

## Enhancing Collaboration and Learning Through a Problem-Based Game in Lower Secondary Social Studies

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### ABSTRACT

*This study was motivated by the low collaboration skills and learning outcomes in social studies subjects, which are attributed to monotonous learning methods and the underutilization of digital learning media. The research aims to analyze the effectiveness of the "Journey to Merdeka" educational game integrated with the Problem-Based Learning (PBL) model in enhancing students' collaboration skills and learning outcomes. Employing a mixed-method research and development (R&D) approach, this study involved 8th-grade students from three junior high schools in Brebes Regency. Key stages included product design, validation, testing, and analysis using statistical techniques such as Wilcoxon and N-gain tests. Findings show a significant increase in collaboration skills—students categorized as "very good" rose from 10.81% to 97.30%—and improved learning outcomes, with an N-gain score of 0.6213 (moderate effectiveness). The results confirm that the educational game is valid and well-received, and effective in supporting active learning, problem-solving, and collaborative engagement in social studies.*

### Keywords:

Educational Game; Problem Based Learning; Collaboration Skills; Learning Outcomes; Social Studies Learning.

### ABSTRAK

*Penelitian ini dilatarbelakangi oleh rendahnya keterampilan kolaborasi dan hasil belajar peserta didik dalam mata pelajaran ilmu pengetahuan sosial, yang disebabkan oleh metode pembelajaran yang monoton dan kurangnya pemanfaatan media pembelajaran digital. Penelitian ini bertujuan untuk*

*menganalisis efektivitas game edukasi "Journey to Merdeka" yang diintegrasikan dengan model Problem Based Learning (PBL) dalam meningkatkan keterampilan kolaborasi dan hasil belajar peserta didik. Dengan pendekatan penelitian dan pengembangan (R&D) metode campuran, subjek penelitian adalah siswa kelas VIII di tiga SMP di Kabupaten Brebes. Tahapan penting meliputi desain produk, validasi, uji coba, dan analisis data menggunakan teknik statistik seperti uji Wilcoxon dan N-gain. Hasil penelitian menunjukkan peningkatan signifikan dalam keterampilan kolaborasi—kategori "sangat baik" meningkat dari 10,81% menjadi 97,30%—serta peningkatan hasil belajar dengan skor N-gain sebesar 0,6213 (efektivitas sedang). Temuan ini menunjukkan bahwa game edukasi ini valid, mendapat respon sangat positif, dan efektif dalam mendukung pembelajaran aktif, pemecahan masalah, serta keterlibatan kolaboratif dalam pembelajaran ilmu pengetahuan sosial.*

**Kata kunci:**

Permainan Edukasi; Pembelajaran Berbasis Masalah; Keterampilan Kolaborasi; Hasil Belajar; Pembelajaran Ilmu Sosial.

## 1. Introduction

Education is an effort to improve the competence and skills of students in line with the demands of the 21st century (Hidayatullah et al., 2020; Jannah et al., 2021; Xu et al., 2023). Active students can be encouraged to achieve social studies learning objectives through the use of innovative media. Therefore, teachers are expected to be able to design and utilize innovative learning media, particularly in understanding a concept, so that they can solve problems (Lestari et al., 2020; Putri & Miharja, 2023; Tunjung & Purnomo, 2020).

The actual conditions related to social studies learning activities among eighth-grade students at JHS 2 Brebes can be seen from their difficulty in understanding the material, such as connecting social studies concepts to everyday life. They prefer to memorise and are reluctant to think critically when faced with a problem. Lecture-based, teacher-centred methods are dominant, as well as the selection of learning models that do not yet focus on fostering interaction among students, limited media, and the use of conventional tools such as blackboards and simple PowerPoint presentations, which make learning activities monotonous, uninteresting, and boring for students (Kusumadewi & Sriyanto, 2022). The teaching strategy using limited media employed by social studies teachers at JHS 2 Brebes resulted in low enthusiasm and activity in participating in learning activities (Herlina & Saputra, 2022). The low enthusiasm of students when participating in social studies lessons, passive attitudes in class discussions, and the fact that most of them are unable to communicate and exchange opinions actively have resulted in low learning outcomes. This can be seen from the average score of the Mid-Semester Summative Assessment, which is 73.39, indicating that it has not yet reached the minimum passing score of 75.00. These conditions prompted the researchers to explore digital-based instructional strategies that are not only relevant to students' interests but also capable of enhancing essential skills such as collaboration and learning performance.

