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SNAKES AND LADDERS GAME MEDIA DEVELOPMENT FOR GEOGRAPHY LEARNING

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ABSTRACT

This research addresses many students' common challenges: difficulty understanding learning material, lack of motivation, passivity in class, and suboptimal learning outcomes. To tackle these issues, the researchers This research employed the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The research participants comprised 34 students from class XIA at SMAN 2 Palu. Data collection techniques included tests, questionnaires, and observations. The Snakes and Ladders game underwent rigorous validation at several levels: validity of the material covered, resulting in a 100% score (very high category). The game design and components were evaluated by media specialists, receiving a perfect 100% score, indicating a very high quality of the physical product. Education practitioners assessed the game's feasibility and value in real classroom settings, giving it a 97.91% rating (very high category). Furthermore, a trial with a small student group demonstrated remarkable improvements in academic performance. The average normalized learning gain (N-gain) was 0.71, falling into the "very high" category. This means the game was highly effective in helping students learn and retain geographical concepts. In summary, this meticulously designed educational game was valid (as judged by experts) and practical (as shown by student outcomes). It has the potential to make geography education much more engaging and fruitful. The researchers suggest future studies explore the Snakes and Ladders game development format to teach different subjects or topics.

Keywords: *media; learning; snakes and ladders game*

INTRODUCTION

Geography education is crucial in developing students' understanding of the relationship between humans and the surrounding environment (Indrayani et al., 2021). It encompasses various branches, such as physical and social geography, which provide insights into using natural resources to meet human needs (Aksa, 2019). These resources are vital for sustaining life, creating employment opportunities, and fostering economic and national development

(Sachan et al., 2024). Geography education offers several benefits in conserving natural resources (Mandasari et al., 2024): 1) Promoting environmental awareness: Geography education cultivates attitudes that encourage eco-friendly practices, such as energy conservation and proper waste management (Hilmi Rachmadian et al., 2024; Mandasari et al., 2024). 2) Facilitating sustainable resource management: Geographic data mapping and analysis aid in development planning and land use, ensuring efficient resource management and considering the needs of future generations (Agustin et al., 2023; Robi'in, 2017; Zulfi KH, 2023). 3) Mitigating environmental impacts: Through geography education, students learn how to minimize the negative consequences of natural resource exploitation (Kindo et al., 2024; Salimian et al., 2024). 4) Enabling appropriate spatial policies and planning: Geography education provides an understanding of environmentally friendly regional spatial planning that prioritizes the balance of natural resource management (Sumarmi et al., 2023). 5) Teaching about natural resources: Geography education covers various aspects of natural resources, including their types, distribution, potential, utilization, conservation efforts, and environmental issues resulting from their exploitation. This knowledge enables the development of sustainable solutions that balance human needs and environmental sustainability (Amin et al., 2020; Wibowo et al., 2023). In essence, geography education builds awareness of the importance of maintaining and managing natural resources sustainably, aligning with the global challenges of the 21st century (Kamil et al., 2020).

The rapid increase in local and global population growth rates is driving a significant rise in the demand for natural resources, resulting in environmental crises and climate change. The unequal distribution of natural resources and heightened exploitation can exacerbate conflicts and threaten national and international stability (Lessmann & Steinkraus, 2019). Addressing these challenges must begin with small, individual actions.

Sustainable development is paramount as it balances economic growth, environmental protection, and social justice (Septianda, 2024). It also ensures that the needs of the current generation are fulfilled without jeopardizing the ability of future generations to meet their

requirements (De Sisto et al., 2024). Through geography learning, students become aware that even the most minor actions can have local and global consequences. Students need to grasp the intricate relationship between humans and the environment. By doing so, they can develop into a wise generation that utilizes natural resources responsibly, considering future generations' needs.

