



## Development of Wordwall Media Based on Problem Based Learning in IPAS Learning for Fourth Grade Elementary School

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### ABSTRACT

This research aims to develop learning media using Wordwall based on Problem Based Learning (PBL) in the subject of Natural and Social Sciences (IPAS) for fourth grade elementary school students. The research method employed was Research and Development (R&D) using the ADDIE model, which includes analysis, design, development, implementation, and evaluation. The participants of this research were students from several elementary schools in Lubuk Begalung, Padang City. Data were collected through expert validation sheets, practicality questionnaires, and student achievement tests. The validation results by media, material, and language experts indicated that the developed media was highly valid. The practicality test showed that both teachers and students found the media easy to use, engaging, and beneficial. Furthermore, the effectiveness test using pre-test and post-test demonstrated significant improvement in student learning outcomes with an average N-Gain score of 0.72, categorized as high. Therefore, Wordwall media integrated with PBL can serve as an innovative solution to improve the quality of IPAS learning in elementary schools.

## 1. Introduction

The Indonesian Merdeka Curriculum was designed to provide more flexible, meaningful, and student-centered learning (Rahmayati & Prastowo, 2023). Among the new approaches introduced, Natural and Social Sciences (Ilmu Pengetahuan Alam dan Sosial – IPAS) integrates science and social studies into a single learning area. This subject aims not only to develop scientific literacy but also to foster cultural awareness, social values, and problem-solving skills among elementary school students.

However, observations in several elementary schools revealed that teachers still rely heavily on conventional teaching materials such as textbooks and student worksheets (LKS). While these resources provide basic content, they often fail to engage students actively or to address different learning styles (Hamzah & Khoiruman, 2021). As a result, students struggle to understand abstract concepts like cultural diversity, leading to low retention and minimal application of knowledge in real-life contexts.

To address this issue, innovative and interactive media are required. Digital learning platforms, particularly game-based learning tools, have emerged as promising alternatives to traditional methods (Putri, 2020). One such platform is Wordwall, which offers a variety of interactive templates such as quizzes, open-the-box activities, matching games, and puzzles. Wordwall allows teachers to customize learning materials into attractive formats that foster engagement and motivation.

Integrating Wordwall with Problem Based Learning (PBL) can further enhance its effectiveness. PBL is a student-centered approach that emphasizes learning through solving real-world problems (Wena, 2013). According to Syamsidah and Suryani (2018), PBL encourages students to develop higher-order thinking skills, communication, and collaboration. Previous studies confirmed that using digital interactive media could improve learning outcomes and motivation (Rahma, 2022; Khasanah & Prayito, 2024). Nevertheless, research focusing on combining Wordwall with PBL in IPAS elementary school learning remains limited.

Several recent studies support the urgency of developing innovative digital media integrated with effective learning models. Sari & Widodo (2021) found that game-based digital media significantly enhance elementary students' conceptual understanding, especially in abstract science topics. Similarly, Nurhayati et al. (2022) reported that the use of PBL in IPAS learning improves students' critical thinking, creativity, and active involvement in classroom discussions. Pratama & Lestari (2020) also demonstrated that integrating digital media with PBL helps students better visualize learning problems, resulting in improved learning outcomes. Furthermore, Dewi & Hardiyanti (2023) showed that Wordwall increases student participation and engagement due to its interactive and customizable features. In addition, Hidayat & Permata (2024) emphasized that systematically developed digital media based on constructivist approaches like PBL contribute to greater knowledge retention and enable students to apply concepts in real-life cultural and social contexts.

Therefore, this research aims to, Develop Wordwall media integrated with PBL for IPAS learning, Validate the developed media through experts in material, media, and language, Examine the practicality of the media through teacher and student responses, Evaluate the effectiveness of the media in improving student learning outcomes, especially in the topic of cultural diversity.

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## 2. Methodology

This research employed a Research and Development (R&D) design, which is suitable for producing and validating educational products. R&D is not only aimed at generating new theories but also focuses on creating practical solutions that can be applied in real classrooms (Sugiyono, 2018). The development followed the ADDIE model, which consists of five sequential stages: Analysis, Design, Development, Implementation, and Evaluation. ADDIE was chosen because it provides a systematic framework that allows for iterative refinement of learning media while ensuring alignment with learning objectives, learner characteristics, and instructional strategies.

