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Analysis of Student Response to the Use of Smart Six Application in Mathematics Assessment

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***Abstract*— The advancement of digital technology has significantly transformed education, including the adoption of online-based assessments. This study investigates students' responses to the use of the Smart Six application for end-of-semester assessments in Mathematics at SMAN 6 Cirebon. Smart Six is a school management application offering features such as data management, attendance tracking, scheduling, and online assessments. However, the abstract and visually intensive nature of Mathematics, which often requires manual calculations and visual aids, raises concerns about the application's effectiveness for such assessments. Using a descriptive research method, the study involved 76 grade 12 MIPA students as participants. Data were gathered through a questionnaire comprising 14 statements focused on two key indicators: students' acceptance of the ease of using Smart Six and the application's performance in supporting assessment requirements. The findings highlight that while Smart Six positively impacts the ease of conducting tests, challenges persist in solving Mathematics problems through the application, with over half of the students reporting difficulties. This study contributes to understanding the potential and limitations of integrating online-based technology into the assessment process, particularly for complex subjects like Mathematics.**

Keywords— ***Online Based Assessment; Computer Based Assessment; Smart Six; Mathematics***

V. INTRODUCTION

The advancement of digital technology has significantly transformed education, including the adoption of online-based assessments. With its rapidly-increasing technological advancement, the education system needs to adapt, as globalization has made technology unseparated from students' lives. These advancements simplify teaching processes by simplifying teaching and assessment processes. Furthermore, the 2013 Curriculum mandates that teachers integrate information and communication technology (ICT) into their teaching practices [1].

Assessment (or an exam) is a fundamental component of the teaching and learning process, and used to evaluate students' knowledge, understanding, abilities, and skills [2]. Technological advancements made this process easier with some technologies such as online-based assessments. These are often referred to as electronic or computer-based testing/exams (and sometimes interchangeably used), unifying and enhancing assessment process [3].

As mentioned in [4], online assessment systems have several advantages, such as automatic assessment processes, immediate feedback, unified management and analysis of student's learning results. These advantages are mentioned in Baleni's research [5], which underlines that immediate

feedback on exams motivates students and improving their learning experience due to its efficiency compared to more traditional assessment processes such as paper-based tests.

Furthermore, researchers found that students prefer online-based exams over paper-based exams because it gives immediate feedback and more fair scoring [6], [7]. However, online-based exams are only reliable for certain types of tests, such as multiple-choice, matching, true-false, and short-answer questions [7]. Another benefit of online exams is the reduced possibility of cheating, since it can randomize questions and choices from the given pool of questions.

However, several challenges remain in adopting online-based exams. An article mentioned student's concern about receiving unfair exam questions due to how the questions are being chosen randomly among the pool of questions [8]. Additionally, technical issues with hardware, software, networks, and internet connectivity frequently pose challenges for students [9]. Another issue in online-based exams is the system's security, which deemed to be critical. Al-Saleem and Ullah [10] proposed various techniques to enhance the security of online exams to try to rectify this issue. Research by Anusha, Soujanya, and Vasavi [11] also highlights the risk of cheating with other devices, potentially performing unwanted communication to other people who will work on their questions instead of the students themselves.

Knowing the benefits and challenges of online-based exams highlights the importance of using digital tools to support modern education system. As an example, at SMAN 6 Cirebon, the school recently implemented the online-/computer-based test dubbed as "Smart Six". Smart Six is a comprehensive school application designed to manage student data, track attendance, organize lesson schedules, and facilitate online-based school exams. Recently, in 2024, all subjects, including mathematics, implemented Smart Six for end-of-semester exams for the first time.

Mathematics is a discipline focused on patterns, shapes, structures, and quantitative relationships. It often requires media such as paper to help someone on visualizing problems and performing calculations. Furthermore, mathematics is inherently theoretical and abstract, consisting of various formulas, calculations, and interconnected concepts that require deep understanding [12]. It is essential to evaluate whether the Smart Six supports the needs of students during exams, including some particular subject such as math. Tasks such as writing complex formulas, solving multi-step problems, and visualizing detailed diagrams is one of the aspects online-based exams have yet to be able to assess, unlike paper-based exams.

Because of that, it's essential to know whether Smart Six is viable to be used or not. How do students respond to end-of-semester assessments using the Smart Six application in mathematics? Do students think that Smart Six is easy to use? Do students think that they can solve problems easier with Smart Six? The objective of this study is to evaluate student responses to these assessments. It is anticipated that the use of Smart Six for mathematics assessments will receive positive feedback from students, thereby supporting its continued application in evaluating mathematics performance.

