



## DEVELOPMENT OF A MOODLE QUIZ AS A MATHEMATICS ASSESSMENT TOOL FOR GRADE VIII STUDENTS OF SMP NEGERI 1 KOLAKA

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### ABSTRACT

This study aims to develop a digital-based mathematics assessment tool using the Moodle application for Grade VIII students at SMP Negeri 1 Kolaka, in response to the growing need for effective and accessible digital testing platforms in mathematics education. The development process followed the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), which supports a systematic and iterative approach to instructional design. The research involved 30 students from Class VIII D, selected through purposive sampling. Content validity was evaluated by two subject-matter experts using a structured rubric, resulting in an average score of 93% (very valid). Media validity was assessed by a media expert, yielding an average score of 82% (very valid). The practicality of the instrument was examined through student questionnaires focusing on usability and clarity, achieving an average score of 84%, indicating high practicality. These results suggest that the Moodle-based quiz is a valid and practical tool for mathematics assessment in junior high schools, with potential to enhance digital assessment practices in similar educational settings.

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## 1. INTRODUCTION

Assessment is an integral part of the learning process, serving to measure the achievement of learning objectives and identify students' weaknesses to provide appropriate follow-up. One common form of assessment in schools is cognitive

evaluation, which can be conducted through written tests, oral examinations, or assignments. Such assessments are expected to ensure that students attain the competencies aligned with the cognitive domain outlined in the curriculum (Wijayanti et al., 2023).

However, in practice, school assessments are still largely dominated by traditional **Paper-Based Tests (PBT)**, in which printed test questions are distributed and graded manually by teachers. This process is time-consuming and labor-intensive, and it does not allow for immediate feedback to students. Moreover, PBT is less environmentally friendly due to the large amount of paper used, which is typically discarded after a single use (Nasrum, 2020; Hasanah et al., 2020).

With the rapid advancement of technology, there is a growing need to adopt more efficient, flexible, and eco-friendly digital assessment systems. Digital assessments enable students to take tests online using computers or mobile devices connected to the internet, while teachers can instantly access and analyze the results (Rahman et al., 2023). Other advantages include the ability to randomize questions, set time limits, and provide automatic feedback and scoring, which enhance the efficiency and fairness of the assessment process (Afifah et al., 2022).

Although various digital assessment platforms are available, their implementation in schools remains inconsistent. Based on an interview with a mathematics teacher at SMP Negeri 1 Kolaka, digital assessments are occasionally used for daily quizzes or mid-term exams. However, final semester examinations are still conducted using the conventional paper-based method, primarily due to limited access to computer facilities.

To address this challenge, a platform that is flexible and accessible via multiple devices—such as computers, laptops, or smartphones—is essential. One such platform is **Moodle (Modular Object-Oriented Dynamic Learning Environment)**, a web-based application designed for online teaching and learning, which includes features such as quizzes, assignments, and discussion forums (Soekarman, 2022; Fikriyah & Sukmawati, 2022). Previous studies have shown that Moodle-based assessments are effective in improving assessment efficiency, providing timely feedback, and increasing student engagement (Usman et al., 2024; Sari & Zulmaulida, 2021; Gamaliel, 2021; Ubaidillah & Muslih, 2021).

Nevertheless, research on the development of Moodle-based mathematics assessment tools contextualized to schools with limited infrastructure, such as SMP Negeri 1 Kolaka, remains scarce. Therefore, this study aims to develop a Moodle-based mathematics quiz for Grade VIII students at SMP Negeri 1 Kolaka as a solution to the limitations of traditional assessments and to promote technology-enhanced learning in mathematics education.

## **2. METHOD**

This study is categorized as a development research. The product developed is a test tool for mathematics instruction. The development model employed is the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation,

and Evaluation, which offers a systematic and flexible framework for developing technology-based instructional instruments.

In the **Analysis** stage, the need for the development of an evaluation instrument is examined, including the feasibility and requirements for its development. This stage aims to identify the need for a digital test tool based on Moodle in mathematics learning. Once these aspects are clearly understood, the process continues to the **Design** stage, where the test tool is structured based on the results of the previous analysis. The process begins with the preparation of test items in the form of multiple-choice, true/false, and short-answer questions. These items are then validated by two content experts. The Design stage also includes decisions regarding the appearance and navigation of the test, such as whether questions are displayed one at a time or all at once.

All elements designed in the previous phase are then realized in the **Development** stage. The validated questions are entered into Moodle, and the display and navigation are arranged according to the previously established design. Once this process is complete, the media is then validated by two media experts until deemed feasible, with repeated validation as necessary.

