Salud, Ciencia y Tecnología. 2025; 5:1967
doi: 10.56294/saludcyt20251967

ORIGINAL

Innovative Game-Based Digital Media to Improve General Life Skills of Primary School Students: A Development Study in the Context of Education 5.0

Medios digitales innovadores basados en juegos para mejorar las habilidades generales de vida de los estudiantes de primaria: un estudio de desarrollo en el contexto de la Educación 5.0

Muhamad Afandi[1], Sari Yustiana[1], Reza Rachmadtullah[2], Sri Wahyuningsih[3], Ahmad Husain[1]

[1]Elementary Teacher Education Study Program, Sultan Agung Islamic University, Semarang, Indonesia.
[2]Universitas PGRI Adi Buana Surabaya, Surabaya, Indonesia.
[3]English Language Education Study Program, UIN Sunan Kudus, Kudus, Indonesia.

Cite as: Afandi M, Yustiana S, Rachmadtullah R, Wahyuningsih S, Husain A. Innovative Game-Based Digital Media to Improve General Life Skills of Primary School Students: A Development Study in the Context of Education 5.0. Salud, Ciencia y Tecnología. 2025; 5:1967. https://doi.org/10.56294/saludcyt20251967

Submitted: 04-02-2025 **Revised:** 29-05-2025 **Accepted:** 19-08-2025 **Published:** 20-08-2025

Editor: Prof. Dr. William Castillo-González

Corresponding author: Muhamad Afandi

ABSTRACT

Introduction: the use of engaging and interactive digital learning media is essential to enhance students' motivation and life skills, particularly in Pancasila Education at the primary school level. This study aims to develop a digital-based educational game as a learning resource for Pancasila Education and to test the feasibility, effectiveness, and user responses to the developed media.
Method: this research employs the Research and Development method using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The universe of this study comprised all fifth-grade students at elementary schools in Gubug Subdistrict, Grobogan Regency, East Java, Indonesia, while the sample consisted of 80 fifth-grade students from SDN 1 Jeketro and SDN 1 Saban, selected using a purposive sampling technique. Data collection techniques included observation, interviews, questionnaires, and tests. Quantitative data analysis involved descriptive analysis for media feasibility and inferential analysis using paired t-tests to measure media effectiveness. Qualitative analysis was used to explore user responses and the implementation of media in the classroom, conducted through data reduction, data presentation, and conclusion drawing.
Results: the results of this study show that: (1) The developed educational game media is highly feasible to be used as a learning resource for Pancasila Education for fifth-grade students, as evidenced by material expert validation results of 97,5 % and media expert validation results of 93,7 %; (2) The use of this media effectively improves students' General Life Skills significantly, with an average difference in pre-test and post-test scores of 8,00 points at SDN 1 Jeketro and 8,18 points at SDN 1 Saban, and test results showing statistical significance; (3) The educational game media received positive responses from teachers and students, demonstrated through active participation in learning and a very good practicality rating.
Conclusions: the conclusion of this study is that the educational game media has been proven to improve students' General Life Skills and can be recommended as an innovative learning tool for civic education at the primary school level.

Keywords: Game-Based Learning; Digital Media; General Life Skills; Education 5.0.

RESUMEN

Introducción: el uso de medios de aprendizaje digitales atractivos e interactivos es esencial para mejorar lamotivación y las habilidades para la vida de los estudiantes, particularmente en la asignatura de Educación

en Pancasila a nivel de primaria. Este estudio tiene como objetivo desarrollar un juego educativo digital como recurso de aprendizaje para la Educación en Pancasila y evaluar la viabilidad, efectividad y las respuestas de los usuarios hacia el medio desarrollado.
Método: esta investigación emplea el método de Investigación y Desarrollo (I+D) utilizando el modelo ADDIE (Análisis, Diseño, Desarrollo, Implementación y Evaluación). El universo de este estudio estuvo compuesto por todos los estudiantes de quinto grado de las escuelas primarias del distrito de Gubug, en el regencia de Grobogan, Java Oriental, Indonesia, mientras que la muestra consistió en 80 estudiantes de quinto grado de la SDN 1 Jeketro y la SDN 1 Saban, seleccionados mediante un muestreo intencional. Las técnicas de recolección de datos incluyeron observación, entrevistas, cuestionarios y pruebas. El análisis de datos cuantitativos se realizó mediante análisis descriptivo para la viabilidad del medio y análisis inferencial utilizando pruebas t pareadas para medir la efectividad del medio. El análisis cualitativo se utilizó para explorar las respuestas de los usuarios y la implementación del medio en el aula, mediante reducción de datos, presentación de datos y elaboración de conclusiones.
Resultados: los resultados de este estudio muestran que: (1) El medio de juego educativo desarrollado es altamente viable como recurso de aprendizaje para la Educación en Pancasila en estudiantes de quinto grado, lo que se evidencia en los resultados de validación de expertos en contenido (97,5 %) y expertos en medios (93,7 %); (2) El uso de este medio mejora de manera efectiva las Habilidades Generales para la Vida de los estudiantes, con una diferencia promedio entre las puntuaciones de pretest y postest de 8,00 puntos en SDN 1 Jeketro y 8,18 puntos en SDN 1 Saban, y resultados de pruebas que muestran significancia estadística; (3) El medio de juego educativo recibió respuestas positivas por parte de docentes y estudiantes, evidenciadas en la participación activa durante el aprendizaje y una calificación de practicidad muy buena.
Conclusión: se concluye que el medio de juego educativo ha demostrado mejorar las Habilidades Generales para la Vida de los estudiantes y puede recomendarse como una herramienta de aprendizaje innovadora para la educación cívica a nivel de primaria.

