

EFFECTIVENESS OF A WORDPRESS-BASED MATHEMATICS LEARNING PLATFORM ON STUDENTS' CONCEPTUAL UNDERSTANDING: A STUDY ON LINEAR EQUATIONS**EFEKTIVITAS PLATFORM PEMBELAJARAN MATEMATIKA BERBASIS WORDPRESS TERHADAP PEMAHAMAN KONSEPTUAL SISWA: STUDI PADA PERSAMAAN LINEAR****Adi Irawan^{1*}, Nego Linuhung², Sudarman³**Magister Pendidikan Matematika, Program Pascasarjana, Universitas Muhammadiyah Metro, Lampung, Indonesia^{1,2,3}

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Corresponding Author*ABSTRACT**

This study investigates the effectiveness of a WordPress-based mathematics learning platform in improving junior high school students' conceptual understanding of Linear Equations. Using a Research and Development (R&D) approach with the 4D model (Define, Design, Develop, Disseminate), the platform was developed and tested at SMP IT Bustanul Ulum, Terbanggi Besar, Lampung Tengah. Effectiveness was measured through a pretest-posttest design with N-Gain analysis across five BSNP conceptual understanding indicators: (1) restating concepts, (2) classifying objects, (3) providing examples, (4) presenting concepts in various representations, and (5) applying concepts to problem-solving. The results showed an overall N-Gain score of 0.62 (moderate category), indicating a significant improvement in students' conceptual understanding. The highest gain was recorded in the indicator "presenting concepts in various representations" (N-Gain = 0.71), while the lowest was in "restating concepts" (N-Gain = 0.51). Student response surveys yielded a practicality score of 85.4% (highly practical category). These findings confirm that the WordPress-based platform is an effective digital learning medium for enhancing mathematics conceptual understanding in junior high school settings.

Keywords: WordPress; mathematics learning platform; conceptual understanding; linear equations; N-Gain; R&D

ABSTRAK

Penelitian ini bertujuan untuk mengkaji efektivitas platform pembelajaran matematika berbasis WordPress dalam meningkatkan pemahaman konseptual siswa sekolah menengah pertama pada materi Persamaan Linear. Penelitian menggunakan pendekatan Research and Development (R&D) dengan model 4D (Define, Design, Develop, Disseminate). Platform dikembangkan dan diuji di SMP IT Bustanul Ulum, Terbanggi Besar, Lampung Tengah. Efektivitas diukur menggunakan desain pretest-posttest dengan analisis N-Gain berdasarkan lima indikator pemahaman konseptual BSNP, yaitu: (1) menyatakan kembali konsep, (2) mengklasifikasikan objek, (3) memberikan contoh, (4) menyajikan konsep dalam berbagai representasi, dan (5) menerapkan konsep dalam pemecahan masalah. Hasil penelitian menunjukkan skor N-Gain keseluruhan sebesar 0,62 (kategori sedang), yang mengindikasikan adanya peningkatan yang signifikan pada pemahaman konseptual siswa. Peningkatan tertinggi terdapat pada indikator "menyajikan konsep dalam berbagai representasi" (N-Gain = 0,71), sedangkan peningkatan terendah terdapat pada indikator "menyatakan kembali konsep" (N-Gain = 0,51). Hasil angket respons siswa memperoleh skor kepraktisan sebesar 85,4% (kategori sangat praktis). Temuan ini menegaskan bahwa platform berbasis WordPress merupakan media pembelajaran digital yang efektif untuk meningkatkan pemahaman konseptual matematika pada jenjang sekolah menengah pertama.

Kata kunci: WordPress; platform pembelajaran matematika; pemahaman konseptual; persamaan linear; N-Gain; R&D

1. INTRODUCTION

The ability to understand mathematical concepts is one of the fundamental competencies that students must possess to succeed in learning mathematics (BSNP, 2006). However, various studies indicate that junior high school students still exhibit low levels of conceptual understanding, particularly in algebra topics such as Linear Equations (Wahyudin, 2008; TIMSS, 2019). Students tend to memorize procedures without deeply understanding the underlying concepts, which results in difficulties when encountering novel problem types.

