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Practicality and Effectiveness of Interactive Learning Media Based on Problem-Based Learning Using WordPress on Rectangle Subjects for Fifth-Grade Elementary School

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Abstract: The rapid application of technology in education opens up opportunities to improve learning outcomes through innovative media; however, many learning resources in elementary schools still lack interactive features and structured pedagogical models that actively engage students in problem-solving. This study aims to develop an interactive learning media product based on the Problem-Based Learning (PBL) model, supported by WordPress. It combines structured PBL inquiry with the flexibility and accessibility of the WordPress platform to create a dynamic and user-friendly digital environment. Using the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The focus of this paper is on the implementation and evaluation stages. The product trial was conducted in the fifth grade of SDN 6 Kalipare, Malang, involving 18 students as respondents. The data collected focused on two main aspects: the practicality and the effectiveness of the developed product. The practicality of the product was evaluated using teacher and student response questionnaires, while the effectiveness of the product was evaluated using a test. The effectiveness test results showed that the average teacher response was 94.25% and the average student response was 88.75%, both falling into the “convenient” category. The

effectiveness test results showed a significant improvement in learning outcomes, with the average score increasing from 62.78 on the pre-test to 88.89 on the post-test, and all students exceeded the minimum passing criterion of 70. These findings indicate that the PBL-based interactive learning media supported by WordPress is practical and effective. These findings offer a replicable model for integrating problem-solving pedagogy with accessible web technology to enhance engagement and achievement in elementary education.

Keywords: learning media, interactive, problem-based learning, WordPress, rectangle.

Introduction

Increasing global competition in the 21st century has underscored the need to enhance human resource standards (Bastas & Altinay, 2019). In the education sector, this requires teachers to implement learning innovations that can achieve educational goals more effectively (Elitasari, 2022). The traditional teacher-centred and memorisation-based approach needs to be replaced with more interactive and participatory methods (Muliana et al., 2024). Mathematics is an essential subject because it is applicable throughout life (Adjie et al., 2021) and serves as the foundation of all other sciences (Ratnasari & Nurhidayah, 2020). It equips learners with advanced skills in abstraction, problem analysis, and logical reasoning (Nurfadilah & Suhendar, 2018). Given its importance in daily life and the advancement of science and technology, schools must organise meaningful and enjoyable mathematics learning to help students grasp concepts that may seem complicated and abstract (Nur et al., 2024).

However, observations and interviews with fifth-grade students at SDN 6 Kalipare, Malang, revealed that many still consider mathematics the most challenging subject. Students often rely solely on textbooks and worksheets, which can lead to low motivation. Teachers indicated that mathematics learning could be more effective if supported by digital-based learning media. According to Saputra and Mampouw (2022), the perception that mathematics is monotonous and uninteresting reduces students' motivation. This situation challenges teachers to create not only an engaging learning environment but also a creative, innovative, and enjoyable experience (Isnaeni & Hildayah, 2020). Learning media can help achieve this by attracting attention, clarifying material, and making learning interactive and productive (Sumadyo, Prameswari, & Susanti, 2024).

The integration of technology in education can increase motivation and improve learning outcomes (Winatha & Setiawan, 2020). Interactive learning media is especially crucial for creating a pleasant learning atmosphere (Mustikawati, 2019). WordPress, an open-source platform built with PHP and MySQL (Aldiyansah & Sayuti, 2023), offers flexibility in delivering multimedia-rich and interactive content. Prior studies have shown that WordPress-based media can enhance student learning outcomes (Sunarti & Baiq, 2016). Meanwhile, Problem-Based Learning (PBL) emphasises learning through solving real-life problems, encouraging active participation, collaboration, and critical thinking (Kurniawan et al., 2023; Ati & Setiawan, 2020).