This topic was chosen because the integration of educational games and problem-based learning has shown strong potential in transforming passive classrooms into active, collaborative environments. The focus on collaboration is essential in preparing students to solve real-life problems and to work effectively in teams, skills that are increasingly valued in the 21st-century workforce (Prasad & O'Malley, 2022). Collaboration skills will train students to find solutions to problems they are facing, through problem-solving with their group (Oktaviani, 2022). Problem-based Learning is a problem-solving approach that emphasizes innovative learning and provides an active learning environment for students in a real-world context (Ghani et al., 2021; Hawamdeh & Adamu, 2021). Teachers can make learning activities more enjoyable and achieve the expected learning objectives, which will encourage students to increase their involvement in solving real-life problems (Safitri et al., 2023).

The solution to social studies learning problems at JHS 2 Brebes can also be found through creativity and innovation in digital learning by selecting the right media that aligns with current demands (Slamet & Sriyanto, 2022). Interactive learning media, which use multimedia as a basis for play and incorporate learning materials into the game, will encourage students to be more active in learning without feeling bored, and is expected to increase their enthusiasm for participating in learning activities (Almulla, 2020; Ardianti et al., 2021; Novita, et al., 2020). One of the media developed is an Android-based educational game called "Journey to Merdeka".

Based on previous research conducted by Novita et al. (2020), it was found that integrating digital games with PBL models can improve both learning outcomes and collaboration skills (Lu, 2023; Lubis et al., 2022). However, most of these studies were conducted in schools located in urban areas with better facilities and resources. JHS 2 Brebes was specifically chosen as the research location because it represents a typical public junior high school in a non-metropolitan area, where limited instructional media and conventional teaching styles are still dominant. Therefore, testing digital PBL-integrated learning innovations in this setting offers insight into broader applicability and potential scalability (Hendarwati et al., 2021; Zhang & Yu, 2021).

Based on previous research, the author attempted to develop an Android-based educational game called Journey to Merdeka and implement it in social studies learning to address the problems faced by the author, namely efforts to improve students' collaboration skills and learning outcomes, which had not been done in previous research activities at JHS 2 Brebes. The purpose of this study is to develop and implement the educational game "Journey to Merdeka" integrated with the Problem-Based Learning model, and to examine its effect on improving students' collaboration skills and learning outcomes in social studies at JHS 2 Brebes.

## 2. Methods

### 2.1 Research Design

This study employed a Research and Development (R&D) design aimed at producing a valid, practical, and effective educational product in the form of an Android-based game, Journey to Merdeka, integrated with the problem-based learning (PBL) model. The R&D approach enabled

iterative development and refinement of the media through expert validation, field testing, and effectiveness evaluation. The research incorporated both quantitative and qualitative methods, following Sugiyono's (Sugiyono, 2021) ten-stage development procedure: identifying potential and problems, data collection, product design, expert validation, revision, limited testing, further revision, effectiveness testing, final revision, and dissemination.

## *2.2 Population and Sample*

The research was conducted during the 2024/2025 academic year in three public junior high schools in Brebes Regency: Junior High School (JHS) 2 Brebes, JHS 2 Songgom, and JHS 1 Tanjung. From each school, four classes were selected—two experimental and two control classes—resulting in a total of 12 eighth-grade classes. The experimental classes used the Journey to Merdeka game integrated with the PBL model, while the control classes followed conventional instructional methods.

## *2.3 Data Collection and Measurement*

Data collection was carried out using multiple techniques, including observation, questionnaires, tests, and documentation. During the development phase, product validation was conducted by media and material experts using scoring instruments to assess the feasibility and quality of the educational game. Student responses to the game were measured using a four-point Likert scale ranging from “disagree” to “strongly agree.” These responses were interpreted based on percentage intervals, where <50% was categorized as not positive, 50–69% as less positive, 70–84% as positive, and ≥85% as very positive. To evaluate collaboration skills, researchers employed observation sheets that used a 1–4 scale corresponding to “poor,” “adequate,” “good,” and “very good,” with percentage interpretations ranging from <55 (poor) to 86–100 (very good), following the criteria of Sugiyono (Sugiyono, 2021). Learning outcomes were assessed using pre-tests and post-tests that were aligned with the cognitive indicators of the curriculum, allowing for comparison between the experimental and control groups.