Palabras clave: Aprendizaje Basado en Juegos; Medios Digitales; Habilidades Generales para la Vida; Educación 5.0.

INTRODUCTION

Entering the era of Society 5.0, the challenges and problems that arise will become increasingly multidimensional in the future. Various life demands, both positive and negative, will continue to emerge.[1] In response to these challenges, the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) launched a new curriculum called the Merdeka Curriculum. This curriculum prioritizes holistic student learning outcomes by realizing the Pancasila student profile.[2,3] Education essentially plays a dominant role in shaping individuals.

One of the most important stages is primary education, which is a crucial period for instilling character education.[4] This aligns well with the various subjects taught at this level, including Pancasila Education, which aims to develop students with strong character.[5] Teachers play a key role in ensuring the successful implementation of the curriculum. They must create innovative and creative learning processes by utilizing technological advancements.[6] Various approaches can be taken by leveraging rapid technological developments for beneficial activities that yield positive impacts.

However, technological advancement does not only bring positive impacts; it also poses negative effects. In everyday life, technological sophistication has been observed to erode essential life values.[7] Students tend to use technology primarily for playing games, neglecting their responsibilities.[8] Here lies the essential role of teachers—not only to create innovative learning but also to synchronize school learning with real-life problems students will face. Therefore, learning should aim to develop life skills that help students face life's challenges proactively and creatively in finding solutions.[9,10] Life skills-based education means that students possess the necessary skills for life supported by fundamental abilities.[11] Moreover, general life skills are essential for everyone—whether employed, unemployed, or still in education.[12]

General Life Skills are a set of basic competencies required by individuals to function effectively in daily life, whether in school, family, or community settings.[13] These skills are universal, not tied to any specific academic discipline, and form a critical foundation for developing independence, adaptability, and readiness to face social and personal challenges in various situations.[14] Unlike specific or professional life skills such as technological or public speaking skills, General Life Skills emphasize mastering essential abilities required by all individuals regardless of academic background.[11,13] Examples include the ability to manage daily schedules, complete tasks independently, understand simple instructions, show responsibility for small decisions, and maintain order in activities.

General life skills can be integrated into every subject, and some subjects are particularly well-suited for developing specific life skill aspects, such as Pancasila Education.[12] In Indonesia, Pancasila Education serves as a cornerstone of character development, ensuring that students uphold the nation's ideology in daily life.[9,10] It reinforces unity across diverse ethnic, cultural, and religious backgrounds while promoting democratic values and social harmony. Within the school curriculum, it equips learners with the mindset and skills needed to contribute positively to national development and community well-being.[15]

At the primary school level, strengthening General Life Skills is crucial as an early step to build independent learning habits, promote structured thinking, and prepare children to manage themselves outside the full control of adults.[14] To facilitate these aspects, an effective learning medium is needed to help teachers deliver content and assist students in understanding it.[16] However, the choice of learning media must match students' learning needs to attract their interest in studying.[17]

Games are one of the learning media that can create meaningful learning experiences.[18] Incorporating games into the learning process creates a fun atmosphere because children can control the learning pace according to their abilities. Educational games influence children by training their thinking and language skills.[19] In addition, educational games can also develop fine and gross motor skills.[20] Educational games are a suitable solution to combine learning and play activities.[21] Educational games are enjoyable activities that can be used as tools for education.[22] These games are designed to stimulate children's thinking and problem-solving skills, and serve as an engaging medium to increase students' motivation to learn.[23]

This study presents an innovation in developing game-based digital learning media specifically aimed at enhancing the general life skills of primary school students—an area rarely explored in technology-based learning contexts. Unlike previous educational digital media that mainly focused on cognitive or academic aspects, this study places general life skills as the core focus. The game design is developed interactively and contextually to meet the needs of 21st-century students, referring to the Education 5.0 framework, which emphasizes the integration of technology to build essential daily life skills. Innovation is also seen in how the game offers a practical and enjoyable learning experience while preparing students to face real-world situations outside the classroom. Furthermore, the integration of gamification concepts in the media is designed to continuously motivate students in developing their life skills. The research is conducted in East Java, Indonesia, a region where primary school curricula have started integrating digital learning but still face challenges in fostering students' practical life skills, making it a relevant and strategic context for implementing this innovation.

Based on the background outlined above, this study aims to develop a digital learning medium in the form of an educational game to improve general life skills among primary school students in East Java, Indonesia. This tool is expected to assist educators in delivering lessons and help students understand the learning material in a way that is engaging and contextually relevant to their environment. The outcomes of this study are expected to contribute to the development of innovative digital learning relevant to contemporary educational demands, particularly within the Indonesian primary education context.

METHOD

Research Design

This development research used the Research and Development (R&D) method and employed the ADDIE model. Research and Development (R&D) in education is a process aimed at developing and validating a product. The R&D research method is used to produce a particular product and test the effectiveness of that product.[24] Therefore, the development research conducted by the researcher was to develop a product in the form of an educational game as a learning resource for Pancasila education, followed by validation of the educational game product. The ADDIE model consists of 5 steps,[25] namely (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation.

