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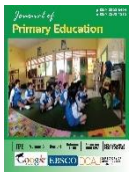

Gamified Branching Scenario Innovation with Lumi Education: Transforming Elementary School Students' Decision-Making and Science Literacy

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Abstract

This study aims to analyze the effect of Gamified-Branching Scenarios supported by Lumi Education on elementary school students' science literacy and decision-making skills, as well as to describe students' responses to the implemented learning. The study employed a mixed-methods approach with an explanatory sequential design, integrating quantitative and qualitative data to provide a more comprehensive understanding of learning outcomes and processes. The participants were 50 elementary school students, consisting of 25 students in the experimental class and 25 students in the control class. Data were collected through science literacy tests, decision-making tests, observations, questionnaires, and interviews. The results showed that the average science literacy score in the experimental class increased from 34 to 54, while in the control class it rose from 21 to 26. The average decision-making score in the experimental class increased from 50 to 74, compared to 46 to 53 in the control class. Statistical analysis indicated a significant effect on decision-making skills, but there was no significant difference in overall science literacy. However, indicator-based analysis showed improvement in all aspects of science literacy. Thus, Lumi Education-assisted learning creates an interactive experience, increases student engagement, and supports the development of decision-making skills in elementary school science learning.

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INTRODUCTION

Decision-making skills and scientific literacy are two important competencies that need to be developed starting in elementary school because they support students in understanding scientific concepts, analyzing information, and responding responsibly to real-world problems (Karahan et al., 2023; Luzyawati et al., 2025; Dewi et al., 2021; Calisici & Yildiz, 2025). Among elementary school students, decision-making skills remain average, while critical thinking dispositions have been shown to predict the quality of their decision-making (Karahan et al., 2023; Calisici & Yildiz, 2025). Scientific literacy also requires special attention because its improvement requires identifying root causes and appropriate learning strategies (Luzyawati et al., 2025; Hikami et al., 2025; Kartika et al., 2026).

Ideally, science learning in elementary schools should provide students with opportunities to actively gather information, question, reason, discuss, analyze, and synthesize as a foundation for developing scientific skills and decision-making (Yulia et al., 2025; Guler, 2025; Kusumawardani et al., 2022). Learning should also involve real-world problems so that students become accustomed to weighing options and making decisions based on relevant information (Nisrina et al., 2025; Öztürk et al., 2024; Guler, 2025; Hikami et al., 2025). For scientific literacy, learning media or activities should ideally be integrated with scientific literacy indicators so that conceptual understanding does not stop at memorization (Septiani et al., 2024; Hikami et al., 2025; Dewi et al., 2021).

However, this ideal condition has not yet been fully achieved. Barriers to science learning in elementary schools still include low interest and motivation to learn, as well as monotonous or conventional learning activities (Wibawa et al., 2023; Hikami et al., 2025; Putri et al., 2024). Low scientific literacy is also related to a lack of active student engagement, resulting in learning that tends to result in memorization without adequate conceptual understanding (Ramadhani et al., 2024; Hikami et al., 2025). In terms of decision-making, most elementary school students still rely on intuition, and making decisions on complex issues remains difficult to do analytically (Sutinah et al., 2023; Calisici & Yildiz, 2025).

Various studies have shown that promising solutions include the use of problem-based learning, socio-scientific issues, and interactive digital media (Hikami et al., 2025; Guler, 2025; Putri et al., 2024). Problem-based learning improves students' scientific attitudes compared with conventional learning and enhances motivation, creativity, and critical thinking (Wibawa et al., 2023; Kusumawardani et al., 2022). Problem-solving methods also improve science decision-making skills, with average scores increasing from 50.48 to 91.01 after treatment (Widya Murni et al., 2022; Calisici & Yildiz, 2025). On the other hand, interactive multimedia, e-modules, and educational games are effective in improving elementary school students' scientific literacy in the moderate category (Ismaniati et al., 2023; Septiani et al., 2024; Suryanti et al., 2021; Dewi et al., 2021; Kartika et al., 2026; Febrianti et al., 2025).