## *2.4 Data Analysis*

Quantitative data were analyzed using SPSS Version 26. Instrument validity was tested using the Pearson product–moment correlation method, where an item was considered valid if the calculated r-value exceeded the critical r-value at a 5% significance level (Utami, 2023). Reliability testing employed the Cronbach's Alpha method, with instruments deemed reliable if  $\alpha$  exceeded 0.6. Data normality was examined using the Kolmogorov–Smirnov test, particularly suitable for large samples. A significance value greater than 0.05 indicated a normal distribution (Sugiyono, 2021). For data that did not meet normality assumptions, the Wilcoxon signed-rank test was used to compare pre-test and post-test results (Sari et al., 2021). To determine the effectiveness of the educational game, the N-gain test was conducted. The results were categorized based on gain values, with  $g \geq$

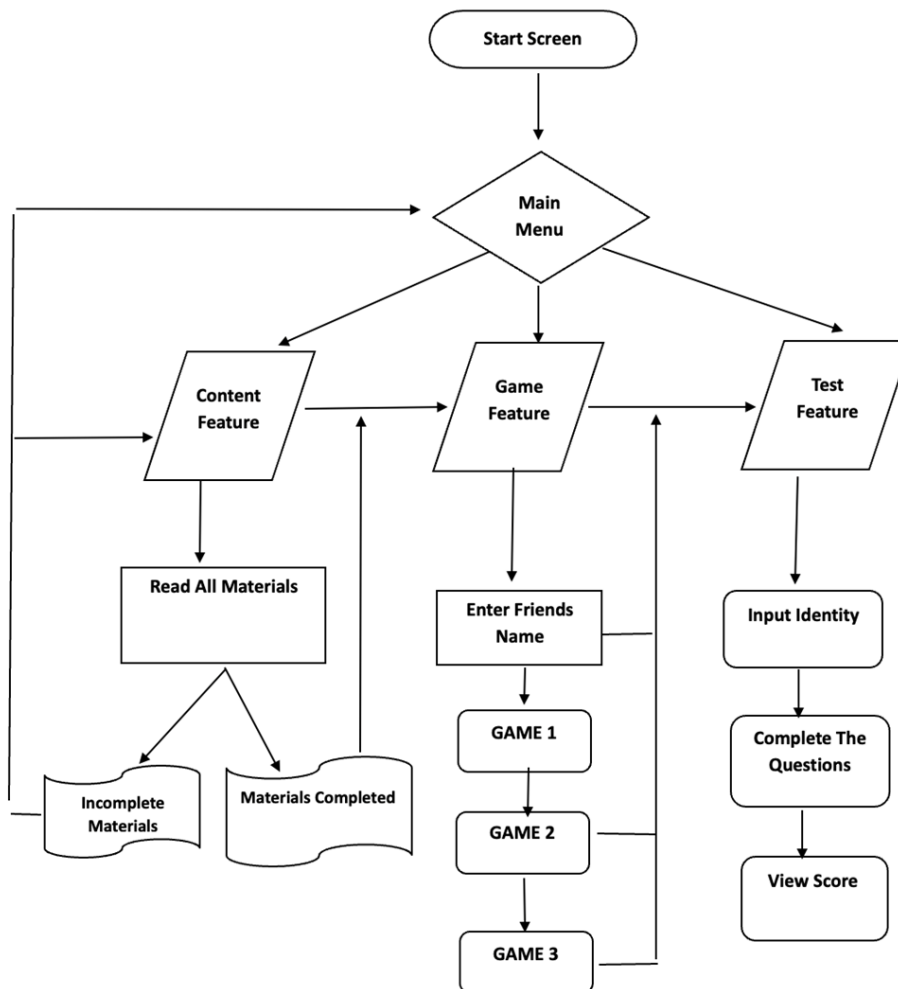
0.7 considered high,  $0.3 < g \leq 0.7$  moderate, and  $g \leq 0.3$  low. Effectiveness levels were further interpreted as follows:  $<40$  (ineffective), 40–55 (less effective), 56–75 (moderately effective), and  $>76$  (effective) (Rahmi et al., 2021).