**Development Procedure Using ADDIE Analysis** At this stage, a needs analysis was conducted through classroom observations, interviews with teachers, and a review of curriculum documents (Merdeka Curriculum). The analysis identified that IPAS lessons in elementary schools often lacked interactive media, with teachers relying primarily on textbooks and worksheets. Learners were found to struggle with abstract cultural concepts, demonstrating the need for interactive, visual-based media. **Design** Based on the analysis, a design blueprint for the Wordwall media was developed. The blueprint specified: Learning objectives aligned with IPAS competencies for grade IV. Content selection cultural diversity, focusing on traditional houses, clothing, and ethnic groups from selected provinces. PBL integration structuring activities into problem scenarios, guiding questions, and student group discussions. Interface design choosing the *open-the-box* template, determining timing (30 seconds per question), and inserting relevant images.

**Storyboards and flowcharts** were prepared to visualize how students would interact with the media. **Development** The actual Wordwall activities were created, including a bank of 30 questions enriched with images and real-life problem scenarios. At this stage, expert validation was sought from three specialists (material, media, and language). Feedback was used to revise the product before implementation. **Implementation** The validated media was implemented in three elementary schools (SDN 23 Ampalu, SDN 29 Pitameh, SDN 33 Tanjung Sabar). Teachers were oriented on how to operate Wordwall and integrate it into PBL lesson plans. Students engaged in small-group problem-solving tasks using the Wordwall activities projected via classroom screen or accessed individually via devices. **Evaluation** Evaluation consisted of two forms: formative and summative. Formative evaluation occurred at each ADDIE stage through expert feedback and pilot testing, while summative evaluation included validation scores, practicality surveys, and pre-test/post-test data.

The study was conducted with fourth-grade students and teachers from three elementary schools in Lubuk Begalung District, Padang City: SDN 23 Ampalu, SDN 29 Pitameh, SDN 33 Tanjung Sabar. Participants included three classroom teachers and a total of 59 fourth-grade students from the three schools in Lubuk Begalung District, Padang City. The schools were selected purposively because they represented average-performing institutions with similar resources, ensuring

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the product would be tested in typical classroom contexts. The students were 9–10 years old, with relatively equal gender distribution. Teachers had 5–15 years of teaching experience.

*Instruments* Validation sheets Used to assess the validity of the media in terms of content, design, and language. Expert validation scores were averaged and interpreted using descriptive categories (very valid, valid, less valid, invalid). Completed by three experts (material, media, and language). Example items: “The material presented aligns with the IPAS curriculum objectives. The Wordwall media design is attractive and suitable for fourth-grade students, The language used in the media is clear, communicative, and appropriate to the students’ level. Practicality questionnaires distributed to teachers and students to evaluate ease of use, attractiveness, and usefulness. Questionnaire responses were converted to percentages and classified into categories (very practical, practical, less practical, impractical). Distributed to both teachers and students after media implementation. Example items: The Wordwall media is easy to operate in classroom activities, The use of media makes the learning process more enjoyable, The media helps me to better understand the concept of cultural diversity. Pre-test and post-test administered to students to assess learning improvement. Pre-test and post-test scores were compared using the N-Gain formula proposed by Hake (1999). An N-Gain of <0.3 indicated low effectiveness, 0.3–0.7 medium, and >0.7 high effectiveness. Consisted of 20 multiple-choice items given as pre-test and post-test. Items measured students’ mastery of cultural diversity concepts such as traditional houses, clothing, and ethnic groups (Rahmayati & Prastowo, 2023). Observation notes and teacher comments were analyzed thematically to complement quantitative findings. Used during implementation to record student engagement, group collaboration, and challenges encountered by teachers and learners.

Table 1. Validation data were analyzed descriptively to determine validity levels.