In the context of this research, the decision-making framework developed by Sutinah et al. (2023) was used as the primary reference in measuring the dependent variable, decision-making ability. According to Sutinah et al. (2023), comprehensive decision-making ability encompasses five essential indicators: identifying problems, generating alternative solutions, evaluating alternative solutions, making choices, and evaluating the effectiveness of choices. This framework is relevant because it not only assesses the outcome of students' decisions but also examines the thought processes underlying rational and systematic decision-making (Calisici & Yildiz, 2025; Tobias et al., 2025). Furthermore, it is crucial to align scientific literacy indicators with the urgency of educational reform to enable students to think critically in problem-solving (Kusumawardani et al., 2022). Scientific literacy is now viewed as an essential competency for understanding phenomena, applying knowledge, and making decisions based on empirical evidence (Dewi et al., 2021).

In this study, the scientific literacy indicators refer to Bilad et al. (2024), which encompass three main dimensions: explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting data scientifically (Hikami et al., 2025). Integrating these three indicators into a gamified branching scenario is expected to improve students' academic achievement while equipping them with adaptive reasoning skills (Bilad et al., 2024; Putri et al., 2024; Febrianti et al., 2025).

The intervention used in this study was a gamified branching scenario innovation supported by Lumi Education. The use of Lumi Education in interactive media has been reported to increase student interest, motivation, participation, learning outcomes, and potentially develop critical thinking and communication skills (Yulia et al., 2025; Gironella, 2023; Febrianti et al., 2025). Pedagogically, branching scenarios in the H5P ecosystem are also seen as having the potential to support a more directed and independent learning process, although their implementation still needs to be aligned with clear pedagogical objectives (Kerr et al., 2025; Guler, 2025; Putri et al., 2024). In terms of state of the art, previous research shows a fairly consistent pattern that interactive digital media, gamification, issue-based scenarios, and rational decision models tend to increase learning engagement and support the development of scientific literacy, critical thinking, and decision-making in elementary school students (Öztürk et al., 2024; Rahayu et al., 2026; Suryanti et al., 2021; Gironella, 2023; Guler, 2025; Calisici & Yildiz, 2025). SSI-based multimedia increases scientific literacy from level 3 to level 4 with an N-gain of 0.4, while Genially-based educational games show an N-gain of 0.573 (Septiani et al., 2024; Suryanti et al., 2021; Hikami et al., 2025). Scenario-based teaching based on SSI also significantly improves decision-making skills, but not all studies show equally strong effects, so evidence for decision-making outcomes varies across interventions (Öztürk et al., 2024; Calisici & Yildiz, 2025; Tobias et al., 2025).

The novelty of this research lies in the integration of gamification, branching scenarios, and Lumi Education in a single intervention to simultaneously target two outcomes: decision-making skills and scientific literacy in elementary school students (Yulia et al., 2025; Gironella, 2023). Previous studies have often focused on one aspect, such as scientific literacy, decision-making, or critical thinking, separately (Öztürk et al., 2024; Rahayu et al., 2026; Septiani et al., 2024; Dewi et al., 2021; Calisici & Yildiz, 2025). Therefore, this study fills the gap in integrating Lumi-based interactive media with gamified branching scenarios to simultaneously develop these two competencies (Kerr et al., 2025; Yulia et al., 2025; Putri et al., 2024; Febrianti et al., 2025).

Based on this description, this study aims to analyze the effect of using gamified branching scenarios supported by Lumi Education on elementary school students' scientific literacy and decision-making skills, as well as examine student responses to the applied learning. This objective aligns with the need to develop more interactive, contextual, and 21st-century skills-oriented elementary science learning (Nisrina et al., 2025; Yulia et al., 2025; Kusumawardani et al., 2022).

METHOD

This research uses a mixed approach. methods) with sequential design explanatory (sequential explanatory This design involves the collection and analysis of quantitative data in the first stage, which is then followed by the collection and analysis of qualitative data to provide a more in-depth explanation of the quantitative findings. The selection of a sequential explanatory design is based on the need to not only measure the effectiveness of gamified learning models, branching scenarios assisted by Lumi Education on students' decision-making abilities and scientific literacy, but also to explore in depth students' learning experiences and teachers' perceptions during the implementation of the innovation. The study was conducted at an elementary school in Baleendah