**3. Results and Discussion**

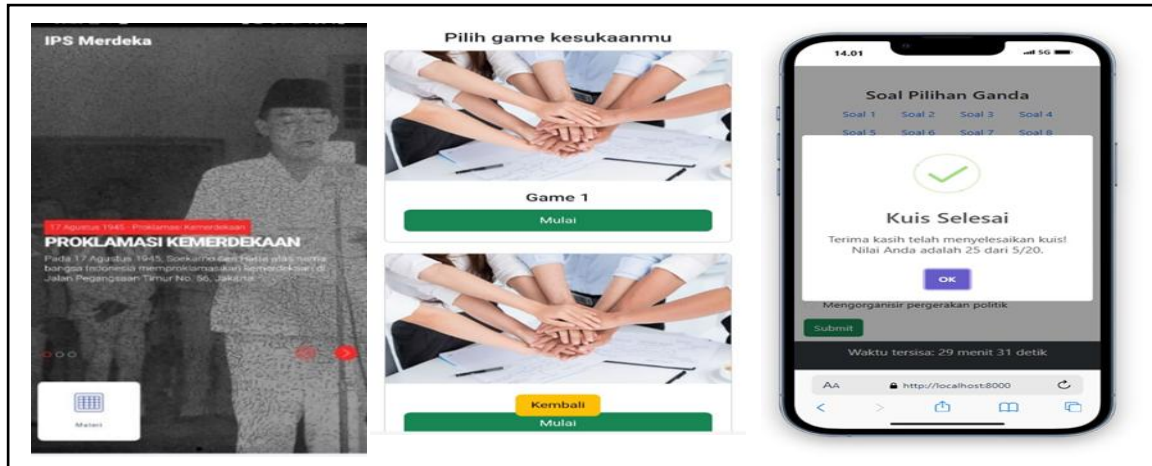
*3.1 The Design Stage of Developing the Educational Game “Journey to Merdeka”*

Based on discussions with subject teachers and classroom observations, it was found that the use of Android-based media in social studies learning activities was not optimal. This was despite the available facilities at JHS 2 Brebes, such as laptops, LCD projectors, and Android smartphones. These devices were underutilized, particularly in engaging students actively in social studies. Data from interviews with 58 eighth-grade students supported this conclusion.

As a response to this need, the researcher designed a prototype of an educational game named “Journey to Merdeka”. The initial design process is illustrated in Picture 1, which presents the flowchart of the application development process. The game features, including animated historical narratives, interactive quizzes, and game-based tasks, are illustrated in Picture 2.



**Picture 1.** Flowchart Design for the Journey to Merdeka Game Application

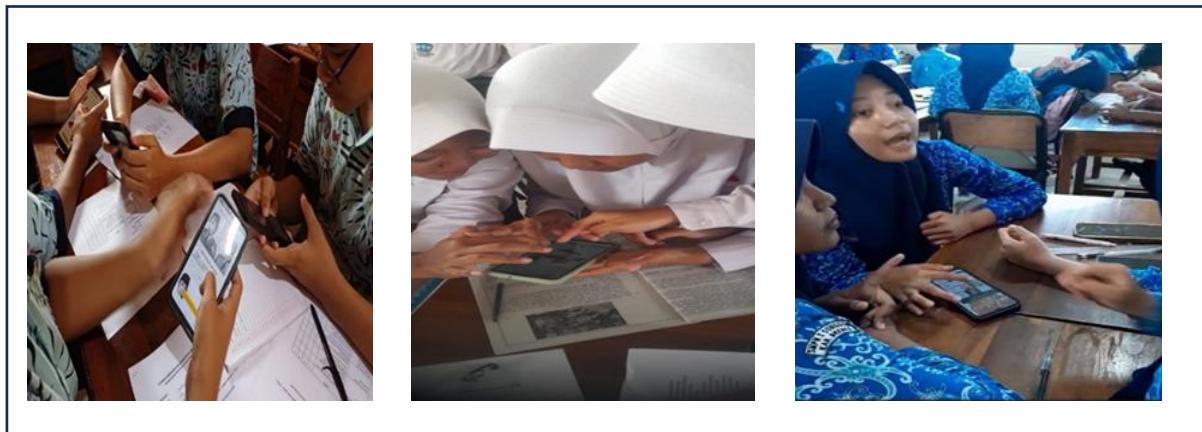


Picture 2. Features of the Educational Game Journey to Merdeka

During the design validation stage, two material experts provided scores of 96.25 and 95.00, respectively, both categorized as "Valid" and "No Revision." The average score was 97.50. Two media experts gave scores of 95.00 and 93.75, also indicating validity. However, suggestions included strengthening the historiographic narrative and adding engaging multimedia content. These inputs guided the design revision stage.

