
Garuda Numeracy Fun: Game-Based Learning Media for Pancasila Education

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ABSTRACT

The low numeracy skills of students and the dominance of conventional-theoretical methods in Pancasila Education in Indonesia require innovation in learning media. The integration of numerical logic into value-based learning is still rarely explored. This study aims to develop and test the feasibility of Garuda Numeracy Fun media based on Game Based Learning (GBL) that integrates numeracy literacy with national symbols in Pancasila Education. Using the Research and Development (R&D) method with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation), a limited trial was conducted on prospective PPKn teacher students in the PPKn Learning Planning course. Data were collected through observation, questionnaires, and documentation, then analyzed using quantitative and qualitative descriptive techniques. The results showed that the Garuda Numeracy Fun Media obtained a feasibility percentage of 88.40% (Very Feasible). These findings do not demonstrate effectiveness in increasing self-efficacy or creativity because this study did not employ a pre-test/post-test design, control group, validated self-efficacy or creativity instruments, or inferential statistical analysis. Thus, the study concludes that Garuda Numeracy Fun media is feasible and receives positive responses as an alternative learning medium that connects Pancasila values with contextual numeracy activities.

Keywords: *game based learning, garuda numerasi fun, learning media, numeracy literacy, pancasila education*

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INTRODUCTION

Pancasila Education plays a crucial role in the national education system in Indonesia, particularly in shaping the character, morals, and national identity of the younger generation based on the noble values of Pancasila ([Anugrah & Rahmat, 2024](#)). In the current era of the Independent Curriculum, the direction of Pancasila Education policy is revitalized to support the realization of 8 graduate profiles, which not only emphasize dogmatic cognitive understanding, but also on critical, collaborative, and applicative thinking skills in everyday life ([Alanur et al., 2022](#)). However, the main challenge in learning Pancasila Education at the elementary and secondary levels is the dominance of conventional, monotonous, and teacher -centered learning methods ([Naura et al., 2025](#)). This has implications for low student learning motivation and the assumption that this subject is theoretical, abstract, and boring ([Aqmarina et al., 2025](#)). Therefore, innovation in learning media is needed that is able to transform Pancasila Education material to be more interactive, contextual, and enjoyable.

On the other hand, the current portrait of the quality of Indonesian education is faced with low student numeracy skills. Based on the results of the 2022 Programme for International Student Assessment (PISA) and the national education report card measured through the National Assessment (AN), Indonesian students' numeracy scores are still below the average minimum ability ([Yuniarti & Setyarsih, 2025](#)). For the Central Sulawesi region, the results of the 2025 Education Report Card at the Elementary School (SD) level in Donggala Regency show that the literacy and numeracy levels of students in Donggala Regency are still below the national average. The Head of the BPMP of Central Sulawesi Province highlighted the challenges of low literacy and numeracy achievements as well as student character indexes. Furthermore, based on data from the 2025 Education Report Card (which refers to the results of the 2024 National Assessment), the literacy and numeracy levels of students in Sigi Regency generally show varying achievements with a tendency to be in the Moderate category.

The empirical conditions in the Central Sulawesi region indicate the urgency of multidimensional handling, where numeracy improvement can no longer be solved partially only through pure mathematics subjects. Numeracy is not just a mechanical mathematical calculation skill, but rather the ability to analyze, interpret, and use mathematical concepts to solve practical problems in various life contexts, including socio-community and civic contexts ([Geiger & Schmid, 2024](#)). The Indonesian government, through the National Literacy Movement (GLN), has mandated the importance of integrating numeracy across subjects (numeracy across the curriculum) ([Dayantri & Nasution, 2024](#); [Awalliyah et al., 2025](#)).

Pancasila education actually has great potential to be integrated with numeracy content, for example in population data analysis, understanding social justice statistics, equitable regional budget allocation, and quantitative mapping of cultural diversity. However, the integration between numeracy and Pancasila Education has not been widely developed in learning practice or research. Previous studies on Pancasila Education media generally focus on moral values, historical understanding, character education, card games, monopoly-based media, or quiz-based digital games ([Kurniawati, 2021](#); [Yogi et al., 2025](#)). Meanwhile, studies on Game-Based Learning for numeracy tend to focus on mathematics learning ([Junaidi & Pramestie, 2024](#); [Sripatmi et al., 2025](#)). This shows a clear research gap. Previous studies have not sufficiently developed learning media that integrate Pancasila values, civic character formation, and numeracy competence in one game-based learning platform.