Sample and Sampling Technique

The universe of this study comprised all fifth-grade students at elementary schools in Gubug Subdistrict, Grobogan Regency, East Java, Indonesia. This study involved samples from four classes across two different primary schools (SDN 1 Jeketro and SDN 1 Saban), consisting of two experimental classes and two control classes. Each class consisted of 20 students, bringing the total number of research subjects to 80 fifth-grade primary school students. All participants shared similar characteristics in terms of age range (10–11 years old), grade level (fifth grade), curriculum followed (Indonesian national curriculum), and socio-cultural background as students in rural public primary schools within the same district.

The sampling technique used was purposive sampling, a non-probabilistic technique applied to determine samples based on specific considerations or criteria set by the researcher according to the needs of the study. This technique was chosen because not all student populations met the required criteria for the research, particularly in an experimental study that requires homogeneous classroom conditions and specific characteristics.[26] Furthermore, purposive sampling allows the researcher to obtain data that are more relevant,

targeted, and aligned with the research objectives. The criteria for selecting subjects included: (1) active fifth-grade students in the schools where the study was conducted, (2) students in cognitive and physical condition that allows them to participate in the entire research process without significant hindrances, (3) classes with relatively equal numbers of students, approximately 20 per class, (4) schools with basic facilities supporting learning, including digital devices to support activities in the experimental class, and (5) class teachers willing to cooperate and not currently implementing other additional learning programs that may affect the research results.

Data Collection Techniques and Instruments

The data collection techniques in this study were carried out through four main methods: interviews, observation, questionnaires, and tests, all used in an integrated manner according to the stages and objectives of the research. Interviews and observations were conducted in the initial phase to obtain needs analysis data and in-depth information on actual conditions, student characteristics, and input for designing the appropriate educational game media. Subsequently, questionnaires and tests were administered to three groups: expert validators (subject matter experts, language experts, and media experts), teachers, and students. These were aimed at measuring the feasibility (validity) and practicality of the developed media in the learning context. Once the instruments were declared valid in terms of content and construct, reliability testing was conducted to measure the consistency of measurement results. Specifically for the test instrument, difficulty index and discrimination index analyses were carried out to ensure that the questions had a proportional level of difficulty and could differentiate between students with varying mastery levels. Table 1 presents the summary of the test instrument validity and reliability analysis.

Table 1. Validity and reliability test of the instruments

Aspect	School	Type of Test	Main Result	Interpretation
Item Validity	Combined	r-count vs r-table test (r-table = 0,412)	All 15 items valid (r-count 0,413 to 0,968)	All items used
Pre-Test Reliability	SDN 1 Jeketro	Cronbach's Alpha	0,707	Reliable (Fairly Good)
Post-Test Reliability	SDN 1 Jeketro	Cronbach's Alpha	0,818	Reliable (Good)
Pre-Test Reliability	SDN 1 Saban	Cronbach's Alpha	0,710	Reliable (Fairly Good)
Post-Test Reliability	SDN 1 Saban	Cronbach's Alpha	0,798	Reliable (Good)
Pre-Test Difficulty Index	SDN 1 Jeketro	Mean Correct Answers	0,52 - 0,91	Majority of Items Moderate - Easy
Post-Test Difficulty Index	SDN 1 Jeketro	Mean Correct Answers	0,47 - 0,95	Majority of Items Moderate - Easy
Pre-Test Difficulty Index	SDN 1 Saban	Mean Correct Answers	0,43 - 0,86	Majority of Items Moderate - Easy
Post-Test Difficulty Index	SDN 1 Saban	Mean Correct Answers	0,50 - 0,79	Majority of Items Moderate - Easy
Item Discrimination	SDN 1 Jeketro	Item-to-Total Correlation	0,371 – 0,553	Majority of Items Worth Retaining

Data Analysis Techniques

The data analysis technique in this Research and Development (R&D) study used a mixed approach combining qualitative and quantitative analysis to obtain comprehensive and objective results. Qualitative analysis employed the Miles and Huberman model, consisting of three stages: data reduction, data display, and conclusion drawing. The data reduction stage involved filtering and summarizing data from observations, interviews, documentation, or expert validation gathered during the product development process, ensuring only relevant information was used. Next, data display was presented in descriptive narrative or tabular form for easier understanding, followed by conclusion drawing to interpret the meaning of the data and verify the findings.

Meanwhile, quantitative analysis was conducted in two stages: descriptive statistics and inferential statistics. The quantitative data were collected on a single variable, general life skills, measured using a multiple-choice test. Descriptive statistics were used to present the results in the form of averages, percentages, maximum and minimum scores, and standard deviations, providing an overview of the data characteristics. Inferential statistics were then applied to test the effectiveness of the developed product through prerequisite tests and hypothesis testing. The prerequisite tests included a normality test to observe the data distribution and a homogeneity test to ensure equal variance between groups. After these conditions were met, an independent sample t-test was conducted to determine whether there were significant differences in the general life skills

scores between the experimental and control groups.

Research Procedure

This research procedure used the ADDIE development model consisting of five systematic stages: Analyze, Design, Development, Implementation, and Evaluation. In the Analyze stage, a learning media needs analysis was conducted by identifying field problems, including the lack of engaging and suitable learning resources for primary school students. In addition, curriculum and material analysis was also carried out to ensure that the content developed was relevant to the basic competencies and learning objectives, particularly in Pancasila education. Next, the Design stage focused on designing the media, which involved creating an initial prototype of an educational game that included elements of Pancasila education and life skills reinforcement (general life skills). This design included interface layout, game flow, and the integration of learning content into the media.