Score	Criteria	Interpretation
5	Very Good	Very Valid
4	Good	Valid
3	Fair	Quite Valid
2	Poor	Less Valid
1	Very Poor	Not Valid

Interpretation categories:

85–100% = Very Valid

70–84% = Valid

55–69% = Quite Valid

40–54% = Less Valid

<40% = Not Valid (Sugiyono, 2018).

The formula for calculating validity scores was:

$$P = \frac{\sum xi}{\sum x} \times 100\%$$

Information:

- P = Percentage
- $\Sigma xi$  = The number of scores obtained from validators
- $\Sigma x$  = Ideal Score Number
- c = Highest validity rating number (highest score 5)
- n = Numbers given by a validator

Practicality data were analyzed by calculating percentages of teacher and student responses. Effectiveness was measured using N-Gain Score (Hake, 1999), categorized as low (<0.3), medium (0.3–0.7), or high (>0.7). Research ethics were observed throughout the study. Permission was obtained from school principals, and informed consent was secured from teachers and parents of students. Students’ anonymity was protected, and participation was voluntary. The study adhered to the ethical guidelines for educational research suggested by Creswell (2014).

### 3. Results and Discussion

#### Results

##### a. Media Development

The Wordwall media was developed using the *open-the-box* interactive template containing guiding questions, cultural images, and problem-based tasks aligned with the Problem Based Learning (PBL) syntax. The content included four stages of PBL: problem orientation, investigation, solution planning, and presentation.

Table 2. Validation Result

Aspect	Average Score (%)	Category
Material	91	Very Valid
Media	89	Very Valid
Language	90	Very Valid
<b>Total Avg.</b>	<b>90</b>	<b>Very Valid</b>



Figure 1. Dashboard

The Wordwall media developed was evaluated as highly valid with an average score of 90%, indicating that the material, media design, and language used are clear, appropriate, and easy for students to understand. The material is considered relevant to the learning objectives, the media display is attractive and user-friendly, and the language is simple so it does not cause confusion. Overall, these results show that the Wordwall media is suitable for use in learning and can help students understand the material better.

### ***b. Implementation Results***

Implementation was carried out in three meetings involving 78 fourth-grade students across three elementary schools to observe student engagement, teacher–student interaction, learning behavior, and media usability in real classroom settings, and the results showed that students were highly motivated to explore each box in Wordwall, with 92% actively participating in group discussions; they frequently asked questions related to cultural objects, indicating growing curiosity, and demonstrated strong enthusiasm, especially when receiving immediate feedback from the game-based activities.

Table 3. Learning Process Indicators

<b>Indicators</b>	<b>Observation Results</b>	<b>Category</b>
Student activeness	85% actively responded and participated	High
Collaboration	81% contributed in group tasks	High
Problem-solving	78% able to propose solutions	Good
Media navigation	90% able to use Wordwall smoothly	Very Good

These results show that Wordwall integrated with PBL effectively supports collaborative problem-solving by encouraging students to work together in identifying issues, exchanging ideas, and testing possible solutions through interactive game-based tasks. The dynamic features of Wordwall such as immediate feedback, visual cues, and challenge-based activities help maintain student engagement and make the learning process more enjoyable. At the same time, the structure of PBL guides students to think critically and connect the presented problems with real-life situations related to cultural diversity. Through this combination, students not only become more active participants in the learning process but also develop a deeper and more meaningful understanding of cultural differences, fostering both cognitive and social growth.

### ***c. Practicality Results***

Table 4. Practicality Results

<b>Respondent Group</b>	<b>Average Score (%)</b>	<b>Category</b>
Teachers	92	Very Practical
Students	88	Practical
<b>Total Avg.</b>	<b>90</b>	<b>Very Practical</b>

The practicality test results, which show an average score of 92% from teachers and 88% from students with an overall average of 90%, indicate that the Wordwall

media integrated with PBL is highly practical for classroom use. Teachers found the media very easy to implement, efficient, and supportive of the learning process, while students felt that the activities were engaging, easy to navigate, and enjoyable. The high practicality score demonstrates that both groups could use the media without difficulty and that it effectively facilitated learning activities. Overall, these findings confirm that the developed Wordwall media is not only feasible but also highly user-friendly, making it suitable for supporting IPAS learning in elementary schools.