This gap is important because Pancasila Education is often positioned as a moral-affective subject, while numeracy is treated as a mathematical-cognitive skill. This separation limits students' opportunity to use numerical reasoning when discussing social, civic, and national issues. In fact, students need numeracy skills to interpret social data, evaluate public problems, and make rational civic decisions ([Aisyah et al., 2024](#)). Current learning media still rarely bridge these two domains simultaneously. Therefore, an interactive learning medium is needed to package Pancasila values in quantitative and contextual forms while presenting numeracy challenges based on civic and character values. This integration is rarely practiced due to the limited teaching tools and media specifically designed for this purpose. A recent review of

previous research shows that the use of Game-Based Learning (GBL) methods in education has been proven effective in increasing student engagement, intrinsic motivation, and retention of understanding ([Thi, 2025](#); [Ismaizam et al., 2022](#)). In the context of Pancasila Education, previous research has generally focused on the development of card games, character-based Monopoly boards, or quiz-based digital games to introduce moral and historical values. Meanwhile, the development of GBL-based media to improve numeracy skills has generally been limited to pure mathematics ([Junaidi & Pramestie, 2024](#); [Sripatmi et al., 2025](#)). To date, research on the development of learning media that harmoniously integrates character building and Pancasila values with numeracy competency improvement in a single integrated game platform is still very limited.

This gap analysis is the urgency behind this research. There is a sharp divide in elementary and secondary schools, where Pancasila Education is considered solely a moral-affective domain, while numeracy is considered a rigid mathematical-cognitive domain. Yet, to develop intelligent and good citizens, students need logical numerical reasoning skills to address socio-political issues rationally and objectively ([Lestari & Annizar, 2020](#)). Current learning media are unable to bridge these two aspects simultaneously. The lack of interactive learning media that can package Pancasila values quantitatively and contextually and present numeracy challenges rooted in Pancasila values causes the learning process to be partial and less meaningful for students. To address this gap, this research proposes a novelty in the form of the development of a learning medium called Garuda Numerasi Fun. based on Game Based Learning. The uniqueness of this game media lies in the design of its game mechanics which creatively combines the pillars of Pancasila Education (the Garuda Pancasila symbol) with numeracy stimuli that demand problem solving. The name GARUDA symbolizes national identity as well as an abbreviation of the ideas of Game Based, Active learning, Reasoning, Understanding, Data analysis, and Action-oriented. This media is designed in the form of an interactive digital adaptation to provide an immersive, collaborative, and fun learning experience for students. Thus, this media not only trains the left brain through the numeracy aspect, but also touches the affective aspect of students through the values of Pancasila.

Based on the background presented, this study aims to analyze the needs and design Game-Based Learning-based learning media for Pancasila Education subjects and to conduct a limited trial on Pancasila and Civics Education students who are prospective teachers. The results of this study are expected to provide theoretical contributions to the development of GBL-based curriculum integration methodology and practical contributions in the form of innovative learning media solutions for educators in realizing meaningful and relevant Pancasila Education learning in the 21st century.

METHOD

This research uses a Research and Development (R&D) approach with the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. The ADDIE model was chosen because it has systematic stages in developing learning media that are appropriate to user needs and the learning context. The research subjects were 30 students from the PPKn Study Program who were taking the PPKn Learning Planning course. The research was conducted in a limited trial phase to determine the feasibility and student response to the Garuda Numerasi Fun learning media based on Game Based Learning.

Data collection techniques included observation, questionnaires, and documentation. Observations were used to obtain data regarding learning needs and media implementation in the learning process. Questionnaires were used to determine student responses to the developed media, while documentation was used to support the research data in the form of activity photos, media development results, and learning documents.

The research instruments were observation sheets and student response questionnaires compiled based on learning media assessment indicators. The content validity of the questionnaire and media prototype was examined through expert judgment involving one learning media expert and one Pancasila Education material expert. The media expert reviewed visual design, navigation, readability, layout consistency, usability, and technical feasibility. The material expert

reviewed the relevance of Pancasila Education content, suitability of numeracy integration, clarity of learning instructions, and alignment with learning objectives. Suggestions from both experts were used to revise the media prototype and questionnaire items before the limited trial.

The student response questionnaire consisted of 15 items representing five assessment aspects: media appearance, ease of use, media appeal, media usefulness in learning, and potential media implementation in Pancasila Education learning. Each aspect was represented by three items. The assessment used a Likert scale of 1–5 with the following categories: 5 = very good, 4 = good, 3 = sufficient, 2 = less, and 1 = very less (see [Table 1](#)).