District. Bandung Regency in May of the even semester of the 2025/2026 academic year. The research subjects consisted of 50 fifth-grade students and one fifth-grade teacher selected using a purposive sampling technique. This strategy was chosen to ensure that the data obtained were relevant to the characteristics of the subjects and the specific needs of the research. This is in line with the characteristics of mixed-method research. Methods that combine the strengths of quantitative methods for generalizing results and qualitative methods for gaining a complete contextual understanding

Explanatory Sequential Design Scheme according to Creswell & Clark (2011) used in the study. The method is described on Figure 1:

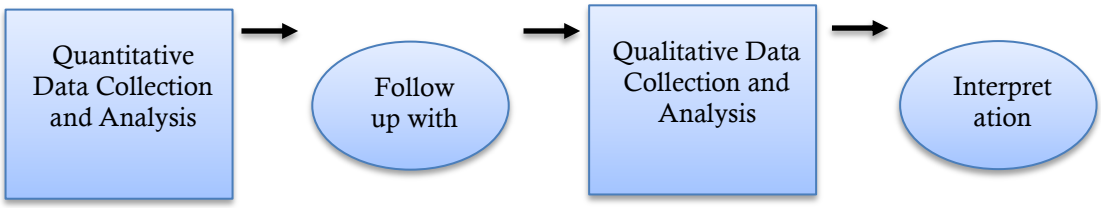


Figure 1 Explanatory Sequential Design Scheme

The research instruments used included decision-making ability and science literacy tests, observation sheets, interview guidelines, and student response questionnaires. According to Arikunto (2021), research instruments must meet validity and reliability requirements to ensure the data obtained accurately reflects the conditions under study. Quantitative data were analyzed using inferential statistics to test the effect of the learning model, while qualitative data were analyzed descriptively through stages of reduction, presentation, and conclusion drawing to strengthen the quantitative results.

Data integration is carried out systematically to gain a more comprehensive understanding of the application of gamified innovation. Branching scenario assisted by Lumi Education. The combination of quantitative and qualitative data is a key characteristic of mixed-methods research. Methods aimed at producing more valid, accurate, and reliable findings. This process allows researchers to triangulate, which not only increases the credibility of the findings but also provides a holistic view of the dynamics of learning in elementary schools.

Table 1. Layout of the Decision-Making Ability and Science Literacy Test

Variables	Indicator	Sub-indicator
Decision-making Ability	Identification Problem	The ability to recognize problems, understand situations, and determine the core issues that must be resolved.
	Produce choice	The ability to put forward several possible solutions or actions.
	Evaluate alternative	The ability to compare the advantages, disadvantages, risks and benefits of each choice.

	Determine and implement choice.	The ability to choose the most appropriate alternative and apply it in real action.
	Evaluate effectiveness of choice.	The ability to assess the results of decisions that have been taken and consider improvements if necessary.
Science Literacy	Scientifically explain phenomena.	The ability to explain natural events or phenomena based on scientific concepts, facts and principles.
	Evaluate and design investigation.	The ability to assess investigative procedures and design experimental or observation steps logically.
	Interpreting data and scientific evidence	The ability to read, analyze, and draw conclusions from data, tables, graphs, or scientific evidence.

Table 2 Student Response Questionnaire Grid

Indicator	Statement Number	Number of items
Showing a liking for the Gamified Branching Scenario assisted by Lumi Education	1.2.3.4,5.6.7.8.9.10	10
Student activities in groups	11.12.13.14,15.16.17.18.19.20	10
Benefits of Decision-Making Ability and Scientific Literacy	21.22.23.24.25.26.27.28.29.30	10

To analyze student responses to the *Gamified learning Branching Scenario,* Lumi *Education conducted activities* such as scoring "answers strongly agree (4), agree (3), disagree (2), and strongly disagree (1)". Calculating scores for each indicator and giving value

$V = \frac{f}{N}\ x\ 100\%$

Information:

Percentage

f The score obtained

Maximum Score

Classification of interpretations of student responses to *Gamified learning Branching Scenario Lumi Education's* rocky as follows

:

Table 3 Criteria response participant educate to learning

Score Interval	Student Response Categories
0%−20%	Very Bad
21%−40%	Not good
41%−60%	Pretty good
$61\% - 80\%$	Good

81% – 100%	Very good

The implementation of interviews in this study used a semi-structured approach with the preparation of general questions directed at students' abilities in solving mathematical problems, to obtain additional in-depth data related to the results of tests on students' decision-making abilities and scientific literacy.