The novelty of this research lies in integrating PBL with a WordPress platform in mathematics learning for elementary students—a combination that remains underexplored. PBL provides an inquiry-based structure that promotes problem-solving and student engagement, while WordPress offers accessible, customizable, and interactive content delivery. Together, they create a unique model for improving both learning motivation and achievement in mathematics.

Based on this rationale, the study addresses the following research questions: (1) How does the integration of the WordPress platform affect the effectiveness of the PBL model in mathematics learning

for fifth-grade students? Moreover, (2) Which aspects of practicality are considered most significant by teachers when using PBL-based interactive learning media assisted by WordPress? The hypotheses formulated are: H1—The use of PBL-based interactive learning media assisted by WordPress significantly improves student learning outcomes in mathematics compared to pre-intervention performance; and H2—Teachers perceive PBL-based interactive learning media assisted by WordPress as highly practical, particularly in terms of ease of use, attractiveness, and support for achieving learning objectives.

Literature Review

Media is an essential tool in the learning process, and it has become a necessity for educators to deliver learning materials (Fadilah et al., 2023). According to Furoidah (2020), learning media are an essential component in the teaching and learning process. In addition, learning media is one way to motivate students and communicate with them more effectively. According to Anggraeni et al. (2021), interactive educational media combines various components (text, graphics, audio, and video/animation) and utilise computers/laptops to illustrate concepts through animations, sounds, and engaging demonstrations. Interactive multimedia educational media can result in effective learning.

The following are relevant studies that researchers have conducted.

Table 1

Relevant Research Studies

No.	Researcher Name, Year	Focus of development
1.	(Putri D. C. et al., 2024)	Learning Media Using the Problem-Based Learning Model in Grade 4
2.	(Fakhrudina,M.F.F. et al, 2024)	Problem-Based Learning Media for Electronics Components Material
3.	(Asyhari & Hidayat, 2023)	Doratoon PBL-Based Learning Media in Science Subjects in Grade IV Elementary School
4.	(Sari D. P. P. et al., 2021)	Interactive Learning Media Based on Problem-Based Learning and Snakes and Ladders Game
5	(Hidayat, 2021)	Motion Graphics E-Learning Content and WordPress Website for Civic Education Lessons in Elementary Schools.

Materials and Methods

This research aims to develop interactive learning media based on the Problem-Based Learning (PBL) model, assisted by WordPress, for the material of rectangles in fifth-grade elementary school. The development followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The focus of this paper is on the implementation and evaluation stages. The product trial was conducted in the fifth grade of SDN 6 Kalipare, Malang, involving 18 students as respondents. The data collected focused on two main aspects: the practicality and the effectiveness of the developed product. Practicality was measured using teacher and student response questionnaires, while effectiveness was assessed through learning outcomes. The teacher questionnaire covered six aspects, namely effectiveness, relevance, efficiency, usability, motivation, and design. The student questionnaire covered four aspects: appearance, content, instructional videos, and enthusiasm. The developed product was considered practical if each respondent gave a score of at least 3 for each aspect, and all aspects met the criteria specified in the practicality category presented in Table 2.

The first stage, Analysis, was carried out over one week and focused on identifying the needs of teachers and students in learning rectangular material. This stage involved classroom observations, interviews with the mathematics teacher, and analysis of the curriculum to ensure alignment with the competencies required for fifth-grade mathematics. The second stage, Design, lasted for two weeks and involved planning the media layout, selecting the features to be included in the WordPress platform, and preparing learning scenarios based on the PBL model. The third stage, Development, took place over four weeks, during which the researcher created the interactive media on the WordPress platform, integrated instructional videos, and embedded PBL-based tasks. This stage also involved testing the technical performance of the website on various devices to ensure accessibility and responsiveness. The Implementation stage was conducted in one week and involved using the media in a real classroom setting with the 18 students. This stage allowed the researcher to observe student engagement, monitor learning activities, and collect responses through questionnaires. The final stage, Evaluation, took place in one week and involved analysing questionnaire data, learning outcomes, and teacher feedback to determine the overall practicality and effectiveness of the media.