Table 1. Questionnaire grid of Garuda Numerasi Fun media feasibility

No	Aspect	Indicator	Items	Example items
1	Media appearance	Visual design, color composition, text readability	3	The visual display of Garuda Numerasi Fun is clear and attractive.
2	Ease of use	Navigation, instruction clarity, operational simplicity	3	The instructions in the media are easy to understand
3	Media appeal	Enjoyment, challenge, student interest	3	The game-based activities make learning more enjoyable
4	Media usefulness in learning	Relevance to material, support for numeracy activity, learning engagement	3	The media helps connect numeracy activities with Pancasila Education content
5	Potential media implementation	Classroom suitability, adaptability, teacher use	3	The media has potential to be used in Pancasila Education learning

The reliability of the questionnaire was examined using Cronbach's Alpha. The reliability test showed an alpha coefficient of 0.87, indicating that the instrument had good internal consistency. However, this study did not conduct construct validity testing through factor analysis because the sample size was limited. This limitation is acknowledged and should be addressed in future studies involving larger samples.

The scope of measurement in this study was limited to media feasibility and user responses. The questionnaire did not measure self-efficacy, creativity, or learning outcomes as dependent variables. Therefore, the data analysis was not intended to test the effectiveness of the media. No pre-test/post-test design, control group, validated self-efficacy or creativity instrument, or inferential statistical procedure was used in this limited trial.



Figure 1. Research Procedure of the =ADDIE Model

The observation data were analyzed descriptively qualitatively, while the questionnaire data were analyzed using quantitative descriptive techniques by calculating the average score and percentage of media suitability using the formula:

$$P = \frac{\Sigma X}{\Sigma X_i} \times 100\%$$

Information:

- P = Percentage of eligibility
- ΣX = Total score obtained
- ΣX_i = Maximum ideal score

The percentage results are then interpreted into media feasibility categories, namely: 81%–100% = very feasible, 61%–80% = feasible, 41%–60% = quite feasible, 21%–40% = less feasible, and 0%–20% = not feasible. The analysis results are used as a basis for evaluating and improving the developed learning media.

RESULT AND DISCUSSION

The Garuda Numeracy Fun media was developed in the form of an educational game based on the Garuda Pancasila symbol. The media utilizes the number of Garuda feathers as a contextual numeracy activity in Pancasila Education learning (see [Figure 1](#)).

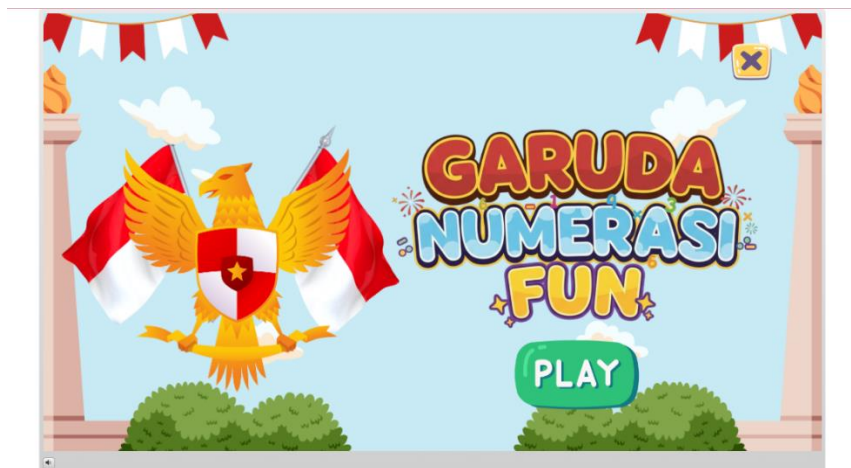


Figure 1. Home screen of *Fun Numeracy Game*

The results of limited trials show that students gave a positive response to the Garuda Numeracy Fun media. Students considered the media interesting, easy to use, and helped create active and enjoyable learning. Based on the limited trial stage of the ADDIE development model conducted on prospective PPKn teacher students in the PPKn Learning Planning course, data was obtained on the feasibility assessment of the Garuda Numeracy Fun media based on Game Based Learning. This assessment measures 5 (five) main aspects using a Likert scale of 1–5. The results of the recapitulation of the feasibility assessment data are presented in [Table 2](#) below:

Table 2. Results of Garuda Numerasi Fun media feasibility

No	Assessment aspects	Average score	Eligibility Percentage	Eligibility Category
1	Media View	4.25	85.00%	Very Worthy
2	Ease of Use	4.40	88.00%	Very Worthy
3	Media Attraction	4.60	92.00%	Very Worthy
4	The Usefulness of Media in Learning Potential	4.50	90.00%	Very Worthy
5	Implementation in Learning	4.35	87.00%	Very Worthy
	Overall average	4.42	88.40%	Very Worthy