The Development stage involved turning the media design into a complete product. At this stage, the developed prototype was validated by experts, including subject matter experts, media experts, and fifth-grade teachers. Validation aimed to ensure the content quality, interface, and technical aspects of the developed learning media. The next stage was Implementation, which involved the application of the validated media product. The educational game was tested on fifth-grade students to examine the product's effectiveness as a learning resource. During this stage, students' life skills were also measured using a general life skills test instrument in the form of pre-tests and post-tests. The final stage was Evaluation, where the practicality of the media and student responses were assessed using questionnaires. This evaluation provided an overview of how well the developed media was received, how easy it was to use, and its positive impact on students' learning processes and outcomes. Through this research procedure, it is expected that the development of Pancasila-based educational game media can optimally enhance students' life skills.

RESULTS

Analysis Stage

Performance analysis was conducted through classroom observations and interviews with teachers to identify obstacles encountered during the learning process. The observation results showed that Pancasila Education learning in grade V was still one-way, dominated by lecture methods, lacking in discussion, and with minimal active student involvement. Students appeared unenthusiastic and had low participation, especially when discussing topics related to Pancasila values, which were perceived as abstract and boring.

Through interviews with grade V teachers, it was revealed that they found it difficult to find interactive learning media that suited students' characteristics and could connect the material to real-life contexts. Teachers also conveyed that most students were more interested in technology-based media such as digital games, yet no suitable educational media existed to meet the needs of Pancasila education materials.

In the needs analysis, based on observation and interview results, it can be concluded that there is a real need for innovative and engaging learning media capable of increasing student engagement in learning. Developing educational game-based learning media is considered appropriate to address this need. Furthermore, curriculum and material analysis was conducted by reviewing the Kurikulum Merdeka documents and the syllabus for Pancasila Education for grade V. Based on the current curriculum, the Pancasila Education material in grade V includes important values such as mutual cooperation, tolerance, love for the homeland, and the application of Pancasila values in daily life. However, implementation in the field shows that material delivery is still limited to declarative knowledge and has not yet optimally built students' attitudes or practical skills. In addition, material analysis revealed great potential to relate learning content with educational game activities, allowing the material to be delivered in a more contextual, enjoyable, and relevant manner to students' lives.

Design Stage

The digital learning media based on an educational game developed in this study is titled "Agen PGSD", an adventure-themed educational game designed to help students understand Pancasila Education materials more interactively and enjoyably. This game was created using Construct 2 software, an HTML5-based game development platform that enables the game to run offline on smartphones without an internet connection. In the game, students take on the role of an agent who must complete missions by exploring various adventure paths. Each path contains five questions or obstacles based on Pancasila Education material that must be answered to proceed to the next path. Students can move the character to the right, left, up, or down to find new routes and continue the adventure, as shown in figure 1.

The game includes a life system, where students are given three chances. If a student answers incorrectly, they may repeat the same obstacle until the chances are used up. If all lives are lost, the player will be directed to the start screen, and the final score will be displayed. The maximum score obtainable is 100 if students answer all questions correctly. Furthermore, there is no time limit to complete the game, allowing students to play at their own pace without pressure.

Figure 1. Display of the educational game-based learning media "Agen PGSD"

Development Stage

The product development stage began with the previously designed concept. The first step in product creation was the digitalization of all visual elements, such as the main character, background, navigation icons, and obstacles. The main character in the game "Petualangan PGSD UNISSULA" is portrayed as an agent with a mission to complete challenges while enhancing students' knowledge of Pancasila Education material. Then, the developer began programming the game paths, where each path is linked to five questions that students must answer to proceed to the next stage.

The questions presented were composed based on the previously analyzed basic competencies and materials, using multiple-choice format with automatic feedback. Students are given three chances (lives) to answer the questions in each level. If they answer incorrectly, they must repeat the same obstacle. If they answer correctly, they can continue the adventure until the game ends. The game is designed without a time limit, allowing students to learn comfortably at their own pace. The final product is a game file that can be installed and run offline on Android devices, specifically smartphones.

Table 2. Summary of feasibility assessment of educational game media

Category	Assessed Aspect	Item Count	Score	Criteria	(%)	Feasibility
X1 Content Feasibility (Subject Expert)	Relevance of Material with SK and KD	3	11	Excellent	91,6	Highly Feasible
	Organization of Material	7	23	Excellent	82,1	Highly Feasible
	Supporting Learning Materials	6	20	Excellent	83,3	Highly Feasible
	Material Relevance	4	14	Excellent	87,5	Highly Feasible
Total Subject Expert		20	78	Excellent	86,6	Highly Feasible
X2 Media Feasibility (Media Expert)	Game Size	2	8	Excellent	100	Highly Feasible
	Initial Display Design	9	34	Excellent	94,4	Highly Feasible
	Content Design	9	33	Excellent	91,6	Highly Feasible
Total Media Expert		20	75	Excellent	93,7	Highly Feasible
X3 Language Feasibility (Language Expert)	Language Accuracy	5	19	Excellent	95,0	Highly Feasible
	Sentence Clarity	6	22	Excellent	91,6	Highly Feasible
	Terminology Appropriateness	4	15	Excellent	93,7	Highly Feasible
	Text Readability	5	18	Excellent	90,0	Highly Feasible
Total Language Expert		20	74	Excellent	92,5	Highly Feasible

Before implementation, the learning media underwent feasibility testing by subject matter experts, media experts, and language experts. The assessment ensured that the content, design, and technical aspects of the game met educational standards and were suitable for primary school environments. Table 2 presents the summary of the feasibility assessment from validators.