After the media has been validated and declared feasible, the **Implementation** stage begins in Moodle. The feasible product is tested by 30 eighth-grade students. The trial is conducted online using a Moodle quiz link. After completing the quiz, students fill out a user response questionnaire to assess the practicality of the tool. The results from the questionnaire are then evaluated as a basis for producing the final version of the platform.

In the **Evaluation** stage, the researcher revises the developed product based on feedback and suggestions from content experts, media experts, and student responses until the product it meets the criteria of validity, practicality, and feasibility. A summary of the implementation stages is illustrated in Figure 1.

Based on the stages illustrated in Figure 1, both item validation and media validation were conducted, requiring appropriate validation instruments: the content expert validation sheet and the media expert validation sheet. The test items must be validated before being uploaded to the Moodle quiz to ensure their validity. The content expert validation sheet is used to assess five aspects: content relevance, user-friendliness, item variety, item quality, and completion time. Meanwhile, the media expert validation sheet evaluates three aspects: interactivity, functionality, and user-friendliness. Validation is measured using a five-point Likert scale. The data obtained from the questionnaires are converted into percentages using formula (1).

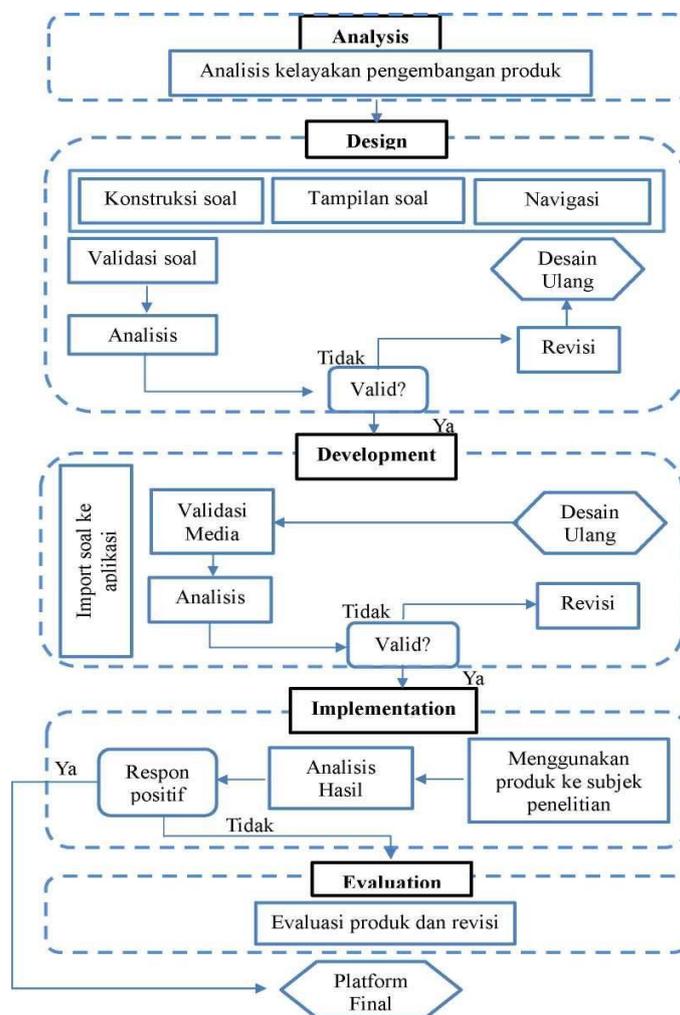
$$P (\%) = \frac{\text{total score}}{\text{Maximum Likert Score} \times \text{number of respondents}} \times 100\% \quad (1)$$

**Information:**

- P = Percentage score
- Total score = Sum of all obtained scores

- Maximum score = Highest possible score (Likert scale = 5)
- Number of respondents = Number of validators or student participants

Next, the average validity score is matched with the validity criteria presented in Table 1.



Source: (Marniati et al., 2023)

Figure 1. Flowchart of ADDIE Model

Table 1. Interpretation of validation data

Interval	Criteria
81% < P < 100%	Very Valid
61% < P ≤ 80%	Valid
41% < P ≤ 60%	Fairly Valid
21% < P ≤ 40%	Less Valid
0% < P ≤ 20%	Not Valid

Source: Riduwan (Tafari & Sari, 2021)

In addition to the content and media expert validation sheets, a student response questionnaire was also distributed to measure the practicality level of the Moodle quiz. Several aspects were evaluated, including ease of access and use, item quality, assessment and feedback, user motivation and comfort, and time management. The practicality of the instrument was measured using a five-point Likert scale. To calculate the average practicality score, formula (1) was applied. The resulting average score was then interpreted according to the practicality criteria outlined in Table 2.

