PAPER

Mobile-Based Digital Assessment Transforming the Learning Support Efficiency

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ABSTRACT

The digital age has brought great changes in many areas of life, including education. The main change is the use of mobile device systems such as smartphones or tablets that are practical to change the way assessments affect learning efficiency. This paper examines how mobile-based digital assessment systems can improve the effectiveness and efficiency of the assessment process in learning. This paper aims to provide educators with practical guidance for integrating technology into their assessment systems by utilizing available mobile smartphones or tablets and conducting an analysis of the benefits and challenges faced. This study also explores how to maximize the use of smartphones or tablets as a support tool in conducting assessments and can enrich the learning experience of students through faster and personalized feedback. Assist educators in managing assessments in a more structured and measurable way. In addition, recommendations for the effectiveness of smartphone use in supporting the assessment system are also included so that educators can achieve optimal results in the learning process. This study contributes to the educational literature by providing new perspectives on the application of technology and the use of mobile devices to assessment by presenting empirical evidence that supports the effectiveness of assessment application in improving the quality of education.

KEYWORDS

assessment transformation, digital assessment, mobile device, assessment application

1 INTRODUCTION

The development of information and communication technology has changed many aspects of human life, including the world of education. In recent decades, integrating technology into education has become an important focus for many education researchers and practitioners [1]. Technology not only makes information more accessible but also enables the development of more innovative and interactive learning methods [2]. Mobile learning promotes better recall of information. Researchers in the United States have found that repetitive retrieval (extraction) of

information is superior to mechanical methods of learning [3]. Important changes are happening to the way learning is assessed. Assessment is an important part of the educational process and is used to measure learner learning, provide feedback, and identify areas for improvement. Traditional paper-and-pencil grading methods are still effective in most cases but have a number of limitations. These methods tend to be time-consuming, inefficient in processing results, and often unable to provide real-time feedback. This can hinder the learning process, which must be dynamic and adjusted to the needs of students. Caiyo et al. n.d (2017) [4] in "The Effect of Kahoot, Quizizz and Google forms on the Student's Perception in the Classrooms Response System," it is stated that many changes have occurred in the 21st century, and people have to adapt to new ways of doing things, which has an impact on the lives of many people. There are now many educational tools and sites that allow teachers to create or share quizzes and surveys while in the classroom. Examples of these tools include Socrative, Polldaddy, Poll Everywhere, Kahoot, Verso, Classmaker, Google Forms, and Quizizz.

Mobile technology is a breakthrough communication and information technology that was developed to meet the individual needs of the information [5]. Mobile technology refers to a device's capability to handle interactions, access data, and conduct commercial activities while in motion [6]. Advances in digital technology that are in line with the advancement of mobile devices, smartphones, or tablets make it easier for services to utilize features from various applications specifically designed to support the assessment process in learning [7]. The use of mobile smartphones or tablets that can download various features related to assessment that not only facilitate the evaluation process but also improve its quality and effectiveness. For example, apps such as Kahoot, Quizizz, Edmodo, Scorative, Wordwall, Educandy, and Google Forms [8], [9], and [10], allow educators to quickly create and distribute quizzes, collect real-time data, and provide instant feedback to students by utilizing available mobile smartphones or tablets. In addition, digital portfolio applications such as Seesaw and Google Classroom enable continuous documentation and grading of assignments, enabling more comprehensive monitoring of learning progress. The transformation of assessment in the digital age not only offers practical benefits in terms of efficiency and speed but also opens up opportunities for a more personalized and customizable assessment approach. The application of assessment can be tailored to the needs of individual learners, enabling more targeted teaching and supporting deeper learning. In addition, data generated from assessment applications can be analyzed to gain deeper insights into the performance of learners and the effectiveness of the teaching methods used. However, there are also some challenges in implementing digital assessment applications.