From a statistical standpoint, the sample size of 18 students was determined based on the total number of students in the fifth grade of SDN 6 Kalipare, applying a total sampling technique. While slight, this sample was appropriate for development research at a single school setting because it ensured that all available participants experiencing the same learning environment were included, thus minimising sampling bias. In addition, descriptive statistical analysis was used to interpret the data, which is suitable for small-scale experimental trials in educational technology development research.

Before data collection, the instruments used for practicality testing underwent an expert validation process. Three experts were involved: a mathematics education lecturer, a media learning technology lecturer, and an experienced elementary school teacher. They assessed the instruments for content validity, clarity of items, and relevance to the research objectives. Their feedback was used to refine the wording of items, adjust rating scales, and ensure that the questionnaires accurately measured the intended aspects. The final instruments were approved after two rounds of validation to achieve a high content validity index.

The research design employed a one-group pretest-posttest design to assess the effectiveness of the media following implementation. The schema consisted of an initial assessment (pretest), the application of the interactive PBL-based media via WordPress, and a final assessment (posttest). This design allowed the researcher to compare student performance before and after using the media, thus identifying any learning gains attributable to the intervention.

The WordPress platform was selected for its flexibility and accessibility in creating interactive learning media. The technical specifications included the use of WordPress version 6.3, a mobile-responsive education theme, and several plugins to enhance functionality. Key plugins included an interactive quiz builder, an embedded video player, and a custom form plugin for collecting student responses. The platform was hosted on a cloud-based server with SSL security, ensuring 99.9% uptime, and supported both desktop and mobile access. The media was optimised for low-bandwidth access to accommodate varying internet conditions in the school's environment.

Ethical considerations were strictly adhered to throughout the research process. Informed consent was obtained from the school principal, teachers, and parents of the students. Participation was voluntary, and students were assured that their responses and performance data would remain confidential and be used solely for research purposes. No personal identifying information was disclosed in the research report. Additionally, the interactive media content was designed to be age-appropriate, culturally sensitive, and aligned with the curriculum standards established by the Indonesian Ministry of Education.

A product meets practicality criteria if each respondent provides a positive response to the developed media, as measured by a score of at least 3 (three) for each aspect and all aspects of the questionnaire. The practicality category follows the criteria presented in Table 2.

Table 2

Product Practicality Criteria

Practicality Percentage (Pr)	Criteria
$80\% < Pr \leq 100\%$	Particularly effective
$60\% < Pr \leq 80\%$	Effective
$40\% < Pr \leq 60\%$	Effective Enough
$20\% < Pr \leq 40\%$	Less Effective
$0\% \leq Pr \leq 20\%$	Not Effective

Note: adapted of (Sarman et al., 2023)

A product is said to meet the effectiveness criteria if: (1) at least 75% of students obtain test scores above the Minimum Passing Grade Criteria, which is 70; (2) there is an increase in scores from pre-test to post-test for all students. Furthermore, the researcher used the N-Gain equation to measure the increase in student learning outcomes before and after being given treatment with learning media. Table 3 displays the N-Gain score categories.

Table 3

N-Gain Score Categories

N-Gain Score	Category
$g > 0,7$	Advanced
$0,3 \leq g \leq 0,7$	Intermediate
$g < 0,3$	Low

Results

A teacher response questionnaire and a student response questionnaire were utilised to measure the practicality of the developed interactive learning media. Table 4 presents the results of the teacher questionnaire, which assessed six aspects: effectiveness, relevance, efficiency, usability, motivation, and design.

Table 4

Results of Teacher Response Questionnaire

Aspect	Score	Score (%)
Effectiveness	3,75	93,75
Relevance	3,50	87,50
Efficiency	4,00	100
Usability	3,67	91,75
Motivation	4,00	100
Design	3,67	91,75
Average	3,77	94,25

Based on Table 4, the teacher's evaluation indicates a very positive response, placing the developed learning media within the "Very Practical" category.