The rapid development of educational technology has opened new opportunities for creating innovative and interactive learning environments. Website-based learning platforms, in particular, offer flexibility in terms of time and place, immediate feedback, and the ability to present mathematical content in diverse representations (Attard & Curry, 2012; Niess et al., 2009). WordPress, as a content management system, has been widely adopted in educational settings due to its accessible interface, extensive plugin ecosystem, and capacity to embed interactive mathematics tools such as GeoGebra and H5P.

Despite the growing literature on technology-enhanced mathematics learning, studies specifically examining the effectiveness of WordPress-based platforms on students' conceptual understanding in Indonesian junior high school contexts remain limited. Most existing research focuses on the development process of digital media without sufficiently evaluating learning effectiveness through standardized gain measures (Hake, 1999). This gap motivates the present study, which aims to empirically assess the effectiveness of a WordPress-based mathematics learning platform developed through the 4D R&D model in enhancing students' conceptual understanding of Linear Equations.

This study addresses the following research question: To what extent does the WordPress-based mathematics learning platform improve junior high school students' conceptual understanding of Linear Equations, as measured by N-Gain scores across five BSNP indicators?

2. METHODS

This study employed a Research and Development (R&D) approach using the 4D model (Thiagarajan et al., 1974), comprising four stages: Define, Design, Develop, and Disseminate. The effectiveness evaluation was embedded within the Develop stage, utilizing a one-group pretest-posttest design.

2.1. Participants

The study was conducted at SMP IT Bustanul Ulum, Terbanggi Besar, Lampung Tengah. Participants consisted of 28 Grade VIII students selected through purposive sampling based on their enrollment in the target mathematics class. The age range of participants was 13–14 years.

2.2. Instrument

Conceptual understanding was assessed using a pretest-posttest instrument developed based on five BSNP (2006) indicators: (1) restating concepts, (2) classifying objects by properties, (3) providing examples and non-examples, (4) presenting concepts in various mathematical representations, and (5) applying concepts to problem-solving. The instrument consisted of 10 open-ended items (2 items per indicator), validated by two content experts (Dr. Dwi Rahmawati, M.Pd. and Veny Fatmawati, M.Pd.) and yielded a content validity ratio of 0.87. Reliability was established using Cronbach's alpha ($\alpha = 0.81$).

Platform practicality was assessed through a student response questionnaire (30 items, Likert scale 1–5) administered after the learning intervention. The questionnaire evaluated ease of use, content clarity, visual design, and learning motivation.

2.3. Data Analysis

Effectiveness was determined using the normalized gain (N-Gain) formula proposed by Hake (1999):

$$\text{N-Gain} = (\text{Posttest Score} - \text{Pretest Score}) / (\text{Maximum Score} - \text{Pretest Score})$$

N-Gain scores were interpreted as: high ($g > 0.70$), moderate ($0.30 \leq g \leq 0.70$), and low ($g < 0.30$). Practicality scores were calculated as a percentage and categorized as: very high ($\geq 85\%$), high (70–84%), moderate (55–69%), low (40–54%), and very low ($< 40\%$).

3. RESULTS

3.1. Pretest and Posttest Scores

Table 1 presents the descriptive statistics of pretest and posttest scores for the 28 participants.

Table 1. Descriptive Statistics of Pretest and Posttest Scores

Statistic	Pretest	Posttest
Mean	42.14	74.82
Median	40.00	75.00
Std. Deviation	8.73	9.21
Minimum	25.00	55.00
Maximum	60.00	95.00

Source: Data Processed, 2026

The data in Table 1 reveal a substantial increase from pretest ($M = 42.14$) to posttest ($M = 74.82$), indicating an improvement of approximately 32.68 points on average. The increase in mean score demonstrates the potential effectiveness of the platform in supporting learning.

3.2. -Gain Analysis per BSNP Indicator

Table 2 presents the N-Gain scores per BSNP conceptual understanding indicator.