Geography education offers various roles and benefits, but it also has several limitations, including that learning outcomes have not been optimized, students show less interest and motivation in learning geography, some students perceive geography learning material as extensive and challenging, students perceive geography education as heavily reliant on memorization rendering it less engaging, and students are passive and hesitant to express their opinions.

Considering the complexity of geography material and these challenges, innovation in geography education is necessary to make the delivery of content more interesting and easily understandable (Listiqowati, 2021). One potential solution is the development of creative, unique, and engaging learning media, such as the Snakes and Ladders educational game.

The Snakes and Ladders game media can seamlessly integrate play and learning activities in a single experience (Rikawarastuti et al., 2018). This game media has been proven to enhance understanding and student activeness, increase student absorption and learning motivation, boost students' confidence in expressing their opinions, leading to improved learning outcomes, and assist teachers in simplifying learning materials (Dewi et al., 2017; Sabila et al., 2021). By incorporating innovative learning media like the Snakes and Ladders game, geography learning can become more engaging, effective, and accessible to students, ultimately addressing the challenges faced in traditional teaching methods.

The Snakes and Ladders media was developed to address several challenges in geography education including (1). Low student learning outcomes: Research and development studies (Kholidah & Fitrah, 2024) have demonstrated that developing Snake and Ladder game media yields a valid, feasible, and effective medium for improving student learning outcomes. Furthermore, studies by Chabib et al. (2017), Khomsin &

Rahimmatussalisa (2021), and Masrukah et al. (2020) have shown that Snake and Ladder game media effectively enhances student learning outcomes. The Snakes and Ladders game material covers the types, benefits, distribution, and preservation of natural resources and is presented through short questions accompanied by pictures and relevant challenges. This approach helps students understand geography concepts that are often considered abstract, making the learning material more accessible to students. (2). Low student interaction: Students are often passive and hesitant to speak in class. Research by Efnandyah & Yulia (2022) and Masrukah et al. (2020) has shown that Snakes and Ladders game media effectively increases social interaction and student activeness. The game activities, which are conducted in groups, encourage students to communicate, cooperate, and share knowledge, improving their collaboration and social skills. (3). Lack of motivation in learning geography: Research by Anggraeni et al. (2023) and Petrus et al. (2023) has demonstrated that Snakes and Ladders game media is highly engaging and can increase student interest and motivation to learn. The developed Snakes and Ladders game media incorporates interesting game elements, which make students enthusiastic about participating in geography lessons. The Snakes and Ladders game creates a more dynamic learning atmosphere and increases student engagement.

The Snakes and Ladders media, explicitly developed for natural resources material, offers a fun and interactive approach to learning. This geography-focused game serves not only as a means of play but also as an educational tool. While engaging in the game, students indirectly learn important concepts such as the types, benefits, distribution, and conservation of natural resources, making the learning process feel more like play than traditional studying. This innovative Snakes and Ladders game media helps students overcome boredom in learning while effectively improving their understanding of key concepts. Incorporating the natural resources material into the game is expected to create a fun learning atmosphere, increase student involvement, and make it easier for teachers to deliver the material creatively and innovatively. Simultaneously, this approach makes it easier for students to receive and absorb the learning material.

The developed Snakes and Ladders game media significantly enhances students' understanding of natural resources concepts. This creative approach helps students acquire knowledge and raises their awareness about environmental sustainability. Introducing this innovative gaming approach to geography learning represents a strategic step toward developing an environmentally conscious and responsible future generation.

MATERIALS AND METHODS

This research focused on developing an educational product in the form of snakes and ladders learning media, utilizing the ADDIE model for development. The ADDIE model was selected for its systematic problem-solving approach, stage-by-stage evaluation capability, and flexible implementation. The research followed the ADDIE model stages:

1. Analysis

The analysis stage incorporated both needs and feasibility analyses. The needs analysis identified student and teacher requirements and challenges regarding developing Snakes and Ladders game media. The feasibility analysis determined whether the developed game media could achieve the formulated objectives effectively. These analyses provided the foundation for designing the game media development.