RESULTS AND DISCUSSION

This study aims to analyze the influence of the use of *Gamified-Branching A scenario* using *Lumi Education* on elementary school students' scientific literacy and decision-making skills. Learning in the experimental class was conducted using *Gamified-Branching media. The scenario* allows students to engage in problem-based digital adventures, while the control class follows regular learning.

During the learning process, students in the experimental class are confronted with various science problems presented in branching scenarios. At each stage, students must make choices based on the available information. Each decision has different consequences, providing a more interactive and contextual learning experience. This activity encourages students to connect science concepts to real-life situations while also practicing their ability to consider various decision alternatives.

The results of the study showed an increase in scientific literacy skills in the experimental class. Based on the pretest and posttest results, the average score of students' scientific literacy increased from 34 to 54. The lowest score increased from 17 to 31, while the highest score increased from 61 to 69. Meanwhile, in the control class, the average score only increased from 21 to 26, with the lowest score increasing from 6 to 8 and the highest score increasing from 31 to 42.

Table 4 Results of the Pretest and Posttest of Scientific Literacy

Class	Pretest	Posttest	Improvement
Experiment	34	54	20
Control	21	26	5

This increase shows that learning using Gamified-Branching Scenarios can help students grasp science concepts better than traditional learning. Through contextual problem presentation and immediate feedback at each branch, students have the opportunity to actively explore science concepts, thereby developing a more meaningful understanding.

To determine the effectiveness of the increase, a statistical analysis was conducted using SPSS. The results of the normality test showed that the significance value of the N-Gain of scientific literacy in the experimental class was 0.007 and in the control class was 0.066. Furthermore, the results of the homogeneity test showed that the data of both classes had homogeneous variance because the significance value was greater than 0.05. Based on the results of the Independent Sample t- Test analysis, a Sig. (2-tailed) value of 0.009 was obtained with an average N-Gain of the experimental class of 0.3028 and the control class of 0.4148. These results indicate a difference in the increase in scientific literacy between the two classes after the implementation of learning.

In addition to scientific literacy, this study also measured students' decision-making abilities. The results showed that the average decision-making ability in the experimental class increased from 50 to 74. The lowest score increased from 20 to 45, while the highest score remained at 90. In the control class, the average score only increased from 46 to 53

.

Table 5 Results of the Pretest and Posttest of Decision-Making Ability

Class	Pretest	Posttest	Improvement
Experiment	50	74	24
Control	46	53	7
Control	46	53	7

The results show that students who learn *using Gamified-Branching Students in the scenario class* experienced a greater improvement in decision-making skills compared to students in the control class. Through branching scenarios, students were required to identify problems, consider alternative courses of action, predict the consequences of each option, and determine the most appropriate decision based on the available information. This activity directly trains reflective thinking and decision-making, essential 21st-century skills.

Statistical analysis shows that the significance value of the N-Gain normality test for decision-making ability in the experimental class is 0.020 and in the control class is 0.006. Furthermore, the results of the homogeneity test using Levene's test obtained a significance value of 0.636, indicating that both groups had homogeneous variance. The results of the Independent Sample t- Test showed a Sig. (2-tailed) value of 0.000 with an average N-Gain of the experimental class of 0.4436, while the average N-Gain of the control class was 0.0972. This finding indicates that the increase in decision-making ability in the experimental class was much higher than in the control class.

More clearly, the increase in the two dependent variables above can be seen in the following graph:

Figure 2 Analysis of Science Literacy Indicators

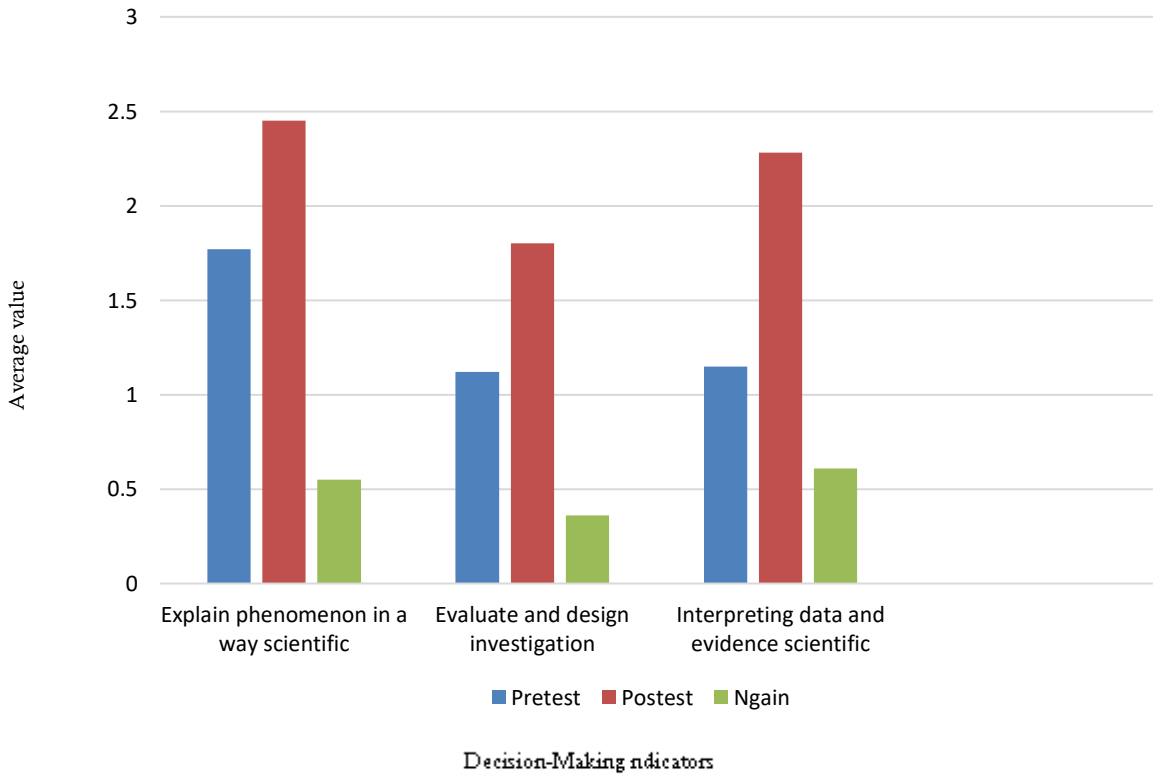
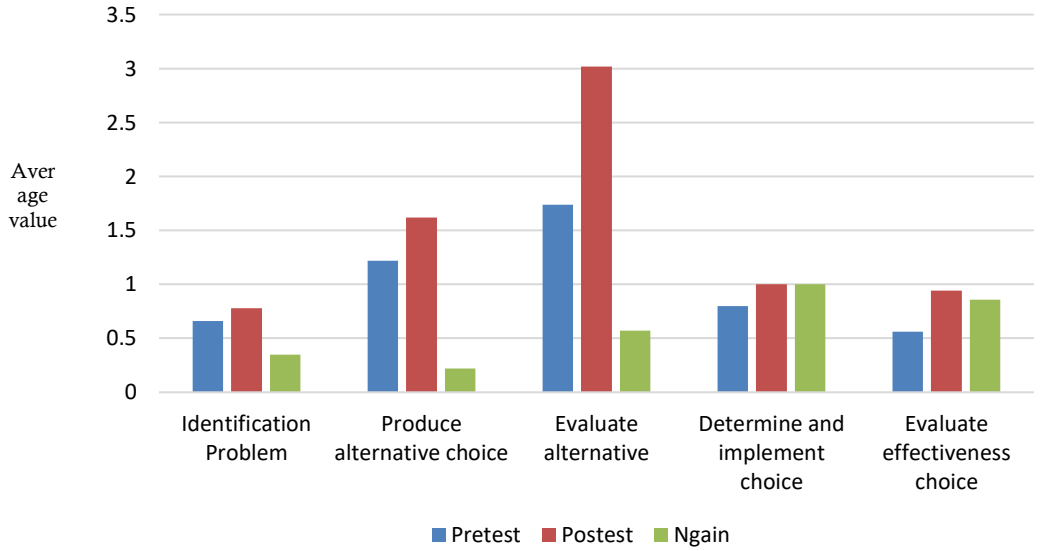