Limited access to technology, lack of educator training, and data security issues are some of the barriers that need to be overcome. Insufficient experience or doubts regarding the scholarly advantages of such application use in the classroom may be contributing factors to teachers' reluctance to incorporate the applications in classroom practice. [10] therefore, it is important for educators and policymakers to understand the benefits and challenges of using mobile smartphones in assessment and develop effective strategies for integrating assessment applications into education systems. [11], [12] This study aims to explore the changing nature of assessment in the digital era, focusing on the use of mobile smartphones and supporting applications in learning. [13], [14] This paper also aims to provide educators with practical guidance to optimize the use of mobile phones or tablets and assessment applications by analyzing the types of applications available, implementing case studies, and discussing the benefits and challenges. In addition, it also provides recommendations

for the effectiveness of the use and integration of assessment applications into the existing curriculum, with the hope that it can contribute to improving the quality of education in the era of digital. The importance of this study lies in the need to update and improve learning evaluation methods to meet the needs of the times. The use of mobile smartphones and digital applications makes the assessment process more efficient and accurate and allows feedback to students to be faster [15], [16].

This paper is divided into several main sections. Section 1 describes the paradigm shift in evaluation in the digital era. [6] Section 2 describes mobile devices as a system support for the available assessment applications and how to use them. Section 3 presents case studies of application in learning assessment. Section 4 discusses the benefits and challenges of using mobile devices in learning assessment. Finally, Section 5 provides recommendations for the use of mobile devices as a support system in effective assessment. Through this comprehensive presentation, we hope that readers, especially educators, will gain deeper and more practical insights into maximizing the functionality of mobile devices and integrating various digital applications into the learning assessment process.

2   LITERATURE REVIEW

Assessment transformation in the digital era over the past few decades, advances in information and communication technology, and the use of mobile smartphones or tablets among academics in general have revolutionized the world of education, especially in the assessment system. Assessment, which is an important part of the learning process, has also changed significantly with the introduction of mobile-based digital assessment applications. Recent literature shows that this application not only improves the efficiency and effectiveness of assessment but also provides opportunities for a more individualized and adaptive assessment approach. The use of digital technology in assessment is not a new innovation in education. The term "electronic assessment" or "technology-based assessment" has different meanings for different people, but here the term refers to the use of digital technology for the purpose of formal education assessment. Oldfield et al. in A research review: Assessment in a digital age [17] mention that the use of digital technology in assessment offers traditional assessment practices as a potential catalyst for change in traditional assessment practices and addresses growing assessment challenges such as distance learning, large student populations, and objective and high-quality feedback. In a rapidly evolving learning environment, keeping pace with rapidly evolving assessments is critical to the overall success of education at all levels. Assessment with online learning assessment tools with intuitive navigation and easy-to-use interface design, multiple question formats, anytime, anywhere access, real-time question management with color coding, and advanced analytics will add to more engaging, effective, and efficient learning performance. The results of the research conducted by [18] in "Instructional educational games in pharmacy experiential education: a quasi-experimental assessment of learning outcomes, students' engagement and motivation" stated that students showed a positive attitude towards participation in this educational activity. Consistent, voluntary, and unvalued weekly participation reflects a high level of engagement and motivation to participate in educational play activities. Educational games that are instructional in nature seem to have a positive impact on students' perceptions of acquiring the desired knowledge and skills. Students feel motivated to participate in this educational activity because it develops confidence in the subject area and motivates learning beyond routine classroom activities.

In the digital age, with the proliferation of electronic learning, there has been a significant shift towards adaptive computer-based assessment [19], utilizing AI-based modeling techniques [20], and emotion-based adaptation in electronic learning environments. This assessment is characterized by its ability to change test parameters in response to student performance, using machine learning algorithms to ensure the student's proficiency level. Among the various assessment options, digital technology offers students the opportunity to demonstrate their skills and knowledge in different formats, through different media, and according to their personal preferences. The ability to capture, review, and create different forms of disclosure of knowledge and skills gives students more opportunities for more personalized assessment, peer and self-assessment, and greater flexibility and choice in how they learn. This instant feedback allows learners to quickly understand their strengths and weaknesses and take the necessary steps to improve their learning outcomes. [21] explore how digital assessment applications enhance broader 21st century skills such as problem-solving, collaboration, and critical thinking. It also emphasizes that it can be taught a scale that can be measured more effectively compared to traditional assessment methods. This application allows you to collect more comprehensive and detailed student performance data.