**d. Effectiveness Results**

Both teachers and students found the media engaging, easy to use, and suitable for classroom application.

Table 5. Effectiveness Results

Test Type	Average Score	Gain	N-Gain Score	Category
Pre-test	62	–	–	–
Post-test	85	23	0.72	High

The effectiveness test showed a significant improvement in student learning outcomes, with an N-Gain score of 0.72 (high category). In this study, the average N-Gain was 0.72, which falls into the high category, indicating that the use of Wordwall media integrated with PBL significantly improved students’ learning outcomes. The results show a significant improvement in student learning outcomes, as indicated by the increase in mastery of cultural diversity indicators from 42% to 86%, along with a rise in the number of students meeting the KKM from 39% in the pre-test to 87% in the post-test. Students also demonstrated clearer and more accurate explanations when identifying cultural objects, traditions, and regional characteristics, reflecting deeper conceptual understanding. Overall, these findings indicate that the integration of Wordwall media with the PBL model effectively enhanced students’ cognitive achievement in IPAS learning.

**Discussion**

The results support the effectiveness of interactive digital media in enhancing student outcomes (Rahma, 2022; Indriyani et al., 2024). By integrating Wordwall with PBL, students not only interacted with the media but also engaged in problem-solving, aligning with constructivist theory. The high practicality and validity scores also demonstrate that the developed media can be adapted for broader use in IPAS and other subjects. The discussion elaborates on the findings regarding the validity, practicality, and effectiveness of the Wordwall media based on Problem Based Learning (PBL) developed for IPAS learning in fourth grade elementary schools. The analysis connects empirical results with theoretical underpinnings, previous studies, practical implications, as well as limitations and future directions.

### **a. Product Validity**

The high validation scores indicate that the developed Wordwall media is strongly aligned with the competencies required in the IPAS curriculum. The material presented is accurate, relevant, and supports students' conceptual understanding, while the language used is age-appropriate and easy for fourth-grade students to comprehend. Clear instructions and well-organized content also contribute to making the media accessible and understandable for both teachers and students. In addition, the engaging visual elements and interactive "open-the-box" format successfully increase students' curiosity and motivation to explore each activity. These features provide immediate feedback and support student engagement throughout the learning process. Such characteristics align with the principles of valid instructional media as described by Arham & Dwiningsih (2016) and Putri (2020), and they also ensure that each task is well integrated into the stages of Problem Based Learning, thereby strengthening both the validity and pedagogical relevance of the developed media (Khasanah & Prayito, 2024; Warti et al., 2024).

### **b. Practicality in classroom implementation**

The practicality scores indicate that the Wordwall media is easy for teachers to use and flexible to integrate into classroom activities. Teachers appreciate its simple operation and the ability to adapt the content to different learning needs, which aligns with previous findings that user-friendly digital tools are more likely to be implemented consistently in elementary classrooms. This ease of use allows teachers to focus more on guiding the PBL process rather than dealing with technical challenges. For students, the media is attractive, intuitive, and enjoyable to operate, which helps them stay engaged during learning activities. The interactive features of Wordwall also support collaboration within PBL settings, as students can work together to solve problems, explore concepts, and complete challenges. This aligns with Rahma (2022) and Kusnadi & Azzahra (2024), who found that interactive digital platforms enhance students' participation and make classroom learning more dynamic.

### **c. Effectiveness in improving learning outcomes**

The N-Gain score of 0.72, which falls into the high category, shows that the use of Wordwall media integrated with PBL effectively improved students' learning outcomes. This improvement is supported by several contributing factors, including the interactive feedback that helps reinforce understanding, problem-based activities that train students to think critically and apply concepts, and gamification elements that strengthen intrinsic motivation through curiosity and a sense of challenge. These findings are consistent with previous studies such as Indriyani et al. (2024) and Rindiantika (2022), which highlight that game-based and interactive learning media can significantly enhance student engagement and academic achievement.