Figure 3: Analysis of Decision-Making Indicators



Students' science literacy and decision-making skills in the experimental class both showed improvement after learning using the Gamified-Branching Scenario with the help of Lumi Education. In terms of science literacy, improvements were seen across all indicators: explaining phenomena scientifically increased from 1.77 in the pretest to 2.45 in the posttest with an N-gain of 0.55, categorized as medium; evaluating and designing scientific investigations went from 1.12 to 1.80 with an N-gain of 0.36, also medium; and interpreting data and scientific evidence rose from 1.15 to 2.28 with an N-gain of 0.61, again in the medium category. These results indicate that students are getting better at connecting science concepts with phenomena, understanding the steps of investigations, and interpreting data to draw conclusions based on scientific evidence. Along with that, students' decision-making abilities also improved across each indicator, including identifying problems from 0.66 to 0.78 with an N-gain of 0.35 in the medium category, generating alternative solutions from 1.22 to 1.62 with an N-gain of 0.22 in the low category, evaluating alternatives from 1.74 to 3.02 with an N-gain of 0.57 in the medium category, selecting and implementing choices from 0.80 to 1.00 with an N-gain of 1.00 in the very high category, and evaluating the effectiveness of choices from 0.56 to 0.94 with an N-gain of 0.86 in the high category. Overall, these findings show that the learning applied not only supports students' development in understanding and using science concepts but also strengthens their skills in recognizing problems, considering alternatives, making decisions, and reassessing the effectiveness of the decisions they've made.

This improvement is supported by the results of statistical analysis using SPSS. In the scientific literacy variable, the average N-Gain value for the experimental class was 0.3028, and the control class was 0.4148.

The results of the independent-samples t-test showed a significance value (Sig . 2-tailed) of 0.009, indicating a difference in scientific literacy results between classes using Gamified-Branching. Scenario Lumi Education- assisted classes and classes using conventional learning. Meanwhile, for the decision-making ability variable, the average N-Gain was 0.4436 in the experimental class and 0.0972 in the control class. The results of the Independent Sample t- Test showed a significance value of 0.000, indicating a significant difference between the two groups. These results indicate that the use of Gamified Branching Scenario Lumi Education- assisted learning provides a greater contribution to improving decision-making abilities than conventional learning.

The results of this study show that the use of Gamified Branching Scenario Lumi Education- assisted learning effectively improves

elementary school students' scientific literacy and decision-making skills. The improvement was greater in the experimental class than in the control class, both in scientific literacy and decision-making, indicating that the intervention performed better than conventional learning. This finding aligns with research on SSI-based interactive multimedia, which effectively improves elementary school students' scientific literacy with a moderate N-gain (Suryanti et al., 2021), as well as research on interactive e-modules, which also showed significant improvements in scientific literacy (Ismaniati et al., 2023).

In the aspect of decision making, the results of this study are also consistent with scenario-based studies. SSI-based teaching has been proven to significantly improve elementary school students' decision-making abilities. (Öztürk et al., 2024)This finding is reinforced by other research showing that problem-solving methods can improve science decision-making skills (Widya Murni et al., 2022), and that collaborative strategies Reasoning helps the acquisition and transfer of decision-making skills (Bayat et al., 2022). Thus, the results of this study show that when students are exposed to branching situations, choices, and the consequences of decisions in contexts close to their lives, their decision-making abilities are further developed.

Theoretically, these results can be explained through constructivism, meaningful learning, and socioscientific approaches. Issues. Students actively construct knowledge as they interact with problems, explore options, and reflect on the consequences of decisions made. (Suryanti et al., 2021) ;(Relmasira et al., 2023). In addition, the SSI context and branching scenarios make learning more relevant, interactive, and encourage multi-perspective evaluation, which ultimately supports scientific literacy and decision-making (Öztürk et al., 2024**;** Rahayu et al., 2026). However, several studies have shown that the influence of scenario learning or SSI on decision-making is not always the same, because it is influenced by the learning design, discussion intensity, and student characteristics (Öztürk et al., 2024). Therefore, the strength of this research's results likely lies in the harmonious integration of gamification, branching, and learning strategies. Scenario and Lumi Education media.

Overall, the added discussion can confirm that the results of this study are supported by previous research and are theoretically sound, especially because the intervention combines digital interactivity, real-world problem context, reasoning exercises, and active decision-making.