The key to assessing learning is to provide feedback to students and encourage them to improve additional activities that can improve their learning. [22] in assessment principles and practices quality assessments in a digital age state that the use of information technology allows the creation of evaluations that adhere to the principles of evaluation, namely validity, accountability, objectivity, fairness, and meaningful transparency. Assessment must be done properly to encourage improvement, shape student behavior, and provide accountability to others. Judgment can also be a source of dissatisfaction, frustration, and anxiety. Existing and emerging technologies are playing a role in transforming assessment, helping to address existing problems in assessment and make them smarter, faster, fairer, and more effective. This study provides an overview of increasing student engagement and how mobile-based digital assessment applications can increase student involvement in the learning process. [23] in the article "Impact of the Use of Gamified Online Tools: A Study with Kahoot and Quizizz in the Educational Context," states that apps such as Kahoot and Quizizz make learning more interactive and enjoyable, and as a result; motivation and engagement. Learners are more motivated to learn and complete assignments when they can participate in fun and interactive assessment activities. Related to the challenges of using the mobile-based digital assessment application. Although there are many benefits obtained from the use of mobile-based digital assessment applications, it is not without challenges. [24] in "The Digital Transformation of Assessment: Challenges and Opportunities" mention the challenges in the implementation of digital assessment. Challenges faced include investment of time and workload, technology (skills and accessibility), illegal assistance, feedback practices, and designing a complete digital assessment activity that is tailored to the results and activities rather than just transferring the assessment of the meeting online. The opportunities presented relate to the consideration of automated assessment options and the implementation of alternative or more creative modes of assessment, such as audio or video delivery or competency-based assessments. In addition, [25] [26] emphasized the importance of educator training in "Classroom Assessment and Pedagogy." As a result, we found many educators lacking confidence in using mobile-based digital assessment apps due to a lack of proper training and support. Ongoing training and appropriate technical support are essential to enable educators to use assessment applications effectively.

In response to an increasingly digital generation, the use of interactive technology in classrooms has grown in popularity over the past decade. Some of the research described in the literature provides insight into best practices when using digital assessment apps. [4] in "The Effect of Kahoot, Quizizz and Google forms on the Student's Perception in the Classrooms Response System," suggests the use of Kahoot and Quizizz in the classroom as a tool to improve the learning experience. It was concluded that Kahoot and Quizizz increased the level of student interactivity, which helped students to be active in class and conduct collaborative learning, which also increased student engagement in the learning process. These results show that incorporating assessment apps into the curriculum can provide positive outcomes, students perceive Kahoot and Quizizz to support learning and improve student concentration, engagement, fun, and motivation. However, there is no difference in students' perception that they learned something from taking quizzes. In addition, [27] measuring innovation in education 2019: What is changing in the classroom? We present various innovations in digital assessment that have been introduced in various countries. The report shows that countries that have successfully implemented digital assessments have supportive policy frameworks, good technical infrastructure, and comprehensive training programs for educators. Data security and data protection are also important concerns when using digital assessment applications.

The importance of utilizing advances in science and technology in education to realize the principle of equal opportunities in education and overcome the problems faced by traditional forms of education through the use of digital assessment tools through electronic platforms. Electronic exams are one of the tools for assessing modern learning trends and can be used to assess the achievement of educational goals, the effectiveness of teaching methods and strategies, the effectiveness of learning activities and resources, and student readiness. A learning resource used for the teaching and testing of computer technology and internet networks. The digital assessment process is one of the elements of developing the educational process in the current situation. Therefore, this study aims to demonstrate the effectiveness of digital assessment tools across educational platforms based on scientific assessment criteria. The study also highlights the need for app developers and educational institutions to work together to implement strict security measures to protect learners' data from unauthorized access [28]. "The Effectiveness of Digital Assessment Tools on the Educational Platforms Based on Science Evaluation Standards at the Secondary Stage" recommends adapting the platform so that the digital test works on low-speed Internet. Based on a review of the literature, it is clear that digital assessment applications have great potential to revolutionize the assessment process in education. However, maximizing mobile smartphones or tablets in digital assessments requires a comprehensive strategy to address existing challenges. This includes increased access to technology, ongoing training for educators, and strict data security measures. Thus, it has been shown that integrating a mobile system-based digital assessment application into learning not only improves the efficiency and effectiveness of assessment but also supports more personalized and adaptive learning. If successfully implemented, this change can certainly significantly improve the quality of education in the digital era.