VI. METHOD

This research uses a descriptive research method, which focuses on providing a detailed account of a phenomenon without making comparisons across other samples or examining relationships with other variables [13]. The goal is to describe, explain, and validate the observed phenomenon [14]. This research specifically analyzes student responses to exams conducted using the Smart Six application. The research instrument is comprised of a questionnaire designed to gather student feedback on the use of Smart Six during end-of-semester exams.

The subjects consisted of 76 grade 12 math and science (MIPA) students, selected using a convenience sampling method. This approach was chosen for its efficiency and cost-effectiveness [15]. Given the time constraints for data collection and the fact that Smart Six was being used for the first time, the convenience sampling method is promising to gather student feedback on this new exam system [16].

This study was conducted to evaluate the use of the Smart Six application at SMAN 6 Cirebon, which was implemented for the first time, in particular its online-based exam system. To partake the exam, each student was provided with an account and password by the school, which allowed them to access the exams prepared through the Smart Six application. Including both positively and negatively worded items in questionnaires is a common practice aimed to mitigate response biases, such as acquiescence bias—the tendency of respondents to agree with statements regardless of their content. The reasoning behind that is a mix of item wordings encourages respondents to engage more thoughtfully with each question, potentially improving the reliability of their responses [17].

After completing the end-of-semester exams through Smart Six, students submitted their responses to this questionnaire via Google Forms. The response questionnaire consisted of 14 statement items to assess the key indicators, with a dichotomous rating scale (agree/disagree). These indicators focused on measuring: student acceptance of the ease of use, and student's performance of solving problems through Smart Six. To mitigate acquiescence bias as mentioned before, some items were worded negatively, requiring value inversion during the calculation process. This approach was employed as an attempt to capture a balanced assessment of students' perceptions.

As outlined in [18], the performance expectancy indicator reflects the belief that the system will provide benefits or facilitate tasks for its users. The details of these indicators are as follows:

TABLE III. STUDENT RESPONSE INDICATORS

Indicators	Statement
Student acceptance of the ease of use of Smart Six	• Students prefer to take exams using the Smart Six school website compared to paper-based exams. • Taking online exams through the Smart Six website is easier for students than paper-based exams. • The Smart Six website used for exams is quite easy to understand and use without technical barriers. • Students find it easier to manage time during online-based exams than paper-based exams. • Students are more confident taking online-based exams using Smart Six accounts than paper-based exams. • Overall, students prefer online-based exams with school apps over paper-based exams.
Students' ability to solve problems through Smart Six	• Students feel more focused when taking exams using the Smart Six app compared to using paper. • Online-based assignments or exam questions through the Smart Six website make students more capable of critical thinking than paper-based exams. • The Smart Six website sometimes makes students feel difficult in working on exam questions, especially questions that require critical thinking. • The use of the Smart Six application for exams makes students feel more helpful in terms of automatic scoring, but less in-depth in measuring their abilities. • Students feel that online-based exam questions often do not cover all aspects that need to be tested, such as critical thinking and creativity. Therefore, students themselves cannot measure their abilities objectively. • When taking online-based exams, students feel more controlled because there is no possibility of cheating like paper-based exams. • Students feel that online exams through Smart Six accounts take longer to prepare than conventional exams. • In certain subjects such as Mathematics, students feel it is not effective to take online-based exams.

Student response to the implementation of Smart Six-based exams is considered good if the average percentage on each indicator of student response reaches or exceeds 70%.

VII. RESULTS AND DISCUSSION

Student responses to the implementation of Smart Six-based exams consist of 14 statements arranged based on relevant indicators. The following is a table summarizing the description of student response results for each statement.

TABLE IV. DESCRIPTION OF STUDENT RESPONSES

Indicator	Statement	Type	Agree	Disagree
Student acceptance of the ease of use of Smart Six	Students prefer to take exams using the Smart Six school website compared to paper-based exams.	Positive	81,6%	18,4%
	Taking online exams through the Smart Six website is easier for students than paper-based exams.	Positive	78,9%	21,1%
	The Smart Six website used for exams is quite easy to understand and use without technical barriers.	Positive	48,7%	51,3%
	Students find it easier to manage time during online-based exams than paper-based exams.	Positive	86,8%	13,2%
	Students are more confident taking online-based exams using Smart Six accounts than paper-based exams.	Positive	81,6%	18,4%
	Overall, students prefer online-based exams with school apps over paper-based exams	Positive	84,2%	15,8%
Average			77,0%	23,0%
Students' ability to solve problems through Smart Six	Students feel more focused when taking exams using the Smart Six app compared to using paper.	Positive	68,4%	31,6%
	Online-based assignments or exam questions through the Smart Six website make students more capable of critical thinking than paper-based exams.	Positive	57,9%	42,1%
	The Smart Six website sometimes makes students feel difficult in working on exam questions, especially questions that require critical thinking.	Negative	65,8%	34,2%
	The use of the Smart Six application for exams makes students feel more helpful in terms of automatic scoring, but less in-depth in measuring their abilities.	Negative	84,2%	15,8%
	Students feel that online-based exam questions often do	Negative	72,4%	27,6%