These quantitative findings align with observations of learning implementation, which indicate that the learning process is proceeding well. Teacher activity achieved an implementation percentage of 76%, while student activity reached 82%. The high level of student engagement indicates that the learning implemented is active and student-centered. (student-centered learning). Although several stages were not implemented optimally due to time constraints, such as the Image feature assistance, Hotspots, and story path reconstruction branching, students are still able to explore these features independently on their respective devices. Students' success in utilizing these interactive features demonstrates that Lumi Education media can encourage independent learning and increase student participation during the learning process.

The improvement of students' decision-making abilities cannot be separated from the main characteristics *of Gamified-Branching. Scenarios* that place students at various decision-making *points points*). At each stage, students are faced with several alternative actions that have different consequences for the environment. This situation encourages students to consider various possibilities before making a choice. Furthermore, the *retry feature* allows students to repeat scenarios when they achieve less than optimal results. The opportunity to try again and correct mistakes helps students develop evaluative skills and consider the impact of each decision.

Interviews with students further strengthened these findings. Students revealed that they felt challenged when having to make

choices in scenarios because each decision had different consequences. The experience of facing failure (*game over*) and trying again made students more cautious in their subsequent decisions. Through this process, students learned to understand the cause-and-effect relationships of each action, thus developing optimal decision-making skills.

In addition to having an impact on decision-making capabilities, the use of *Gamified-Branching Scenario* assisted *Lumi Education* also contributes to improving students' scientific literacy. During learning, students are required to gather information, identify problems, analyze data, and use scientific evidence as a basis for making choices. These skills are demonstrated when students create and present Journey Maps that show the decision paths they choose during the learning process. Students can explain the reasons for their chosen actions and relate them to their impact on the environment. This activity demonstrates that students not only understand scientific concepts theoretically but also can apply them in everyday life.

These findings are also supported by the results of the student response questionnaire, which showed an average percentage of 87%, categorized as Very Good. The indicator of enjoyment of learning achieved the highest percentage at 90%, while the indicators for group activity and the benefits of scientific literacy and decision-making each achieved percentages of 86%. These high percentages indicate that students responded very positively to the use of *Gamified Branching. Scenario-assisted Lumi Education*. Students find learning more engaging, enjoyable, and challenging than conventional learning.

Interview results showed that students enjoyed this learning experience because they felt as if they were playing an adventure game that required them to save the environment through various action choices. Furthermore, the branching scenarios presented encouraged active group discussions. Students exchanged opinions and considered various alternative solutions before deciding on the most appropriate decision. This created a collaborative learning environment and increased student engagement throughout the learning process.

Overall, the research results show that the implementation *of Gamified-Branching Scenario* assisted *Lumi Education* in creating interactive, contextual, and meaningful learning. The integration of gamification elements, story branching, direct feedback, and the presentation of environmental issues close to students' lives has been proven to improve scientific literacy and decision-making skills. These findings indicate that *Lumi Education- based learning innovations* are not only effective in improving cognitive learning outcomes, but also capable of developing critical thinking skills, the ability to analyze scientific evidence-based information, and responsible decision-making skills in addressing various environmental issues.

Socio-scientific issues, but this capacity is still limited (Sutinah, Widodo, Muslim, & Syaodih, 2023). This is in line with the results of previous studies, which confirmed that although elementary school students are capable of making decisions, the process is still limited because it is highly dependent on the students' personal values, knowledge, and experience (Sutinah et al., 2023). This low ability, especially in identifying problems, reflects the cognitive challenges that elementary school students face at the concrete operational stage, so they tend to rely on intuition rather than systematic analytical reasoning (Sutinah et al., 2023).

This limitation is reinforced by the fact that climate change issues and other socio-scientific issues are often considered too complex for elementary school students, especially because the material has not been taught explicitly in the formal elementary school curriculum (Sutinah et al., 2023). According to experts, analytical decision-making skills require adequate information, the ability to process the complexity of information, and sufficient experience to evaluate the pros and cons of a choice (Sutinah et al., 2023). Minimal exposure to contextual issues and structured decision-making practices in schools are the main inhibiting factors that cause students to fail to develop high-level reasoning (Sutinah et al., 2023; Widya Murni et al., 2022).