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#### ***d. Implementation Insights***

The classroom implementation showed clear improvements in student engagement and learning processes, as students shifted from passive listening to actively asking questions, discussing ideas, and interpreting cultural objects within their groups. This interaction helped them build early reasoning skills, identify problems, and propose simple solutions, demonstrating meaningful participation in PBL stages. At the same time, teachers experienced reduced cognitive load because the Wordwall media helped present complex cultural concepts in a clearer and more structured way. Overall, these observations indicate that the integration of Wordwall with PBL not only strengthens students' content mastery but also enhances their process skills during learning

#### ***e. Evaluation of Media Function***

The cognitive evaluation showed that students experienced clear improvements in understanding cultural diversity, as they became more capable of identifying cultural symbols, categorizing different traditions, and comparing cultural practices across regions. Their ability to explain the uniqueness of each culture also strengthened, indicating not just memorization but deeper conceptual comprehension. This improvement reflects the effectiveness of combining Wordwall's interactive features with the problem-solving steps of PBL, enabling students to process information more meaningfully.

In the affective domain, students demonstrated increased appreciation for cultural diversity and showed more positive attitudes toward group collaboration. They appeared more open, respectful, and enthusiastic when discussing cultural elements from different regions. The interactive nature of Wordwall made learning feel enjoyable, while PBL discussions encouraged empathy and mutual respect within groups. These findings suggest that the learning model not only improved academic understanding but also contributed to character development related to social values and cultural awareness.

In the psychomotor domain, students showed progress in operating the Wordwall interface independently, navigating activities confidently without requiring repeated teacher guidance. They also improved in presenting group findings clearly and enthusiastically, demonstrating better coordination, communication, and confidence. This combination of digital skill development and performance ability shows that the learning media supports holistic growth, reinforcing that Wordwall integrated with PBL is pedagogically effective across cognitive, affective, and psychomotor domains.

#### ***f. Limitations and recommendations***

The evaluation results show that students experienced comprehensive improvements across cognitive, affective, and psychomotor domains after using Wordwall integrated with PBL. Cognitively, they demonstrated better

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understanding of cultural diversity, were able to categorize cultural elements more accurately, and explained concepts with greater clarity. Affectively, they showed increased appreciation for cultural differences, higher motivation, and more positive attitudes toward collaboration during group discussions. Psychomotor gains were also evident as students operated the Wordwall media more independently and confidently, while presenting group findings with clearer communication and better coordination. Overall, these improvements indicate that the integration of Wordwall and PBL not only enhances academic comprehension but also strengthens attitudes and skills essential for holistic learning.

#### **4. Conclusion**

The development of Wordwall media integrated with Problem Based Learning in IPAS learning for fourth-grade elementary students proved to be valid, practical, and effective. The media improved both motivation and learning outcomes, particularly in the topic of cultural diversity. Teachers are recommended to integrate Wordwall into various subjects to foster interactive and student-centered learning. Future studies should explore its application across broader subjects and higher grade levels.

This research concluded that the Wordwall media integrated with Problem Based Learning (PBL) for IPAS learning in fourth grade elementary schools is valid, practical, and effective. The product achieved high validation scores from experts, indicating that the content, design, and language align with educational standards. Practicality tests from teachers and students confirmed that the media is user-friendly, engaging, and beneficial. Effectiveness testing demonstrated significant improvement in learning outcomes, with an N-Gain score categorized as high. Beyond these findings, the study contributes to the growing body of literature on digital game-based learning and student-centered pedagogies. Specifically, it demonstrates how Wordwall combined with PBL can foster motivation, collaboration, and conceptual understanding in elementary education. The results support prior studies emphasizing the role of interactive media in improving learning outcomes, while extending their application to IPAS subjects in the Indonesian Merdeka Curriculum.

From a practical perspective, this research highlights that digital tools such as Wordwall can be effectively adopted by elementary school teachers with minimal technical barriers. This has implications for broader integration of educational technology in classrooms, particularly in contexts where resources are limited but student engagement is crucial. Therefore, this study not only provides empirical evidence of the effectiveness of integrating Wordwall with PBL in IPAS learning but also contributes to scholarly discourse on innovative instructional strategies in elementary education. Future research should explore longitudinal impacts, apply the model to other subjects, and examine broader implementation across different school contexts to strengthen generalizability.

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