Table 5

Student Response Questionnaire Results

Aspect	Score	Score (%)
Appearance	3,61	90,25
Content	3,52	88
Learning Videos	3,44	86
Enthusiasm	3,64	91
Average	3,55	88,75

The student responses (Table 5) also met the criteria for "Very Practical." Positive feedback highlighted the media's visual appeal, the clarity of its content, and the engaging nature of its instructional videos.

To measure effectiveness, a pre-test and post-test were administered to 18 fifth-grade students. The descriptive statistics are presented in Table 6.

Table 6

Statistics of Research Result Data

Statistics		Pretest	Posttest
N	Valid	18	18
	Missing	0	0
Mean		61.67	83.89
Std. Error of Mean		2.830	1.432
Median		60.00	80.00
Mode		70	80
Std. Deviation		12.005	6.077
Variance		144.118	36.928
Range		40	20
Minimum		40	70
Maximum		80	90
Sum		1110	1510

Table 7

Ranks of Research Results data

Ranks		N	Mean Rank	Sum of Ranks
Posttest - Pretest	Negative Ranks	0 ^a	.00	.00

	Positive Ranks	18 ^b	9.50	171.00
	Ties	0 ^c		
	Total	18		

a. Posttest < Pretest

b. Posttest > Pretest

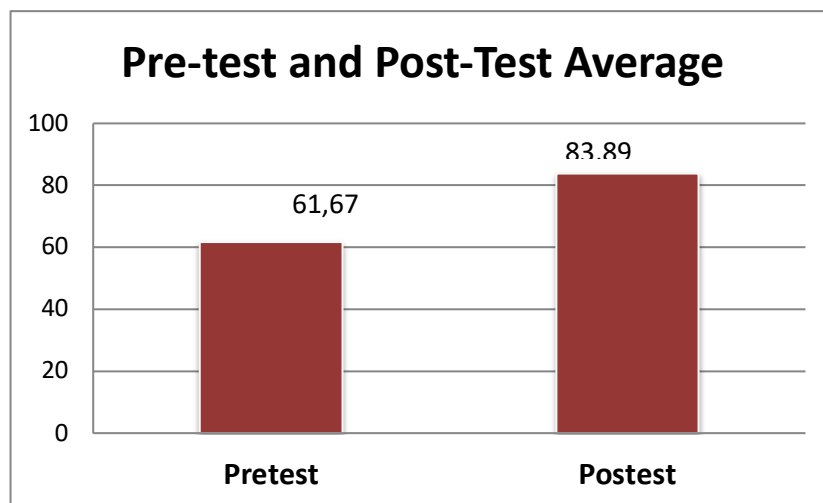
c. Posttest = Pretest

Based on Table 6 and Table 7, all students experienced an increase in scores from the pre-test to the post-test. Considering the fifth-grade mathematics passing grade at SDN 6 Kalipare, which is 70, all students' post-test scores were above the passing grade. It indicates that the developed product meets the criteria for "effectiveness."

Figure 1 shows the average results of the pre-test and post-test carried out by students. This figure will show a comparison of the results before and after students received treatment or used learning media. It will help measure the extent to which learning media influence student learning outcomes.

Figure 1

Average Pre-test and Post-test



Based on Figure 1, there was a very significant increase in student learning outcomes after being given treatment using learning media. The average pre-test score was 61.67 and increased to 83.89 in the post-test. That demonstrates that the use of learning media is effective in enhancing students' understanding of rectangular material and positively impacting their learning outcomes. Furthermore, the researcher used the N-Gain equation to measure the increase in student understanding before and after being given treatment with learning media. The N-Gain values from each student's pre-test and post-test are in Table 8. This data provides a more detailed picture of the individual increase in students' understanding of the material related to rectangles.