3   METHODOLOGY AND DATA COLLECTION

The research method describes the design, scope, or purpose of the activity, main materials and tools, location, data collection techniques, operational definition of

research variables, and analysis techniques. This study introduces a mixed research method. This method combines quantitative and qualitative approaches to obtain a comprehensive understanding of the use of mobile systems as a supporting tool to run digital assessment applications in learning. This study was conducted at SMK Negeri Kundur, the source of this study data is the principal, vice principal for academic affairs, educators, and students. The data source is selected using the targeted sampling method. The data collection techniques in this study are carried out through survey activities, data analysis, interviews, class observations, document analysis, questionnaire distribution, interviews, and documentation. Data analysis techniques are activities that aim to process data obtained through data collection activities and analyze them.

Data collection implementation plan:

1. To obtain representative data, the survey was distributed to a number of respondents. In-depth interviews and classroom observations were conducted in a number of schools selected as case studies.
2. Data analysis: Quantitative data is analyzed using statistical software, and qualitative data is analyzed using thematic techniques to identify key themes and patterns.
3. Reporting of research findings: research findings are reported in a structured format, combining quantitative and qualitative results to provide comprehensive insights into the changing nature of evaluation in the digital age.

Using this mixed research method, we will explore how the use of mobile smartphones or tablets in running digital assessment applications has an impact on the learning process, what benefits are seen, and how optimizing the use of mobile smartphones in educational research will be able to identify challenges that need to be done more accurately to overcome.

4   RESULT AND DISCUSSION

The discussion in this study examines the transformation of assessment in the digital era through the use of assessment applications in learning. This study uses a mixed survey method to collect quantitative and qualitative data from various sources to provide a comprehensive picture of the use of assessment applications. The survey results show that most educators have started using digital assessment applications for learning [29]. Some of the most commonly used apps include Google Forms, Kahoot, Quizizz, and Google Classroom. Quantitative data shows that 86% of respondents find this application very helpful in improving evaluation efficiency, and 60.5% of educators report that this application allows them to quickly create and distribute tests, collect assessment results in real time, and provide instant feedback to learners. This not only speeds up the assessment process but also improves the quality of feedback that learners receive, giving them a deeper understanding of the learning content.

The benefits of assessment applications through in-depth interviews with educators and students have revealed a number of benefits of using assessment applications [30]. First, 83.7% of these applications are more time-efficient in more structured and measurable evaluations. Educators can easily track learners' progress over time and identify areas for improvement. Second, the assessment application increases student engagement. It showed the results of 56.8% that students

reported that the use of interactive and gamified applications such as Kahoot and Quizizz increased their motivation to learn and complete assignments, and 11.6% stated that this application greatly increased learning motivation with a pleasant learning atmosphere. Third, assessment applications allow for more personalized learning. Educators can adjust the assessment to the needs and abilities of each student, supporting a more adaptive learning approach. Learners will gradually overcome their inner fears while fighting. Once the inner fear is overcome, students will maximize their fighting skills while fighting. Future research can further learn how to improve game-based teaching modes and how to better improve the learning effects of students [31]. Ease of access and flexibility allow students to access assessments anytime and anywhere using their mobile devices, increasing flexibility in their learning. This reduces geographical and time constraints and allows learning to be more tailored to individual needs. Teachers and students improve their digital technology skills by using digital assessment platforms on a regular basis. In the modern education era, increasing digital literacy is important [1], [30].