**Table 2.** Interpretation of Student Response Percentages

Interval	Criteria
$81\% < P < 100\%$	Very Practical
$61\% < P \leq 80\%$	Practical
$41\% < P \leq 60\%$	Fairly Practical
$21\% < P \leq 40\%$	Less Practical
$0\% < P \leq 20\%$	Not Practical

*Source: Riduwan (Tafari & Sari, 2021)*

The methodological approach is designed to achieve the primary objective of the study to produce a digital Moodle-based test instrument that is valid, practical, and feasible for use in evaluating mathematics learning among students.

### 3. RESULTS AND DISCUSSION

#### 3.1 Results

This development research resulted in a mathematics test tool using the Moodle quiz for students, developed through the ADDIE model. The process followed these stages:

##### 1. Analysis

At this stage, observations were conducted at the school, and interviews were held with mathematics teachers regarding the testing system, available facilities and infrastructure, curriculum, and students at SMP Negeri 1 Kolaka. The information obtained revealed that most teachers still use paper-based media for testing. This is due to the limited availability of technological facilities such as computers, which has hindered the optimal integration of technology in supporting teaching and learning activities in the classroom, particularly during assessment. Therefore, a platform accessible via all technological devices PCs, laptops, and smartphones is needed so that students can access it using their own devices. Moodle was identified as a suitable alternative to meet this need. The facilities and infrastructure at SMP Negeri 1 Kolaka are relatively adequate, including the availability of a computer laboratory, computers, LCD projectors, laptops, Android devices, and Wi-Fi, which can support the development and implementation of the Moodle quiz as a mathematics test tool for students. Moreover, SMP Negeri 1 Kolaka has adopted the Merdeka Curriculum.

## 2. Design

The process began with the development of test items based on the topic of Linear Equations. A total of 10 questions were created, consisting of multiple-choice, true/false, and short-answer formats. These questions were then validated by content experts, with the validation results presented in Table 3.

**Table 3.** Results of Content Expert Validation

Aspect	Average	Criteria
Content Relevance	93%	Very Valid
Ease of Understanding	95%	Very Valid
Question Variety	90%	Very Valid
Question Quality	90%	Very Valid
Completion Time	95%	Very Valid
Average	93%	Very Valid

The navigation settings for the questions were also determined during this stage. The 10 questions to be administered to students are displayed randomly. Students may answer whichever questions they find easiest first. An example of the question display in Moodle can be seen in **Figure 2**.



**Figure 2.** Moodle Quiz Question Display

## 3. Development

All components that were previously designed were then implemented in this stage. The validated questions were entered into the Moodle platform. The navigation and visual layout of the questions were adjusted according to the established design. Once the process was completed, the media link was submitted to media experts for validation. The results of the media expert validation are presented in **Table 4**.

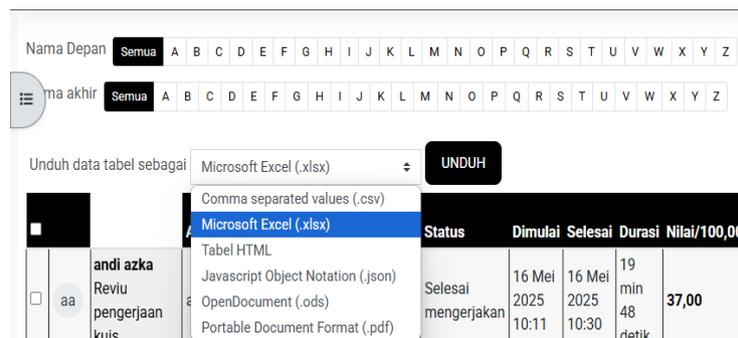
**Table 4.** Results of Media Expert Validation

Aspect	Average	Criteria
Interactivity	90%	Very Valid
Functionality	72%	Valid
User-Friendliness	83%	Very Valid
Average	82%	Very Valid

This indicates that the developed media test tool has already been classified as feasible for use.

#### 4. Implementation

Before the implementation stage, all student names had to be entered into the system. The registration process was managed by the admin to simplify access, including the setup of usernames and passwords. Once all students were registered in the Moodle class, the test instrument was ready for implementation. This instrument was used for the daily assessment on the topic of **Linear Equations** during the **even semester of the 2024/2025 academic year**. As shown in **Figure 3**, the students' test results can be downloaded in Excel format.


**Figure 3.** Menu for Exporting Test Results to Excel File

After the implementation of the test instrument was completed, the next step was to distribute questionnaires to students to assess their responses regarding the practicality and usefulness of the developed test instrument. The results of the student response questionnaire are presented in **Table 5**.