3.2 Product Testing and Integration with the Problem-Based Learning Model

The product testing phase involved teachers and students from JHS 2 Brebes, who accessed the game via a downloadable WhatsApp link. Testing in two experimental classes per school evaluated the ease of use, learning experience, interface, and impact on student collaboration and engagement. The trial usage scenario is depicted in Picture 3.



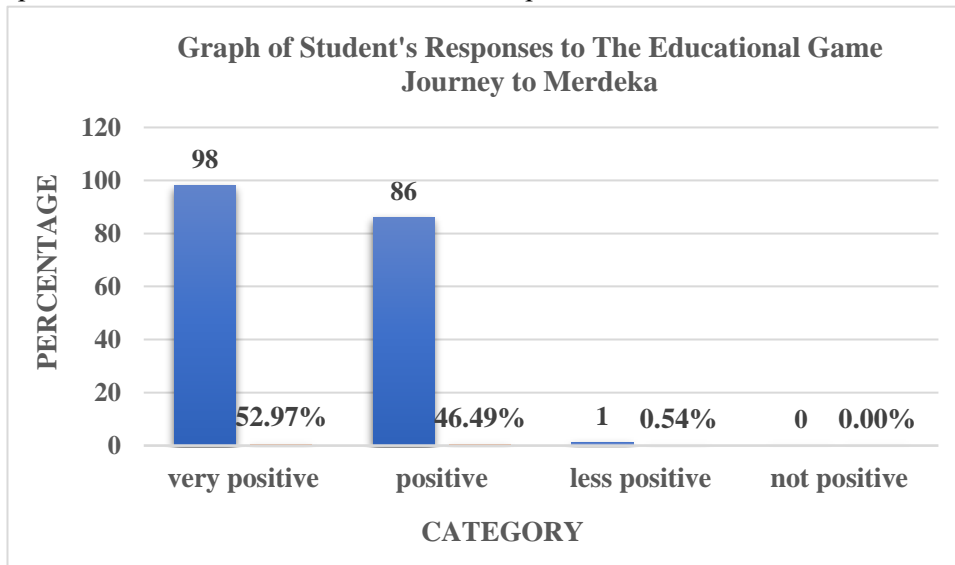
Picture 3. Trial Use with Students

Table 1. Results of Student Response Validity Test

T O T	Pearson Correlati on	.48 7**	.53 1**	.50 7**	.59 6**	.59 2**	.53 9**	.53 1**	.61 8**	.60 2**	.64 4**	.67 1**	.59 6**	.60 1**	.62 4**	1
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<b>A L</b>	<b>r Tabel</b>	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	
	<b>Sig. (2-tailed)</b>	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	<b>N</b>	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185

Table 1 shows the validity test results of the student response questionnaire. All 15 items had r-calculated values greater than the critical r-table value of 0.138, indicating validity. Reliability testing yielded a Cronbach’s alpha value of 0.864, which exceeds the acceptable threshold of 0.60.