Challenges in the use of assessment applications in this study also reveal a number of challenges in the use of assessment applications. The results of the survey showed that 60.5% stated that the biggest challenge was limited access to technology that supports [13–32]. Many educators report that they need further training to use assessment apps effectively. Furthermore, 51.2% of students' unpreparedness in the implementation of mobile-based digital assessments also had a great influence on its implementation. Another challenge identified is the issue of data security. The results found that 23.3% of educators and school administrators are worried about the privacy and security of student data stored in digital applications [33].

The study focuses on the transformation of mobile digital assessment and its impact on learning efficiency and effectiveness. To better understand the benefits and changes brought about by mobile-based digital assessments, several key indicators have been analyzed and presented in the form of tables, graphs, and flowcharts. A flowchart is attached to this study to provide a more comprehensive picture of the conversion process. This diagram shows the important steps in the transformation, from the development of digital assessment applications to teacher training and the implementation of classroom assessments. This diagram helps to visualize the systemic and structural changes that occur during this transformation.
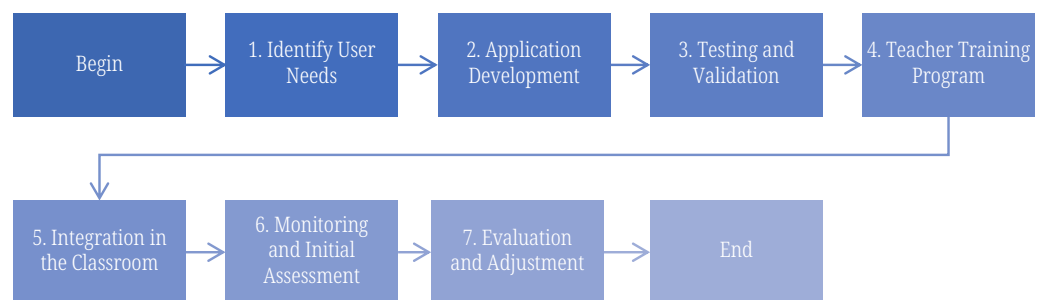

Fig. 1. Processes in mobile-based digital assessment transformation

In the context of this study, a flowchart is a visual representation of the steps or processes involved in the transformation of mobile-based digital assessment. Flowcharts are used to explain the process in a systematic and structured manner and to better understand the implementation of change.

Below is a brief breakdown of the possible steps in a mobile-based digital assessment transformation flowchart:

1. App development:
   - Identify the needs of users (teachers and students).
   - Development of key features of digital assessment.
   - Application testing and validation.
2. Teacher training:
   - Training program for teachers on how to use the app.
   - Providing training materials and tutorials.
   - Assess teachers' skills and preparation.
3. Implementation in the classroom:
   - Integration of applications into teaching and learning activities.
   - Use of the app for assessments, exams, and daily exams.
   - Implementation monitoring and initial evaluation.
4. Evaluation and adjustment:
   - Get input from teachers and students.
   - Analysis of usage data and evaluation results.

Table 1. The effectiveness of mobile-based digital assessment

Matrik	Results in %	
	Before Transformation	After the Transformation
Learner engagement	60	85
Average Exam Score	65	80
Task Completion Rate	75	90
Teacher Satisfaction	65	88
Time Required for Assessment (in minutes)	60	20

The following is an explanation of the Table 1 above:

1. Student engagement research shows that student engagement increases significantly after the implementation of mobile-based digital assessments. Before the transition, only 60% of students actively participated in assessment activities. However, after the implementation of this technology, the engagement rate increased to 85%. This comparison diagram of student engagement shows an increase in student motivation and participation in the learning process.
2. Average exam scores research data shows that the average exam scores of students increased from 70% before the change to 80% after the change. This average graph of test scores shows that mobile-based digital assessments can improve students' academic comprehension and performance. This reflects that more interactive and accessible assessment methods can help students achieve better learning outcomes.
3. Task completion rate after being changed from 75% to 90%, the student completion rate has also increased significantly. This graph of assignment completion rates shows that the use of mobile-based digital assessments allows students to complete tasks more disciplined and responsibly. This improvement shows that mobile technology allows for better task management and can motivate students to complete assignments on time.