Indicator	Statement	Type	Agree	Disagree
	not cover all aspects that need to be tested, such as critical thinking and creativity. Therefore, students themselves cannot measure their abilities objectively.			
	When taking online-based exams, students feel more controlled because there is no possibility of cheating like paper-based exams.	Positive	77,6%	22,4%
	Students feel that online exams through Smart Six accounts take longer to prepare than conventional exams.	Negative	63,2%	36,8%
	In certain subjects such as Mathematics, students feel it is not effective to take online-based exams.	Negative	57,9%	42,1%
Average			45,1%	54,9%

The results of the questionnaire indicate that the indicator for student acceptance of the ease of use of Smart Six showed an average of 77.0% positive responses and 23.0% negative responses. This suggests that students generally think that the Smart Six application makes them easier to do their exams. A majority of students found online-based exams are more practical than paper-based exams, with 81.6% agreeing with this statement. Additionally, other 81.6% of students reported feeling more confident using the Smart Six application, and 86.8% found that time management is easier with Smart Six.

However, a common negative response, agreed by 51.3% of students shows that students faced technical challenges while using Smart Six. This percentage highlights that nearly half of the students faced technical difficulties. This shows that it is important to provide initial training or orientation on the use of applications like Smart Six to minimize barriers. Additionally, similar research conducted by Alyahya and Almutairi [19] also concluded a similar negative response, who emphasized that the ease of use of online-based exams is significantly influenced by students' proficiency in operating digital tools in general.

In addition to technical challenges, the questionnaire revealed that 63.2% of students felt they needed more time to prepare for exams using Smart Six compared to conventional exams. This is likely due to two issues: the time to adapt themselves using Smart Six with no prior knowledge, and the technical issues suffered during the exam. Furthermore, 72.4% of students thinks that online-based exam questions did not cover all aspects that should be assessed, such as creativity. This finding highlights the need for more diverse and comprehensive question development to ensure the validity of assessments. While most of the students, about 81.6% feeling more confident when using Smart Six, this confidence tends to decrease when faced with questions requiring critical thinking, as many students mentioned before reported difficulty with such tasks.

Student responses regarding their ability to take exams through Smart Six were predominantly negative. For example, in one statement, 57.9% of students agreed that the use of Smart Six was ineffective, particularly in subjects such as Mathematics.

This finding is consistent with the research by Hensley et al. [20], which shows a difference in performance between students taking paper- and computer-based exams. Another research by the Fordham Institute reported negative effects from computer-based test (CBT) on average scores, with reductions ranging from 0.02 standard deviations in math to 0.09 in English Language Arts during the first year of CBT adoption [21]. These negative effects did not diminish in subsequent years, highlighting potential challenges in transitioning to CBT. Similarly, in math subject, especially calculus, a study by Smolinsky et al. compared computer-based and paper-and-pencil tests in Calculus II classes for STEM majors. The results indicated that classes using paper-based exams had slightly better outcomes than fully computer-based exams [22], despite both measuring the same aspects.

These findings provide an overview that, while Smart Six demonstrates significant potential as an online examination platform, improvements are needed in terms of technical functionality, content development, and user support to comprehensively meet educational needs.

VIII. CONCLUSIONS

Based on the questionnaire results, it can be concluded that the Smart Six application responded positively by students in terms of ease of use for tests, as reflected by 77.0% positive responses. Aspects such as preference and confidence also perceived positively among the students. Despite its ease of use, about half of the students had technical difficulties while taking exams through Smart Six. Students thought that their ability to solve questions through Smart Six was difficult, with only 45.1% responded positively. Preparation to take exams through Smart Six is generally longer according to 63.2% of students.

Both of the findings align with past researches, further confirming that these are common in computer-based exams. While computer-based exams, including Smart Six offered advantages over paper-based exams, some students felt that Smart Six was not always effective across all subjects, aligning with findings from previous research. Implementing computer-based tests requires more preparation in many aspects to ensure its validity and efficiency.

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