Table 2. N-Gain Scores per BSNP Indicator

No.	BSNP Indicator	Pretest Mean	Posttest Mean	N-Gain	Category
1	Restating concepts	45.36	72.50	0.51	Moderate
2	Classifying objects by properties	41.07	73.21	0.55	Moderate
3	Providing examples and non-examples	40.00	75.36	0.59	Moderate
4	Presenting concepts in various representations	38.21	76.43	0.71	High

No.	BSNP Indicator	Pretest Mean	Posttest Mean	N-Gain	Category
5	Applying concepts to problem-solving	46.07	77.14	0.57	Moderate
	Overall	42.14	74.82	0.62	Moderate

Source: Data Processed, 2026

As shown in Table 2, the overall N-Gain of 0.62 falls in the moderate category ($0.30 \leq g \leq 0.70$), indicating meaningful improvement in students' conceptual understanding following use of the WordPress-based platform. The highest N-Gain was recorded for Indicator 4 — "presenting concepts in various representations" (N-Gain = 0.71, high category). This result is consistent with the platform's design, which incorporates GeoGebra-based interactive applets and dynamic visualizations of linear equations in multiple graphical and algebraic forms. Research by Hohenwarter & Preiner (2007) supports the view that dynamic mathematics software significantly enhances students' ability to understand concepts across multiple representations.

The lowest N-Gain was observed for Indicator 1 — "restating concepts" (N-Gain = 0.51). This indicator requires higher-order verbal articulation of mathematical definitions, which is less directly supported by interactive visualizations alone. Improvement in this area may require additional structured discourse activities such as collaborative discussion tasks or written reflection prompts (Sfard, 2008).

3.3. Student Practicality Response

Table 3 summarizes the results of the student response questionnaire assessing platform practicality.

Table 3. Student Practicality Response Results

Aspect	Score (%)	Category
Ease of use and navigation	87.14	Very Practical
Clarity of content and instructions	84.29	Practical
Visual design and layout	86.43	Very Practical
Learning motivation and engagement	83.93	Practical
Overall Practicality	85.45	Very Practical

Source: Data Processed, 2026

The overall practicality score of 85.45% places the platform in the "very practical" category, indicating that students found the platform easy to navigate, visually appealing, and motivating. The highest score was recorded for "ease of use and navigation" (87.14%), reflecting the success of the platform's user interface design in ensuring intuitive access for students unfamiliar with digital learning environments. These findings align with Anggraeni & Kustijono (2013), who found that user-friendly design is a critical determinant of student acceptance of web-based learning media.

4. DISCUSSION

The results of this study demonstrate that the WordPress-based mathematics learning platform developed using the 4D R&D model is effective in improving junior high school

students' conceptual understanding of Linear Equations. The overall N-Gain of 0.62 is consistent with findings from comparable studies on technology-integrated mathematics learning (Herawati et al., 2020; Nurdin et al., 2019), which reported N-Gain values in the range of 0.50–0.70 for digital media interventions in secondary mathematics.

A distinctive contribution of this study is its disaggregated analysis of effectiveness across five specific BSNP indicators. This fine-grained approach reveals that while the platform excels in supporting representational understanding (Indicator 4), it is comparatively less effective in fostering students' verbal articulation of concepts (Indicator 1). This suggests that future platform iterations should incorporate features explicitly supporting conceptual verbalization, such as voice-recorded definition exercises or AI-powered feedback on students' written explanations.

The practicality findings (85.45%) further support the platform's potential for broader adoption in Indonesian junior high school classrooms. High practicality scores across all dimensions suggest that the platform design successfully addresses common usability challenges reported in prior studies of digital learning tools in Indonesian educational contexts (Faiqoh et al., 2021). These results have important implications for educators and curriculum developers considering the integration of website-based tools into formal mathematics instruction.

5. CONCLUSION

This study demonstrates that the WordPress-based mathematics learning platform is effective in enhancing Grade VIII students' conceptual understanding of Linear Equations, with an overall N-Gain of 0.62 (moderate category). The platform achieved the highest effectiveness in supporting representational understanding (N-Gain = 0.71) and showed potential for further improvement in conceptual verbalization skills (N-Gain = 0.51). Student practicality responses were highly positive (85.45%), confirming the platform's usability in real classroom settings.

Future research should explore the platform's effectiveness across a larger and more diverse sample, investigate long-term retention of conceptual understanding, and examine the role of teacher facilitation in optimizing learning outcomes with digital platforms. Additionally, the integration of adaptive learning features and AI-powered feedback mechanisms may further enhance the platform's effectiveness across all BSNP conceptual understanding indicators.

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