Overall, the Garuda Numeracy Fun media achieved an average feasibility percentage of 88.40%, placing it in the Very Feasible category for implementation in Pancasila Education learning. The short trial's findings indicate that prospective PPKn teacher students responded

favorably to Garuda Numeracy Fun media. Students evaluated the media as appealing, user-friendly, helpful for enhancing educational activities, and pertinent to the Pancasila Education environment. With an overall feasibility score of 88.40%, it is classified as very viable. Based on user feedback, this outcome shows that the created media has satisfied the basic feasibility requirements as a learning media prototype. However, the limitations of a small trial should be taken into consideration when interpreting these results. The study did not assess how the media directly affected pupils' character index, education report card results, or numeracy achievement. As a result, there is no factual proof that the media can raise national or regional education indicators. The results just indicate that more testing of the media in larger classroom environments may be possible ([Hilberg, 2023](#)). The high media attractiveness score suggests that the game-based learning strategy may sustain students' interest throughout the educational process ([Tolentino et al., 2024](#)). For aspiring educators, the combination of basic numeracy tasks and Garuda Pancasila symbols offers a contextual learning opportunity. This study relates to the necessity for creative media in Pancasila education, particularly media that include tasks using logical reasoning and civic values ([Husni et al., 2021](#); [Surbakti, 2025](#)). Additionally, the usefulness component scored very feasible. This implies that aspiring educators thought the media was useful for creating more engaging lesson plans. However, it is not yet possible to interpret this view as a rise in self-efficacy or creativity ([Kizi, 2025](#); [Ceh & Lebuda, 2022](#); [Yuldashov, 2025](#)). To more thoroughly investigate the media's efficacy, more study utilizing validated creativity and self-efficacy measures, pre-test and post-test designs, and control groups is required ([Skurka et al., 2023](#)). Garuda Numeracy Fun media can therefore be positioned as a workable and promising prototype for learning in Pancasila Education. Larger samples, more robust experimental or quasi-experimental designs, and more empirical testing involving schoolchildren are still needed for its wider deployment.

However, it is important to interpret these results in the context of a restricted trial. The direct effects of the media on kids' character index, education report card results, and numeracy achievement were not measured in this study. As a result, the findings offer no concrete proof that the media may raise national or regional educational standards. The results just indicate that more testing of the media in larger classroom environments may be possible.

In terms of media appearance, students assessed that the visualization of the Garuda Pancasila symbol and the integration of numeracy visuals were packaged aesthetically, proportionally, and cleanly, thereby reducing cognitive load during learning. In terms of ease of use, the game mechanics adapted into this digital platform have intuitive navigation and are easy for users to understand without requiring complex technical skills. As the highest score, the media's appeal aspect is very feasible because the Game Based Learning approach that challenges students to solve Garuda feather-based numeracy puzzles creates a healthy and fun competitive atmosphere. In addition, the media's usefulness aspect is considered successful in harmoniously bridging the dichotomy between the affective aspect (Pancasila Education) and the cognitive-logical aspect (numeracy literacy). In terms of implementation potential, as prospective PPKn teachers, students see this media as having great potential for replication and application at the elementary (SD) and secondary (SMP/SMA) levels to boost regional education report card scores on literacy and numeracy indicators (see [Figure 2](#)).



Figure 2. Fun numeracy game display counting the wings on the Garuda Pancasila symbol

The Game-Based Learning approach can increase student interaction in learning ([Siti et al., 2022](#)). In addition, the integration of numeracy literacy with national symbols helps students understand that numeracy can be applied in Pancasila Education learning contextually. The Garuda Numeracy Fun media is also considered capable of increasing student creativity in designing innovative learning. The implications of this finding confirm that the Garuda Numeracy Fun media does not merely function as a conventional visual aid, but acts as a catalyst in the reconstruction of learning methodologies for prospective educators. The increase in student creativity in designing innovative learning is triggered by the direct experience (experiential learning) they feel when exploring the media. Research states that experiential learning activities increase student creativity, especially in problem solving and idea generation ([Lie et al., 2025](#)). Studies show that students with experiential learning have higher creativity scores than students in traditional learning environments ([Pillai & Singh, 2024](#)).