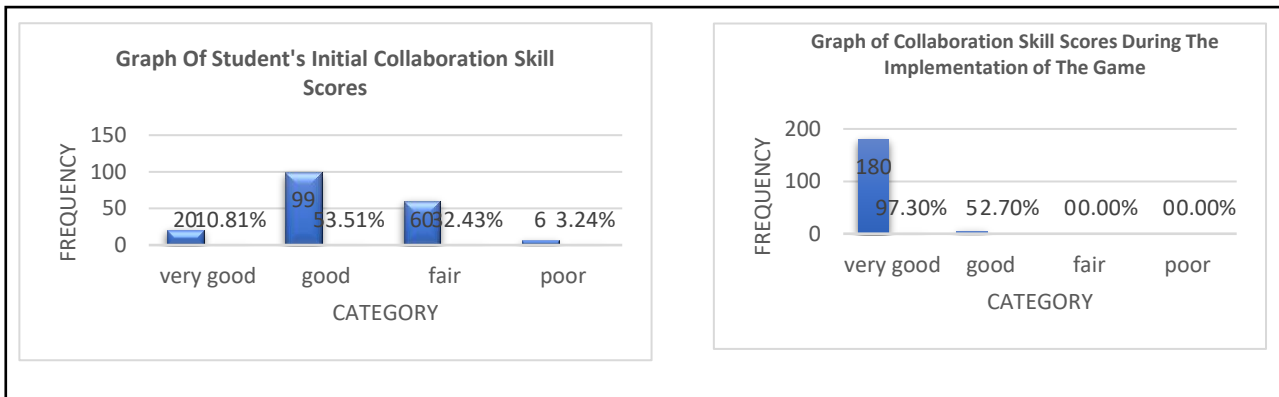
**Picture 4.** Student Responses

Picture 4 visually summarizes student responses from 185 respondents: 52.97% (98 students) responded very positively, 46.49% (86 students) responded positively, 0.54% (1 student) responded less positively, and none reacted negatively.

These data show a strong positive reception toward the game, supporting its potential as an engaging educational tool.

### 3.3 Effects on Collaboration Skills

To measure the effect of the game on collaboration skills, data from pre- and post-observations were analyzed. Graph 2 illustrates a substantial increase in the proportion of students rated as very good, from 10.81% (20 students) before using the game to 97.30% (180 students) after its use. Meanwhile, the good, fair, and poor categories dropped to almost zero, indicating significant improvement.



Picture 5. Collaboration Skills Score

The validity of the collaboration observation sheet was tested (see Table 2), with all r-calculated values exceeding the critical value of 0.138. The reliability result showed a Cronbach’s alpha of 0.815, further affirming the quality of the instrument.

Table 2. Validity Test Results of Student Collaboration Ability Observation Sheet

T Pearson	.612*	.617*	.626*	.620*	.610*	.620*	.610*	.608*	.615*	.616*	1
O Correlation	*	*	*	*	*	*	*	*	*	*	
T r Tabel	.138	.138	.138	.138	.138	.138	.138	.138	.138	.138	
A Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
L											

Normality testing using the Kolmogorov–Smirnov test yielded significance values > 0.05, indicating normally distributed data. The Wilcoxon test showed a significance value of 0.000 < 0.005, supporting the hypothesis that the educational game significantly improved students' collaboration skills. The N-gain score was 0.6364, which falls within the moderate category, and the N-gain percentage of 63.6376% indicates that the game is sufficiently effective in enhancing collaboration.

### 3.4 Effects on Learning Outcomes

Learning outcome tests were administered to 370 students across both control and experimental groups. The validity test for pre- and post-test items showed that all calculated r-values exceeded the r-table value of 0.098, as shown in Table 3, confirming the validity of the test items. Reliability analysis yielded a Cronbach’s alpha of 0.645.

Table 3. Results of Learning Outcome Validity Tests for Students

Total Pearson Correlation	.319*	.376*	.310*	.323*	.327*	.316*	.340*	.335*	.316*	.325*	.328*	.327*	.325*	.318*	.341*	.388*	.522*	.484*	.505*	.364*	1
Sig.(2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
N	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370

Kolmogorov–Smirnov normality tests for both pre- and post-tests in all classes yielded significance values greater than 0.05, indicating that the distributions were normal. The Wilcoxon signed-rank test showed a significant difference in the experimental group's pre- and post-test scores ( $p < 0.005$ ), while the control group showed less change.

Rank analysis revealed that in the experimental group, 183 students showed improvement, one student declined, and one student remained unchanged. In the control group, 155 improved, 14 declined, and 16 were unchanged.

The N-gain score for learning outcomes was 0.6213, categorized as moderate, and the N-gain percentage of 62.1266% confirmed the game was sufficiently effective in improving learning outcomes.