Based on the validation results, the subject matter expert (X1) scored the media at 86,6 %, the media expert (X2) at 93,7 %, and the language expert (X3) at 92,5 %, all within the Excellent category. The highest ratings in each domain were for curriculum relevance (91,6 %), game size optimization (100 %), and language accuracy (95 %). The overall average feasibility score reached 90,9 %, categorizing the educational game as Highly Feasible. These findings demonstrate that the media is accurate, engaging, and well-suited to the cognitive level of primary school students.

However, some revision notes were made to perfect the visual and technical aspects according to the validators' suggestions. Revisions were made to enhance interface clarity, improve game navigation, and adjust some question content to better match the cognitive development level of primary school students. After revision, the game "Petualangan PGSD UNISSULA" was ready to be implemented in learning activities.

Implementation

The implementation stage was carried out to test the effectiveness of the educational game-based digital learning media that had been validated by experts. This application was conducted by piloting the media with fifth-grade students in two elementary schools, namely SDN 1 Jeketro and SDN 1 Saban. In addition to using the game, students' general life skills were measured using pre-test and post-test instruments to assess improvements before and after utilizing the media.

The results, as summarized in table 3, indicate a clear improvement in students' general life skills after using the game-based media. The mean post-test score was higher than the mean pre-test score in both schools, suggesting positive learning gains. The increase in average scores was accompanied by a reduction in score variability, implying more consistent performance among students after the intervention. These results demonstrate that the media effectively enhanced general life skills in the targeted group.

Table 3. Descriptive statistics

Statistics	SDN 1 Jeketro (N = 40)	SDN 1 Saban (N = 40)
Mean Pre-Test	52,84	52,64
Mean Post-Test	60,84	60,82
Mean Difference	+8,00	+8,18
Standard Deviation Pre-Test	4,237	2,947
Standard Deviation Post-Test	6,546	5,278
Standard Error Mean Pre-Test	0,646	0,557
Standard Error Mean Post-Test	0,998	0,997

The descriptive statistics show an increase in the average scores of student learning outcomes in both SDN 1 Jeketro and SDN 1 Saban after the implementation of educational game-based learning media. In SDN 1 Jeketro, the pre-test mean score of 52,84 rose to 60,84 in the post-test, while in SDN 1 Saban the mean increased from 52,64 to 60,82, reflecting gains of 8,00 and 8,18 points, respectively—both exceeding the 5-point minimum improvement threshold for similar interventions. This indicates that the developed media significantly enhanced students' general life skills.

The higher pre-test standard deviation in SDN 1 Jeketro (4,237) compared to SDN 1 Saban (2,947) suggests a wider range of initial abilities, which may have influenced the degree of post-test improvement, while the consistent reduction in variation after the intervention implies that the media helped narrow performance gaps, promoting more equitable outcomes. Additionally, the small standard error values confirm the stability and representativeness of the findings.

Table 4. Inferential statistical results (t-Test)

School	Mean Difference	Std. Deviation	Std. Error Mean	Interval 95 % (Lower - Upper)	t-Value	df	Sig. (2-tailed)
SDN 1 Jeketro	-8,000	7,181	1,095	-10,210 s.d. -5,790	-7,305	42	0,001
SDN 1 Saban	-8,179	6,007	1,135	-10,508 s.d. -5,849	-7,205	27	0,002

The t-test results indicate a significant difference between the pre-test and post-test scores in both SDN 1

Jeketro and SDN 1 Saban. At SDN 1 Jeketro, the average score difference was -8,00, with a standard deviation of 7,181 and a standard error of 1,095. The 95 % confidence interval ranged from -10,210 to -5,790, with a significance value (Sig. 2-tailed) of 0,001, which is below the 0,05 threshold.

Meanwhile, at SDN 1 Saban, the average score difference was -8,179, with a standard deviation of 6,007 and a standard error of 1,135. The 95 % confidence interval ranged from -10,508 to -5,849, with a significance value of 0,002, which is also below 0,05. Furthermore, a t-value greater than 2 with $p < 0,05$ indicates a significant difference. The t-values above 7, such as in the results from SDN 1 Jeketro (-7,305) and SDN 1 Saban (-7,205), are considered very high in the context of a t-test, meaning the difference between pre-test and post-test is not only statistically significant but likely has a strong practical impact as well. This indicates that the use of educational game media also brings a significant improvement in students' general life skills.

Evaluation Stage

The evaluation stage was carried out to assess the effectiveness and feasibility of the educational game-based digital learning media developed. The evaluation involved students and teachers who had used the media during the learning process. Student responses were obtained through observations during lessons and a questionnaire distributed after the activities were completed. The results showed that students gave a very positive response. This was reflected in their enthusiasm, active participation, and increased learning motivation during the use of the educational game. The questionnaire results are presented in table 5.

Table 5. Recapitulation of positive responses to the educational game media

Assessed Aspect	Percentage (%)	Category
Subject Matter Expert Rating	97,5	Highly Feasible
Media Expert Rating	93,7	Highly Feasible
Student Response to the Media	92,8	Very Positive
Teacher Response to the Media	95,2	Very Positive

DISCUSSION

In the analysis stage, classroom observations and teacher interviews revealed that Pancasila Education in grade V was still lecture-centered, lacked engaging media, and failed to actively involve students, highlighting the need for interactive, technology-based tools like educational games to make the material more relevant and appealing. This is supported by Piaget's theory, which explains that primary school-aged students are in the concrete operational development stage, where they more easily understand abstract concepts if connected to direct experiences or visually engaging media.[27] Therefore, the use of digital media, particularly game-based educational tools, is highly appropriate to enhance student engagement.