Table 8

N-GAIN SCORE

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
NGain	18	.33	.75	.5676	.13926

Valid N (listwise)	18				
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The average N-Gain score of 0.568 places the learning media in the “Medium” improvement category (Hake, 1998 classification).

Overall, the results demonstrate both high practicality (teacher and student evaluations) and effectiveness (significant score gains and medium N-Gain) for the developed WordPress-assisted PBL interactive learning media on the topic of rectangles.

Discussion

The findings of this study, showing high practicality (teacher response: 94.25%, student response: 88.75%) and clear gains from pre-test to post-test, are consistent with a substantial body of research on Problem-Based Learning (PBL) and interactive multimedia. Several empirical studies report similar benefits: Nisa et al. (2020) found improved collaborative skills in mathematics using PBL; Wulansari et al. (2025) reported enhanced conceptual understanding; Sunarti & Baiq R.A.S. (2016) documented learning gains with WordPress-based media; Wijayanti (2022) and Dwiqi et al. (2020) demonstrated that interactive media raise motivation and comprehension; Nurul Audie (2019) and Pratiwi & Meilani (2018) found interactive media effective in improving achievement; B. Lee et al. (2019) and Zhao et al. (2021) noted student preference and engagement advantages for multimedia electronic resources; and Nabila et al. (2021) described how interactive media support independent learning and enjoyment. Placing these local and regional findings alongside foundational literature strengthens the case: Hwang & Kim (2016) have long argued that PBL fosters deeper problem-solving skills and knowledge integration, while Richard E. Mayer’s cognitive theory of multimedia learning explains why well-designed multimedia reduces extraneous cognitive load and supports retention. In short, this study’s results align with both contemporary Indonesian studies and international theoretical frameworks, indicating that combining PBL with multimedia web platforms can be a pedagogically powerful approach.

Comparatively, this research aligns most closely with studies where (a) PBL is paired with digital multimedia (e.g., Sunarti & Baiq, 2016), (b) short, scaffolded PBL activities were used in primary mathematics (Nisa et al., 2020), and (c) student-centered web tools increased motivation (B. Lee et al., 2019; Wijayanti, 2022). Where it differs is scale and scope: many larger experimental studies include control groups, longer interventions, or broader content coverage (for example, multi-topic interventions reported by international PBL meta-analyses). This study presents a context-specific instance of elementary geometry (rectangles) delivered via WordPress, confirming the transferability of the PBL + multimedia synergy to an Indonesian primary classroom.

A critical appraisal of limitations is necessary. First, the sample ($n = 18$, single class) and single-group pretest-posttest design limit external validity and causal attribution; without a randomised control group, effects may partly reflect maturation, testing, or teacher effects. Second, the content scope was narrowly confined to rectangular material, so generalisation to other mathematics domains remains untested. Third, the intervention duration was short (a few sessions), so claims about sustained learning, retention, or transferability to complex problem-solving should be tempered. Fourth, contextual constraints, such as uneven internet access, device variety, and varying digital literacy among teachers and parents, could bias both participation and outcomes. Finally, instrument limitations (self-report response scales and potential social desirability) and the lack of qualitative triangulation (e.g., classroom video analysis or focus groups) limit the depth of process understanding. These limitations likely mean the measured effect sizes predominantly indicate short-term, within-class improvements rather than durable, broadly generalizable gains.

Theoretically, the results reinforce constructivist and social-constructivist perspectives: PBL encourages knowledge construction through authentic problem solving, while WordPress-mediated multimedia provides scaffolding that aligns with Mayer's cognitive theory. Multimedia cues and worked examples reduce extraneous load, freeing cognitive resources for germane processing. The combination therefore, supports cognitive and socio-motivational mechanisms: cognitive scaffolding (clear multimedia explanations and embedded tasks), social learning (group PBL collaboration), and affective engagement (an attractive interface and videos), which together explain improvements in both motivation and achievement. This suggests that hybrid pedagogical models, PBL for process and CMS/web platforms for content delivery, can be theoretically integrated into an "online-enhanced constructivism" framework for elementary STEM education.