**Table 5.** Results of Student Response Questionnaire

Aspect	Average	Criteria
Ease of Access and Use	76%	Practical
Question Quality	88%	Very Practical
Assessment and Feedback	85%	Very Practical
Motivation and User Comfort	84%	Very Practical
Completion Time	86%	Very Practical
Average	84%	Very Practical

This indicates that student responses to the use of the Moodle-based test were very positive. However, there were some system-related challenges during the implementation of the test instrument, including network issues and limitations in hardware access speed.

## 5. Evaluation

Although Wi-Fi facilities were provided during the study, network connectivity remained a challenge. These issues were beyond the researcher's control and could not be predicted in advance. Nevertheless, the entire implementation process was completed successfully.

### 3.2 Discussion

The results of the validation and practicality tests indicate that the Moodle-based mathematics quiz developed for Grade VIII students at SMP Negeri 1 Kolaka meets the criteria of a valid and practical assessment tool. This aligns with the standards of a good assessment instrument in educational settings.

From the **content expert validation** (Table 3), the average score of 93% places the quiz in the "Very Valid" category. Notably, aspects such as *Ease of Understanding* and *Completion Time* scored highest (95%), indicating that the test is not only aligned with learning objectives but also well-suited to students' cognitive levels. Meanwhile, *Question Variety* and *Question Quality* both received 90%, suggesting room for further diversification and enhancement of item types to engage different levels of thinking skills, particularly higher-order thinking.

The **media expert validation** (Table 4) yielded an average score of 82%, also in the "Very Valid" category. However, the *Functionality* aspect scored only 72%, classified as "Valid" rather than "Very Valid." This suggests some functional limitations in the implementation of the Moodle platform, which could be due to system compatibility issues, user interface design, or technical glitches. This finding highlights the need for ongoing refinement and possibly increased technical support or training for teachers and administrators.

From the **student response questionnaire** (Table 5), the tool was rated as "Very Practical" with an average of 84%. This indicates a high level of acceptance among students. Interestingly, the lowest score was found in *Ease of Access and Use* (76%), which may relate to the technical challenges faced by some students during the quiz, such as login difficulties or inconsistent internet connectivity. Despite this, the high scores in *Motivation*, *Feedback*, and *Completion Time* reflect the interactive and responsive nature of the Moodle platform, which supports autonomous and technology-integrated learning as emphasized by the **Merdeka Curriculum**.

These findings are consistent with those of **Jahring et al. (2022)**, stated that interactive digital assessments can enhance student engagement and provide immediate, reflective feedback. The use of randomization in question order also minimizes academic dishonesty and encourages individual accountability during assessments.

Nevertheless, **challenges remain**. Although the school is equipped with Wi-Fi and digital devices, the **network speed and stability** were noted as obstacles. This mirrors findings in previous research (e.g., Sari et al., 2021) that underscore the importance of stable infrastructure in ensuring the effectiveness of digital learning tools. Addressing these technical limitations is crucial for the sustainability and scalability of such assessments.

The **scope of this development** was limited to a single topic (Linear Equations) and a single institution. Thus, while the results are promising, further research should expand implementation across various mathematical topics and educational contexts to evaluate generalizability. Moreover, future studies could integrate reliability testing and explore the impact of such tools on learning outcomes, not just assessment delivery.

In conclusion, the Moodle quiz developed in this study not only facilitates efficient and objective assessment but also supports reflective learning practices. With some technical improvements and broader implementation, it holds strong potential to become an integral tool for digital assessment in the secondary school context.

#### 4. CONCLUSION

The use of the Moodle-based quiz as a mathematics test tool on the topic of linear equations meets the criteria for a valid and practical assessment instrument. Validity was confirmed through expert reviews from both content and media experts, with average scores exceeding 80%. Practicality was supported by student response questionnaires, which also showed average scores above 80%.

This digital test instrument provides an effective alternative to traditional paper-based assessments, offering advantages such as efficiency, objectivity, and faster grading. Moodle supports question randomization, varied question formats, and immediate feedback, which in turn promotes student reflection on their performance. Therefore, the platform aligns well with the goals of the **Merdeka Curriculum**, which emphasizes independent and technology-integrated learning.

However, this study has certain limitations. It focused solely on one topic (linear equations), used limited question types (multiple-choice, true/false, and short-answer), and evaluated only validity and practicality. Future research is encouraged to:

- Cover a broader range of mathematical topics, including more complex concepts;
- Develop additional question types such as open-ended or problem-solving tasks;
- Evaluate the **effectiveness** of Moodle in improving students' learning outcomes.

In practical terms, mathematics teachers are advised to begin integrating digital platforms such as Moodle into their assessment practices. Schools should also support the adoption of educational technology by enhancing infrastructure and providing teacher training, ensuring that digital-based evaluation can be implemented optimally, equitably, and sustainably.

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