Furthermore, the needs, curriculum, and material analysis indicate a strong demand for innovative educational game-based media to enhance student engagement and transform Pancasila Education in grade V from merely declarative knowledge into contextual, enjoyable, and skill-oriented learning aligned with the Kurikulum Merdeka. The development of learning media must begin with a deep understanding of the subject matter and alignment with fun learning concepts to enhance learning effectiveness.[28] Learning media must be designed according to the content and the characteristics of learners so that it can bridge students' understanding of abstract concepts more concretely.[29] Moreover, assert that good learning media not only deliver information but also create an active and engaging learning experience.[30]

In the design stage, the choice of an adventure game format aligned with students' preferences for technology-based learning and provided opportunities for problem-solving, decision-making, and exploration—important elements in building engagement and motivation. Educational games excel in integrating cognitive, affective, and psychomotor aspects simultaneously, thus creating a meaningful, challenging, and enjoyable learning experience.[31] This is supported by [32] who state that adventure-based games with challenges or content-based questions can enhance active participation and student memory retention. Additionally, research by [33] shows that using Construct 2-based games enables teachers to present interactive learning media accessible via mobile devices without relying on internet connectivity, thus fitting schools with limited facilities.

In the development stage, the high feasibility scores across content, media, and language dimensions indicated that the product was both pedagogically sound and technically effective. Minor revisions, such as interface clarity and adjustment of question difficulty, reflected the need to match learning media with students' cognitive development levels. The results from the development stage reaffirm that learning media must meet the criteria of content clarity, curriculum relevance, readability, and technical effectiveness to be optimally used in teaching and learning processes.[34]

Additionally, improvement suggestions from subject and media experts, such as enhancing visual clarity

and adjusting the difficulty level of questions, are supported by [27] who emphasize the importance of aligning learning stimuli with students' cognitive development. Particularly at the primary level, learning media should feature engaging visuals, simple navigation, and easily understood content to improve attention, motivation, and learning effectiveness.[35,36] Adjusting the question content is also part of an effort to avoid cognitive overload, which stresses that materials must be presented within the capacity of students' working memory to prevent confusion or mental fatigue.[37,38]

The implementation stage findings demonstrated statistically significant improvements in general life skills, with reduced score variability post-intervention suggesting more equitable learning outcomes. Educational game media such as Petualangan PGSD UNISSULA provides a learning experience where students are actively engaged in completing challenges, answering questions, and interacting in a virtual environment that mirrors real-life contexts.[39] Through these activities, children develop problem-solving skills by analyzing situations and determining appropriate strategies, enhance critical thinking by making decisions under specific game constraints, and strengthen collaboration when tasks require teamwork.

This is consistent with Piaget's theory which states that the cognitive development of elementary school-age children is optimized through activities that are concrete, interactive, and involve direct experience.[37] Furthermore,[40] emphasize that today's digital native generation tends to be more motivated and focused when using educationally designed game-based media, as it combines cognitive, affective, and psychomotor aspects. In line with that, research by [41,42] shows that mission- or challenge-based educational games are able to improve 21st-century skills, as the games require students to apply knowledge in situational contexts, practice strategic thinking, and adapt to various game conditions.

Finally, in the evaluation stage, the overwhelmingly positive feedback from both students and teachers underscored the media's relevance and effectiveness. The very positive response to this media indicates a real need for more varied, innovative learning resources that can accommodate 21st-century students' learning styles. Teachers felt supported because this media not only served as a visual aid but also encouraged students' general life skills. Good learning media should be able to integrate visual, audio, and interactive elements to create meaningful learning experiences while increasing student motivation and active participation.[33,43] Similar findings were conveyed by[44,45], who explained that game-based learning is effective in increasing student engagement and providing an enjoyable learning experience.

CONCLUSION

Based on the results of the research conducted, it can be concluded that: (1) The educational game-based digital learning media developed is highly feasible to be used as a learning resource for Pancasila Education for fifth-grade elementary school students. This feasibility is evidenced by the results of assessments from subject matter experts and media experts, which show the media meets very good criteria; (2) The use of educational game media has been proven effective in providing significant improvement to students' general life skills. The learning process with the help of this media supports students' understanding and skills in dealing with everyday life problems; (3) The educational game media received positive responses from its users. Students showed enthusiasm and active involvement during the learning process. In addition, teachers expressed appreciation for the usefulness of this media in supporting the achievement of learning objectives in a more engaging, interactive, and enjoyable way. Therefore, it can be concluded that the educational game-based digital learning media developed is highly feasible, effective in improving general life skills, and positively received, and thus can be recommended as an innovative learning tool for interactive and contextual Pancasila Education at the elementary school level.

REFERENCES

1. Yaraş Z, Öztürk FK. Society 5.0 in Human Technology Integration: Digital Transformation in Educational Organizations. Int J Prog Educ. 2022;18(1):458–74. Available from: http://www.keidanren.or.jp/en/

2. Irawati D, Iqbal AM, Hasanah A, Arifin BS. Profil Pelajar Pancasila Sebagai Upaya Mewujudkan Karakter Bangsa. Edumaspul: Jurnal Pendidikan. 2022;6(1):1224–38.