This medium successfully eliminates the conventional dichotomous paradigm that often separates the affective domain of Pancasila Education from logical-mathematical reasoning. They do this by harmoniously integrating national values and numerical abilities ([Ramadhani et al., 2025](#); [Jamaludin et al., 2025](#)). The self-efficacy of students preparing to become future teachers increased significantly when they experienced a challenging yet enjoyable game-based learning environment. The ability to incorporate national symbols into the logical structure of numeracy provides a new empirical reference that character education can be delivered without losing its cognitive depth ([Leal Ramirez, 2025](#); [Nsiangani, 2023](#)). Furthermore, the potential for replicating this media at the elementary and secondary school levels offers a tactical solution to the problem of low literacy and numeracy competencies often reflected in educational report cards in various regions. Rigid learning patterns, conventional teaching methods, and a lack of contextualization of material have been identified as the main causes of students' academic failure. Highly organized methodologies often lead to rigid learning patterns that prioritize conformity and compliance over creativity and critical thinking. These methods can lead to disengagement and academic failure by suppressing intellectual freedom and adaptability. The lack of flexibility in the learning environment can lead to unstable learning patterns as students struggle to connect with the material in meaningful ways ([Nurbayanni et al., 2023](#)).

School teachers can create more dynamic and inclusive classrooms by using the Garuda Numeracy Fun adaptive mechanism. This method not only improves students' cognitive abilities in solving numeracy puzzles but also helps them understand the values of Pancasila as the foundation of their character ([Alanur et al., 2023](#)). Teachers must be able to create a fun learning atmosphere so that students feel enthusiastic and excited in participating in each learning activity ([Ababilayka & Suriansyah, 2023](#)). Overall, teachers as facilitators are responsible for ensuring that every element of learning, from the media to the methods used, contributes to the creation of a meaningful learning experience ([Mardin et al., 2025](#)) and is not boring for students. By

integrating technological elements, it is hoped that it can improve the quality of learning while creating a more lively classroom environment ([Rahmatullah et al., 2023](#)). Therefore, the use of innovative media like this to improve the abilities of prospective PPKn teachers is a strategic step that not only focuses on fulfilling curriculum targets but also on the cultural transformation of learning that is more meaningful, contextual, and relevant to the challenges of the 21st century ([Astiya et al., 2026](#); [Jamaludin et al., 2024](#); [Sukmawati et al., 2024](#)).

CONCLUSION

This study concludes that Garuda Numeracy Fun is a feasible game-based learning medium for integrating numeracy literacy into Pancasila Education. The media was developed to answer the research objective, namely to design an interactive learning medium that connects Pancasila values with numeracy-based problem-solving activities. The findings show that Garuda Numeracy Fun can support more contextual, active, and learner-centered Pancasila Education learning without reducing the moral substance of Pancasila values.

This study contributes to the development of cross-curricular learning media by showing that numeracy can be integrated into civic and character education through game-based learning. Practically, this media can help prospective teachers design more creative and meaningful learning scenarios. It also offers an alternative learning innovation for improving numeracy competence and character education, especially in regions that still face challenges in education report card indicators.

This research has successfully reconstructed an innovative game-based learning (GBL) media called Garuda Numerasi Fun. It was specifically created to incorporate numeracy literacy into the Pancasila education content. The success of this development empirically demonstrates that using game mechanics based on national symbols, such as displaying the Garuda bird feathers from the past, can naturally improve students' numerical logic skills without changing the substance of Pancasila's moral values. This research provides a significant theoretical contribution to the discussion on cross-subject curriculum integration, or cross-curricular integration. Effectively, the Garuda Numerasi Fun media helps prospective educators increase their creativity and independence as they create dynamic, immersive, and learner-centered learning scenarios. This media has many benefits and offers solutions for policymakers and education practitioners in the region to improve national education report card scores, especially for numeracy competency indicators and character indexes, which are currently still major challenges in Central Sulawesi.

However, this development research is still limited to a small-scale pilot test at the pre-service teacher level. Future researchers should conduct large-scale, ongoing effectiveness testing at the elementary and secondary school levels. To strengthen the product's generalizability at the national level, further studies on the impact of GBL integration on the retention of civics concepts and the numerical problem-solving abilities of students in disadvantaged, frontier, and outermost (3T) regions are crucial.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, S.N.A.; methodology, J. and S.A.; investigation, S.N.A.; data curation, S.N.A.; formal analysis, S.N.A. and H.; writing, original draft preparation, S.N.A.; writing, review and editing, H. and N.; supervision, J., S.A., and N. All authors have read and agreed to the published version of the manuscript.

AI DISCLOSURE STATEMENT

The authors used Napkin AI during the preparation of this manuscript to assist in creating and designing figures and diagrams, and SciSpace to assist in identifying and exploring relevant literature. The use of these tools was limited to supporting the preparation of the manuscript. The authors thoroughly reviewed and verified the information and content generated or identified with

the assistance of these tools, and take full responsibility for the content, accuracy, and integrity of the published work.

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