpusID:86674552 [accessed 6 August 2023].

Erduran, S., Ioannidou, O., & Baird, J. A. (2021). The impact of epistemic framing of teaching videos and summative assessments on students' learning of scientific methods. International Journal of Science Education. [Online] 43(18), 2885-2910. Available from: https:// doi: 10.1080/09500693.2021.1998717 [accessed 6 August 2023].

Garrison, D. R., & Ehringhaus, M. (2011). Formative and summative assessments in the classroom. *Assessment & Evaluation in Higher Education.* [Online] 32(3), 335-346. Available from: https://api.semanticscholar.org/CorpusID:156800791 [accessed 6 August 2023].

Ormaza, A., & Nataly, J. (2019). Analysis of the effective use of summative and formative assessment at primer año de Bachillerato class "a" at Unidad Educativa "Vicente and a aguirre" in the city of Riobamba, Chimborazo province, during the academic year 2018-2019 (Bachelor's thesis, Riobamba). Available from: http://dspace.unach.edu.ec/handle/51000/5383 [accessed 6 August 2023].

Gikandi, J. W., Morrow, D., & Davis, N. E. (2011). Online formative assessment in higher education: A review of the literature. Computers & Education. [Online] 57(4), 2333-2351. Available from: https://doi.org/10.1016/j.compedu.2011.06.004 [accessed 6 August 2023].

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research.* [Online] 77(1), 81-112. Available from: https://doi.org/10.3102/003465430298487 [accessed 6 August 2023].

Henderson, M., Ryan, T., & Phillips, M. (2019). The challenges of feedback in higher education. *Assessment & Evaluation in Higher Education.* [Online] 44(8),1237-1252. Available from: https:// doi: 10.1080/02602938.2019.1599815 [accessed 6 August 2023].

Hondonga, J., Chinengundu, C., & Maphosa, C. (2021). Readiness of training systems and availability of digital technologies for online teaching in Botswana. *Journal of Education, Society, and Behavioural Science.* [Online] 36(11), 104-117. Available from: http://hdl.voced.edu.au/10707/572756 [accessed 6 August 2023].

Ivashkina, T. A., Sidorenko, V. N., & Sukhova, E. I. (2022). Impact of MOOC on increasing student interest in the learning process in the context of blended learning. Revista Tempos e Espaços em Educação. [Online] 15(34), e17321. Available from: http://dx.doi.org/10.20952/revtee.v15i34.17321 [accessed 6 August 2023].

Jonsson, A., & Svingby, G. (2007). The use of scoring rubrics: Reliability, validity and
educational consequences. *Educational Research Review.* [Online] 2(2), 130-144. Available from: https:// doi: 10.1016/j.edurev.2007.05.002 [accessed 6 August 2023].

Kocdar, S., Karadeniz, A., Peytcheva-Forsyth, R & Stoeva, V. (2018). Cheating and
plagiarism in e-assessment: Students' perspectives. *Open Praxis.* [Online] 10(3), 221-235. Available from: https:// doi: 10.5944/openpraxis.10.3.873 [accessed 6 August 2023].

Lam, P., Lau, C., & Chan, C. (2019). Flipped classroom assessment: A learning process approach. Paper presented at the Multi Conference on Computer Science and Information Systems, MCCSIS 2019 - Proceedings of the International Conference on e-Learning 2019. [Online] 123-130. Available from: https://www.scopus.com [accessed 6 August 2023].

Liu, M., Kang, J., & McKelroy, E. (2015). Examining learners' perspective of taking a MOOC: Reasons, excitement, and perception of usefulness. *Educational Media International*. [Online] 52(2), 129-146. Available from: https:// doi: 10.1080/09523987.2015.1053289 [accessed 6 August 2023].

Mathew, M., & Iloanya, V. (2016). Technology use in open and distance learning in Botswana higher education: Benefits, challenges, and recommendations. International Journal of Educational Technology in Higher Education, 18(1), 1-23. https://creativecommons.org/licenses/by-sa/4.0/ [accessed 6 August 2023].

Nleya, P. T., Mtsweni, J., & Lotriet, H. (2020). E-learning readiness in rural and urban areas: A comparative analysis of higher education students in Botswana. E-Learning and Digital. [Online] 17(1), 69-85. Available from: https://doi.org/10.1177/2042753019888665 [accessed 6 August 2023].

Weller, M. (2011). A pedagogy of abundance. *Spanish Journal of Pedagogy*. [Online] 69(249), 223–236. Available from: https://www.researchgate.net/publication/264873960 [accessed 6 August 2023].