3. Aryani N, Rahayu S. KEARIFAN LOKAL DALAM PEMBELAJARAN PAUD UNTUK MEMFASILITASI PROFIL PELAJAR PANCASILA. Early Childhood: Jurnal Pendidikan. 2023;7(1):50–60.

4. Irawati D. Profil Pelajar Pancasila Sebagai Upaya Mewujudkan Karakter Bangsa. Jurnal PENDIDIKAN. 2022;6:1224–38.

5. Latif Y. The Religiosity, nationality, and sociality of Pancasila: Toward Pancasila through soekarno's way. Studia Islmika. 2018;25(2):207–45.

6. Safitri, Andriani, Dwi Wulandari YTH. Proyek Penguatan Profil Pelajar Pancasila: Sebuah Orientasi Baru Pendidikan dalam Meningkatkan Karakter Siswa Indonesia. Jurnal basicedu. 2022;6(4):7076–86. Available from: https://doi.org/10.31004/basicedu.v6i4.3274

7. Puolitaival T, Kiroff L. Digital technologies in construction management education: A digital natives' perspective. In: Proceeding of the Conference CIB W78 2021. 2021. p. 650–8.

8. Saienko N, Lavrysh Y, Lukianenko V. The impact of educational technologies on university teachers' self-efficacy. International Journal of Learning, Teaching and Educational Research. 2020;19(6):323–36.

9. Kiroff L, Puolitaival T. Fun Is Serious Business: Digital Natives and Digital Technologies in Construction Education. Journal of Higher Education Theory and Practice. 2021;21(1):75–90.

10. Bezliudniy O, Kravchenko O, Kondur O, Reznichenko I, Kyrsta N, Kuzmenko Y, et al. National and Patriotic Education of Young Students by Means of Digital Technologies in Distance Learning Environment. IJCSNS International Journal of Computer Science and Network Security. 2022;22(7):451. Available from: https://doi.org/10.22937/IJCSNS.2022.22.7.55

11. Prajapati R, Sharma B, Sharma D. Significance Of Life Skills Education. Contemporary Issues in Education Research (CIER). 2016;10(1):1–6.

12. Zahroh W, Afandi M. ANALISIS GENERAL LIFE SKILL (GLS) DALAM. JURNAL ILMIAH SULTAN AGUNG. 2023;

13. Gerami S, Ahmadi S, Safat MB, Farsi F. Life skills training and its effectiveness: A systematic review. Mediterr J Soc Sci. 2015;6(2S1):385–92.

14. Nair PK, Fahimirad M. A qualitative research study on the importance of life skills on undergraduate students' personal and social competencies. International Journal of Higher Education. 2029;8(5):71–83.

15. Yustiana S, Afandi M. Conflict resolution in citizenship education in elementary schools. In: AIP Conference Proceedings. 2023. p. 1–10.

16. Afandi M, Wahyuningsih S, Yustiana S, Kusumadewi RF, Rachmadtullah R. Correlation of Work Discipline and Pedagogical Competence to Teaching Performance in Elementary Teacher. International Journal of Instruction. 2023;16(4):189–208. Available from: http://www.e-iji.net/dosyalar/iji_2023_4_12.pdf

17. Fajari LEW, Sarwanto, Chumdari. Improving elementary school's critical thinking skills through three different PBL-assisted learning media viewed from learning styles. Journal of E-Learning and Knowledge Society. 2020;16(1):55–64.

18. Abdullah D, Reza B. GAME EDUKASI BERBASIS ROLE PLAYING GAME DENGAN METODE FINITE STATE MACHINE. 2015.

19. Rahimi S, Shute V, Zhang Q. The Effects of Game and Student Characteristics on Persistence in Educational Games: A Hierarchical Linear Modeling Approach. International Journal of Technology in Education and Science. 2021;5(2):141–65.

20. Kharisma GI, Arvianto F. Pengembangan aplikasi android berbentuk education games berbasis budaya lokal untuk keterampilan membaca permulaan bagi siswa kelas 1 SD/MI. Premiere Educandum : Jurnal Pendidikan Dasar dan Pembelajaran. 2019;9(2):203.

21. Afandi M, Wahyuningsih S, Mayasari LI. DOES ELEMENTARY SCHOOL TEACHER'S PERFORMANCE MATTER? Cakrawala Pendidikan. 2021;40(1):242–52.

22. Chang KE, Wu LJ, Weng SE, Sung YT. Embedding game-based problem-solving phase into problem-posing system for mathematics learning. Comput Educ. 2012;58(2):775–86.

23. Duncan KJ. Examining the Effects of Immersive Game-Based Learning on Student Engagement and the Development of Collaboration, Communication, Creativity and Critical Thinking. TechTrends. 2020;64(3):514–

24.

24. Afandi M, Yustiana S, Kesuma NP. The Development of Pop-Up Book Learning Media in Pancasila Materials Based on Local Wisdom at Elementary School. ELEMENTARY: Islamic Teacher Journal. 2021;9(1):57.

25. Putera Permana E, Nourmavita D. PENGEMBANGAN MULTIMEDIA INTERAKTIF PADA MATA PELAJARAN IPA MATERI MENDESKRIPSIKAN DAUR HIDUP HEWAN DI LINGKUNGAN SEKITAR SISWA KELAS IV SEKOLAH DASAR. 2017.

26. Campbell S, Greenwood M, Prior S, Shearer T, Walkem K, Young S, et al. Purposive sampling: complex or simple? Research case examples. Journal of Research in Nursing. 2020;25(8):121–5.