### *3.5 Discussion*

The results of this study are then linked to the results of previous studies that discuss the same issues and provide the same results as this study, including the implementation of Android-based Social Studies learning media, stating that the practicality of the media has proven to be very practical to use and its effectiveness has proven to be effective, as seen from the positive impact on media users, the success of students in completing tests with an average score above the school's predetermined minimum passing grade (Kurniawati et al., 2023; Lin, 2020; Ningrum et al., 2021).

Research by Nanda & Murwitaningsih (Nanda & Murwitaningsih, 2024) and Wulandari et al (Wulandari et al., 2020) states that learning using the problem-based learning model with the help of crossword puzzles has been proven to improve learning outcomes. It is recommended that the role of students in the learning process be increased by providing more opportunities for them to work together and be actively involved in the learning process (Sajidan et al., 2022).

Other findings from Bakhanova et al. (Bakhanova et al., 2020) emphasize that serious games and gamification have great potential to improve the quality of participatory modeling processes while highlighting the additional research needed to design specific practical gamification applications whose overall application in a participatory context can yield positive results. Huizenga (Huizenga et al., 2019) found that game activities have a significant impact on both individual and group learning outcomes. Their results show that mobile game-based learning improves concept understanding, problem-solving strategies, cognitive engagement, and affective involvement (Ali, 2019; Wijaya et al., 2024).

The findings of this study align with those of previous studies in demonstrating that the use of educational games, especially when integrated with pedagogical models such as problem-based learning, can significantly enhance student engagement, collaboration, and learning outcomes.

Zhang & Yu (Zhang & Yu, 2021) found that Kahoot, when used appropriately, can improve learning outcomes, thus concluding that it can enhance curricular interactions between students and

teachers, as well as extracurricular collaboration among students. Foy (Foy, 2021) reports that digital games are useful pedagogical tools and are considered a motivating alternative, demonstrating high engagement compared to more traditional approaches.

This current study supports and extends those findings by demonstrating the specific impact of a custom-developed Android educational game—Journey to Merdeka—not only on cognitive outcomes but also significantly on students' collaboration skills, as evidenced by pre- and post-test comparisons. The integration of this educational game with the problem-based learning model yields a synergistic effect, reinforcing prior research while also providing a practical and scalable model for junior high school settings in Indonesia.

The novelty of this study lies in its contextual and methodological integration:

1. It specifically develops a historically contextualized educational game focusing on Indonesian national awakening material, which is locally relevant and culturally situated.
2. The study uses rigorous validation by subject and media experts, followed by pre-/post-quasi-experimental testing in classroom settings.
3. It evaluates both cognitive (learning outcomes) and socio-collaborative competencies (collaboration skills), which few previous studies have assessed simultaneously in a junior secondary context.
4. The product was tested and prepared for mass dissemination via the Google Play Store, making the application scalable and implementable in real learning environments.

The results of this study indicate that students expect to learn with the help of educational game media, as it can easily capture and help them understand the material presented. Learning is more enjoyable, and the material is more engaging, which increases enthusiasm for learning. The results of the study were further analyzed by linking them to the findings of previous studies, with the intention of comparing and strengthening the findings of this study, while also enriching the understanding of the results.

#### **4. Conclusion**

This study confirms that integrating an Android-based educational game, Journey to Merdeka, with the Problem-Based Learning (PBL) model offers a promising strategy to enrich social studies instruction at the junior high school level. Validated through expert assessment and positively received by students, the game not only supports content mastery but also cultivates collaborative learning environments. The essence of this study lies in its innovative combination of mobile game-based learning and PBL pedagogy, which simultaneously addresses both academic and social-emotional learning goals. Its development—grounded in curriculum content relevant to Indonesian national history—provides localized, culturally resonant educational media that is engaging, technically feasible, and ready for classroom use.

Practically, this research provides a scalable learning tool that can be accessed on students' own devices, thereby reducing the need for additional infrastructure while promoting digital literacy and collaboration. The game provides a model for how educators can leverage mobile technology to enhance motivation and learning outcomes. Future research could explore broader implementation across different subjects and grade levels, as well as its impact on other 21st-century competencies such as critical thinking or digital citizenship. Longitudinal studies may also reveal how sustained use of such tools influences students' long-term academic engagement and performance. In conclusion, this study contributes to the growing body of evidence on educational technology by presenting a contextual, validated, and pedagogically integrated digital learning innovation for secondary education in Indonesia.

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