Nicol, D., & Macfarlane-Dick, D. (2006). Formative Assessment and Self-Regulated Learning: A Model and Seven Principles of Good Feedback Practice. *Studies in Higher Education.* [Online] 31(2), 199-218. Available from: http://dx.doi.org/10.1080/03075070600572090.

Ntshwarang, M., Malinga, M., & Losike-Sedimo, J. (2021). Challenges of e-learning during the COVID-19 pandemic: A case study of the University of Botswana. *International Journal of Educational Technology in Higher Education*. [Online] 18(1), 1-22. Available from: Available from: https://doi.org/10.1177/2347631120986281 [accessed 6 August 2023].

Peytcheva-Forsyth, R., Aleksieva, L., & Yovkova, B. (2018, December). The impact of technology on cheating

and plagiarism in the assessment–The teachers' and students' perspectives. In AIP conference proceedings (Vol. 2048, No. 1). *AIP Publishing*. Available from: https:// doi: 10.1063/1.5082055 [accessed 6 August 2023].

Ramly, N., Rosli, A. N., Suhaimi, S., Abd Wahab, M. H., & Ariffin, A. H. (2023). The Effects of Using Educational Videos in Online Learning: A Case Study for Basic Computer Science Subject. *International Journal of Recent Technology and Applied Science (IJORTAS*). [Online] 5(1), 12-23. Available from: https://doi: 10.36079/lamintang.ijortas-0501.479 (PDF) [accessed 20 November 2023].

Rogers, E.M. (2003). Diffusion of innovations (5th ed.). NewYork, NY: Free Press.

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In An integrated approach to communication theory and research (pp. 432-448). Routledge.

Rust, C. (2002). The impact of assessment on student learning: How can the research literature practically help to inform the development of departmental assessment strategies and learner-centred assessment practices? *Active Learning in Higher Education.* [Online] 3(2), 145-158. Available from: https://doi: 10.1177/1469787402003002004 [accessed 6 August 2023].

Speed, C. J., Lucarelli, G. A., & Macaulay, J. O. (2018). Student Produced Videos - An Innovative and Creative Approach to Assessment. *International Journal of Higher Education.* [Online] 7(4), 99-109. Available from: https://doi.org/10.5430/ijhe.v7n4p99 [accessed 6 August 2023].

Valladares-Celis, M. C., & Timmis, S. (2022). Digital inequalities across higher education in the global south and global north since the start of COVID-19: A review of the literature. Centre for Higher Education Transformations. Available from: https://doi.org/10.5281/zenodo.7116730 [accessed 6 August 2023].

Walsh, B., Nixon, S., Walker, C., & Doyle, N. (2015). Using a Clen Feedback Model to Facilitate the Learning Process. *Creative Education.* [Online] 6(10), 953-960. Available from: https://doi:10.4236/ce.2015.610097 [accessed 6 August 2023].

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in psychology*. [Online] 10, 3087. Available from: https:// doi: 10.3389/fpsyg.2019.03087[accessed 6 August 2023].

Biographies of the authors

Dr. End Salani, a Mathematics Education lecturer at the University of Botswana's Department of Primary Education, holds a Ph.D. in Mathematics Education from the University of South Africa. Specializing in mathematics pedagogy, he actively explores innovative teaching and learning methods, conducting research on classroom instructional practices. Dr. Salani's commitment extends to effectively incorporating ICT in education, contributing to the advancement of Botswana's educational landscape. As an educator, he plays a pivotal role in shaping the future of primary education, exemplifying a holistic dedication to improving educational outcomes through rigorous research and innovative pedagogy. Dr. Salani is actively involved in academic platforms such as Academia.edu, Research Gate, Google Scholar, and the university's official website (www.ub.bw), where his research publications are accessible. ORCID: 0000-0001-6561-8790

Ms. Amantle Sekgoma, a lecturer in the Department of Primary Education at the University of Botswana, not only brings a wealth of knowledge to her field but also holds an M.Ed in Mathematics Education from the University of Botswana and is actively pursuing a Ph.D. in the same discipline, showcasing her dedicated commitment to advancing her expertise. Her research interests are distinctly focused on integrating technology into mathematics instruction. With a keen interest in exploring innovative methods, Ms. Sekgoma aims to incorporate technological tools such as digital resources, interactive platforms, and educational software to enhance the learning experience for students. Her emphasis on technology reflects her commitment to staying abreast of contemporary advancements that can significantly improve the overall effectiveness of mathematics instruction. In essence, Ms. Sekgoma's academic pursuits and research interests underscore her dedication to the intersection of technology and mathematics education, with the expectation that her work will offer valuable insights into effective teaching practices and contribute to the ongoing discourse on the pivotal role of technology in shaping the future of education. ORCID: 0009-0002-9315-6110