27. Pakpahan FH, Saragih M. Theory Of Cognitive Development By Jean Piaget. Journal of Applied Linguistics. 2022;2(2):55–60.

28. Fajari LEW, Meilisa R. The Development of Augmented Reality to Improve Critical Thinking and Digital Literacy Skills of Elementary School Students. Dwija Cendekia: Jurnal Riset Pedagogik. 2022;6(3):1–23.

29. Rukayah, Daryanto J, Atmojo IRW, Ardiansyah R, Saputri DY, Salimi M. Augmented Reality Media Development in STEAM Learning in Elementary Schools. Ingenierie des Systemes d'Information. 2022;27(3):463–71.

30. Aisyah St, Syarifuddin S, Triana Y. DEVELOPMENT OF LEARNING MEDIA USING GOOGLE SITES TO IMPROVE STUDENTS' ABILITIES. JURNAL SOCIUS. 2023;12(1):431–49.

31. Clark D. Playing the game: a realist approach to evaluating online student access, retention, progression and attainment initiatives. Research in Learning Technology. 2022;30(1063519):1–15.

32. Liao CHD, Wu WCV, Gunawan V, Chang TC. Using an Augmented-Reality Game-Based Application to Enhance Language Learning and Motivation of Elementary School EFL Students: A Comparative Study in Rural and Urban Areas. Asia-Pacific Education Researcher. 2024;33(2):307–19.

33. Rahman AA, Angraeni A. Empowering learners with role-playing game for vocabulary mastery. International Journal of Learning, Teaching and Educational Research. 2020;19(1):60–73.

34. Faiqoh N, Karyanto P, Indrowati M. Characteristics of Learning Media Development to Strengthen Senior High School Students Eco-Literacy in The Industrial Revolution 4.0 Era. In: Proceeding Biology Education Conference. 2019. p. 16–1.

35. Gómez Sanguino NC, Rivera Salamanca SA, Torres Barreto ML. Playful exercise focused on microeconomics, applying gamification: "Rompeconomía". Gamification and Augmented Reality. 2024; 2:.71.

36. Ardila Otero CF, Lozano Pineda C, González García JC, Rincón Jerez AD, Torres-Barreto ML. Design and implementation of a Game-Based Activity to promote Learning of Prompt Engineering. Gamification and Augmented Reality. 2024; 2:.75.

37. Brayadi B, Supriadi S, Manora H. Information Processing And Cognitive Theories Of Learning. Edification Journal (Pendidikan Agama Islam). 2022;4(2):347–55.

38. Duisenbayeva S, Urazgaliyeva S, Kassymova GK, Duisenbayeva SS, Adilbayeva UB, Bekalaeva A, et al. Cognitive Pedagogy and Teaching Approaches Via e-Learning System. Linguistica Antverpiensia. 2021;12(1):1609–24. Available from: https://www.researchgate.net/publication/351576227

39. Ahmad S, Hussain A, Batool A, Sittar K, Malik M. Play and Cognitive Development: Formal Operational Perspective of Piaget's Theory. Journal of Education and Practice. 2016;7(28):72–9. Available from: http://www.iiste.org

40. Srirahayu DP, Premananto GC. THE PRINTED BOOK AND ELECTRONIC BOOK (E BOOK) EXPERIENCES OF DIGITAL NATIVES IN INDONESIA. Journal of Southwest Jiaotong University. 2020;55(6):1–13.

41. Suharti P, Asy'ari A, Wikanta W. Augmented reality integrated education game using problem-based learning model to improve critical thinking skills. Research and Development in Education (RaDEn). 2024;4(1):320–36. Available from: https://ejournal.umm.ac.id/index.php/raden/article/view/32026

42. Kenanoğlu D, Duran M. The Effect of Traditional Games on the Language Development of Pre-School Children in Pre-School Education. Asian Journal of Education and Training. 2021;7(1):74–81.

43. Syahrial, Asrial, Kurniawan DA, Kiska ND, Damayanti L. Teaching Primary School Students through Local Cultural Games for Improving Positive Characters. International Journal of Instruction. 2022;15(3):1047–78.

44. Hu L, Yuan Y, Chen Q, Kang X, Zhu Y. The Practice and Application of AR Games to Assist Children's English Pronunciation Teaching. Occup Ther Int. 2022;2022(3966740):1–12.

45. Alrehaili EA, Al Osman H. A virtual reality role-playing serious game for experiential learning. Interactive Learning Environments. 2022;30(5):922–35. Available from: https://doi.org/10.1080/10494820.2019.1703008

FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Muhamad Afandi, Sari Yustiana.
Data curation: Muhamad Afandi, Sari Yustiana, Reza Rachmadtullah.
Formal analysis: Muhamad Afandi, Sari Yustiana.
Research: Muhamad Afandi, Sari Yustiana, Reza Rachmadtullah.
Methodology: Muhamad Afandi, Sari Yustiana, Reza Rachmadtullah.
Project management: Muhamad Afandi.
Resources: Sari Yustiana, Reza Rachmadtullah.
Software: Reza Rachmadtullah, Sri Wahyuningsih.
Supervision: Muhamad Afandi.
Validation: Muhamad Afandi, Sari Yustiana, Reza Rachmadtullah.
Display: Sari Yustiana, Sri Wahyuningsih.
Drafting - original draft: Muhamad Afandi, Sari Yustiana.
Writing - proofreading and editing: Muhamad Afandi, Sari Yustiana, Reza Rachmadtullah, Sri Wahyuningsih, Ahmad Husain.