On the other hand, recent research shows that intervention through the use of interactive multimodal digital teaching materials based on socio-scientific issues can significantly improve students' ability to read socio-scientific texts and think critically (Sutinah et al., 2023). This supports the argument that when students are given contextual and interactive learning materials, they can more actively explore, analyze, and evaluate information rather than just memorizing facts (Sutinah et al., 2023). The use of rational decision-making learning models and problem-solving methods has been proven effective because it provides a framework for students to identify problems, generate alternative solutions, and logically evaluate the effectiveness of these choices (Sutinah et al., 2023; Murni et al., 2022).

These results strongly imply that education in Indonesia needs reform, particularly in addressing the challenges of literacy and critical thinking highlighted in the PISA data (Bilad, Zubaidah, & Prayogi, 2024). The low science and mathematics literacy scores of Indonesian students in the 2022 PISA are not solely a matter of curriculum design, but also a matter of poorly contextualized content delivery (Bilad, 2024). et al. , 2024). Therefore, integrating socioscientific issues into multimodal teaching materials is a strategic step. As stated in the literature, data-driven interventions and student-centered approaches, such as those implemented in curricula that encourage critical thinking skills, are crucial for bridging the gap in student achievement (Bilad et et al., 2024).

Overall, the dialogue between the results of this study and related literature confirms that decision-making and critical thinking skills are not innate abilities, but rather competencies that must be trained gradually (Sutinah et al., 2023; Murni et al., 2022). By combining an innovative multimodal approach and a structured decision-making model, elementary school students can be facilitated to transform from intuitive decision-makers to more rational, critical, and responsible decision-makers regarding issues in their environment (Sutinah et al., 2023; Murni et al., 2022). This effort not only improves students' academic abilities but also prepares them to participate in sustainable and competitive national development in the global era (Bilad et et al., 2024).

CONCLUSION

Gamified-Branching Learning Scenario: The Lumi Education- assisted learning model has a positive impact on elementary school students' decision-making skills and scientific literacy. This is demonstrated by the analysis results, which show that the improvement in both skills in the experimental class was greater than in the control class after the learning implementation. In decision-making skills, students in the experimental class showed better development in recognizing problems, considering alternative options, making decisions, and understanding the consequences of those decisions. Meanwhile, in terms of scientific literacy, students in the experimental class showed improvement in understanding scientific concepts, interpreting information, and linking scientific knowledge to contextual situations in learning.

The results of the descriptive analysis also show that after participating in learning with Gamified-Branching Scenario through Lumi Education, students' decision-making skills and scientific literacy are in a better condition compared to before the learning. This improvement shows that learning that combines elements of gamification, branching scenarios, and interactive digital media can create a more active, challenging, and meaningful learning experience. Students not only act as recipients of information, but also directly engage in the process of thinking, evaluating choices, and building scientific understanding through a participatory learning flow.

Qualitative findings show that students with high ability can understand problem situations well, make logical choices, and connect scientific concepts to their decisions. Students in the medium category have demonstrated quite good abilities, although they still need guidance in explaining the reasons for their decisions and communicating their scientific understanding

more fully. Meanwhile, students in the low category still have difficulty systematically analyzing alternatives and understanding scientific concepts in depth. Nevertheless, overall, this learning continues to show a positive trend in fostering student development.

In addition, the responses of teachers and students to the use of the Gamified-Branching Scenario, the Lumi Education- assisted learning model, fall into the positive category. Learning is considered more engaging, interactive, and able to increase student motivation and engagement throughout the learning process. Teachers also gain innovative learning media alternatives to create a more varied, contextual classroom environment that meets the needs of elementary school students. Therefore, this learning innovation can be viewed as an effective alternative to support the transformation of elementary school students' decision-making skills and scientific literacy, while simultaneously making the learning process more relevant and meaningful.

For readers, this research can serve as a reference regarding the importance of utilizing innovative digital learning media to support the development of thinking skills and scientific literacy in elementary school students. For teachers, Gamified-Branching Scenario Lumi Education- assisted learning strategies can be used as alternative learning strategies to increase student engagement, motivation, and the quality of the learning experience. Future researchers can expand this research to include a broader sample size, materials, and levels, and integrate it with other variables such as critical thinking, learning motivation, or learning outcomes to gain a more comprehensive understanding of the effectiveness of this learning implementation.

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