For practitioners, concrete recommendations follow. First, integrate PBL sequences with WordPress pages that contain brief problem scenarios, guided inquiry prompts, short instructional videos, and downloadable worksheets; keep multimedia segments short (≤ 5 minutes) to reduce cognitive load. Second, provide teacher training focused on (a) orchestrating small-group PBL discussions, (b) managing WordPress content and basic troubleshooting, and (c) formative assessment practices that align with PBL (rubrics, peer evaluation). Third, prepare low-bandwidth versions (image/text fallbacks and local hosting or offline packages) and printable alternatives to preserve equity where connectivity is limited. Fourth, involve parents by sharing clear guides and short video demonstrations so home reinforcement is possible. Fifth, adopt simple analytics (page visits, quiz completion) to monitor usage and iterate content. Finally, scale gradually: pilot additional topics (e.g., area/perimeter, fractions) and run controlled quasi-experimental trials with matched comparison classes to build more substantial evidence.

Cultural and contextual considerations in Indonesia are crucial to the implementation and interpretation of policies. Indonesian classrooms often value teacher authority and whole-class instruction, so PBL requires careful facilitation and explicit modelling to shift norms toward student autonomy. Localising content — using culturally familiar contexts, examples from community life, and Bahasa Indonesia language prompts—enhances relevance and engagement. The Merdeka curriculum's emphasis on student competency and project work provides a supportive policy backdrop for PBL and WordPress integration. Still, disparities in school resources across regions (urban vs. rural) mean that implementation models must be flexible. Additionally, communal learning traditions can be leveraged; collaborative PBL activities align well with group-oriented cultural practices, but assessment systems will need to strike a balance between group and individual accountability. Finally, professional development must be tailored to teachers' varying digital literacy levels and workload constraints; incentivising participation (through certificates, recognition, or integration into school improvement plans) will improve adoption rates.

In summary, this study's results align with multiple Indonesian and international studies and theoretical perspectives, demonstrating that PBL paired with WordPress multimedia can improve motivation and learning in primary mathematics. However, the limitations of small sample, limited topic scope, short duration, and contextual constraints require cautious interpretation and call for larger, controlled, and longer-term studies. Practitioners should apply the approach thoughtfully, adapting content and technical delivery to local infrastructure and cultural norms while collecting formative data to refine practice.

Conclusions

The experimental results of interactive learning media based on problem-based learning assisted by WordPress indicate that the media meet the criteria of practicality, validity, and effectiveness. The practicality is supported by highly positive teacher responses, with an average percentage of 94.25%, and positive student responses, with an average percentage of 88.75%. Effectiveness is evidenced by the

improvement of all students' scores from pre-test to post-test, with all post-test results exceeding the passing grade. The scientific novelty of this study lies in integrating problem-based learning with WordPress as an interactive learning platform for mathematics, explicitly focusing on rectangular material, thereby bridging the gap between pedagogical strategies and digital learning tools. The study concludes that this media can serve as an alternative instructional resource to improve engagement and learning outcomes. However, limitations include the restricted scope of material, as the content is limited to rectangular concepts, and the lack of experimental analysis comparing control and experimental groups to measure broader effectiveness. These limitations may affect the generalizability of the results, making them applicable primarily to the specific topic and context. For practical implementation, teachers are recommended to integrate this media into classroom learning, especially in topics requiring visualisation and problem-solving.

Suggestions for Future Research

Future research should expand content coverage to other mathematical topics, employ experimental designs with control groups to provide more robust evidence, and explore integration with other digital platforms to enhance adaptability. Additionally, further investigation into long-term learning retention and the impact on higher-order thinking skills will strengthen the media's contribution to digital education innovation.

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Conflict of Interest

None.

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