4. In addition to having an impact on students, the study also found that teacher satisfaction increased from 65% to 88%. This Table 1 shows that teachers are satisfied with the new, more efficient, and effective assessment method. Reducing administrative efforts and easier management and assessment of student assignments contributes to this increase in satisfaction.
5. Time efficiency one of the main findings of this study is the time efficiency achieved through mobile-based digital assessments. As seen in the Table 1, the time it takes to complete the assessment is reduced from 30 minutes to 15 minutes. This reduction in time shows that digital assessments can be done faster without sacrificing the quality of assessments, thus allowing more time for the active learning process in the classroom.

If presented in the form of a graph, then we will be able to see a significant movement of improvement in the results of the transformation.
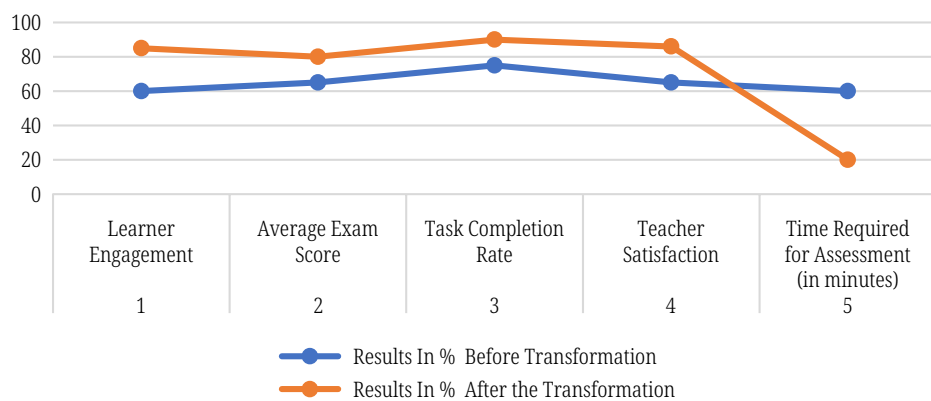

Fig. 2. The effectiveness of mobile-based digital assessment

Summary of the findings of this study includes:

1. Effectiveness of assessment applications overall, the results of the study show that digital assessment applications significantly increase the effectiveness and efficiency of the assessment process in learning. Educators reported that there was an increase in the speed of assessment and the quality of feedback to students. Quantitative data shows that 86% of educators stated their efficiency and effectiveness, and 56.8% of learners consider the learning intake they receive through the app to be more impactful and quality compared to traditional methods.
2. The increase in student engagement during classroom observation shows that the use of assessment applications increases student engagement in the learning process. Students become more enthusiastic about completing assignments and taking quizzes provided through interactive applications. Case studies from several schools show that the use of apps such as Kahoot and Quizizz not only makes learning more enjoyable but also improves student learning outcomes.
3. Integration into the curriculum, This study also found that assessment applications can be successfully integrated into the existing curriculum. Educators who successfully integrate this application report an improvement in the implementation of assessments and monitoring of student progress. Apps such as Google Classroom make it easy for educators to organize assignments, assign assessments, and track student progress in a structured manner.

5 CONCLUSION

Based on the results and discussions in this study, the following recommendations are proposed to increase the use of assessment applications in learning.

1. Improving access to technology: Governments and educational institutions need to work together to close the access gap to technology, especially in remote areas.
2. Educator training: Intensive and ongoing training should be provided to educators so that they can use the assessment app effectively.
3. Data security: To protect learners' data and ensure privacy is maintained, stricter security measures must be implemented.
4. Advanced use: Educators are encouraged to continue to explore and incorporate assessment applications into their teaching practices to create a dynamic and adaptive learning environment.

From this recommendation and the results described, the conclusion of this study shows that changes in assessment in the digital era have great potential in improving the quality of education through the use of assessment applications. Although there are many challenges to overcome, the benefits provided by the assessment app are far greater. With the right strategy, this application can be an effective tool to support a more efficient, personalized, and enjoyable learning process for students.

6 ACKNOWLEDGMENT

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