2. Design

The design stage focused on developing the snake ladder game media for natural resources material. This stage included organizing educational content, designing the game board layout and imagery, developing game mechanics, and creating validation instruments.

3. Development

This stage involved creating the snake ladder game media according to the design specifications, followed by three validity tests: 1) Khairurraziq, M.Pd., a natural resources and land use course lecturer with expertise in natural resource material, assessed material validity. 2) Learning media validity was evaluated by Rendra Zainal Maliki, M.Pd., who teaches Learning Technology and Media courses. 3) I Putu Raditya Eka Pratama, S.Pd., M.Pd, a geography teacher at SMA N 2 Palu, assessed the validity of the practitioner. The three validators were provided with validation instruments consisting of Likert scale questionnaires to evaluate the accuracy, relevance, and suitability of natural resources and conservation material in the Snakes and Ladders game media. The scores were calculated using the following formula:

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

Where:

P = Score sought
x = Total number of validator answers
∑xi = Total number of ideal values
100% = Constant multiplier

The validation criteria are presented in **Table 1**.

Table 1. Validity Assessment Criteria

Scoring Percentage	Category	Description
90% - 100%	Very Good	Very good and no need for revision
75% - 89%	Good	Feasible and needs minor revision
65% - 74%	Moderate	Moderately feasible and needs major revision
55% - 64%	Poor	Not feasible
0% - 54%	Very Poor	Not feasible

Scouce: (Arikunto, 2001)

4. Implementation

The implementation phase was conducted through small group trials at SMAN 2 Palu, specifically with 34 students in class XI-A. SMAN 2 Palu was selected as the research location due to several challenges in geography learning outcomes, particularly regarding natural resources material. These challenges include students experiencing difficulty understanding natural resources content, low learning outcomes, and limited student engagement in geography learning. The development of Snakes and Ladders game media aimed to address these educational challenges.

The student profile of class XI A at SMAN 2 Palu revealed that while most students possessed basic geography knowledge, they showed limitations in understanding natural resource concepts, distribution and preservation, geography learning motivation, learning outcomes, and class participation. Students demonstrated a preference for interactive, game-based learning methods. Therefore, the Snakes and Ladders game media was implemented to enhance student engagement, content understanding, learning motivation, and learning outcomes in natural resources material. The effectiveness assessment included small group trials, observations, and questionnaires. During implementation, both pretests and post-tests were administered, with effectiveness measured using the N-gain formula:

$$N - gain = \frac{Posttest\ scores - pretest\ scores}{\text{Maximal Scores} - \text{Pretest Scores}}$$

After calculating the N-gain scores, they are classified according to the N-gain interpretation **Table 2**.

Table 2. Interpretation of N-gain Values

N-gain Values	Interpretation
<g> ≥ 0.7	High
0.7 > <g> ≥ 0.3	Moderate
<g> < 0.3	Low

From the table above, the Snakes and Ladders game media can be considered effective in improving learning outcomes if the calculation results fall within the high or medium interpretation ranges. The data from observations and questionnaires are analyzed using the following formula:

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

Where:

- P = Score sought
- x = Total number of respondent answers
- ∑xi = Total number of ideal values
- 100% = Constant multiplier

The eligibility criteria can be found in **Table 3**.

Table 3. Product Feasibility Assessment Criteria

Scoring Percentage	Category	Description
90% - 100%	Very High	Very good and no need for revision
75% - 89%	High	Feasible and needs minor revision
65% - 74%	Moderate	Moderately feasible and needs major revision
55% - 64%	Low	Not feasible
0% - 54%	Very Low	Not feasible

Source: (Arikunto, 2001)

5. Evaluation

The evaluation process comprised both formative and summative assessments. Formative evaluation occurred throughout each stage of the ADDIE model development process. The summative evaluation was conducted after implementing the Snakes and Ladders game media to assess its effectiveness.

RESULTS AND DISCUSSION

Stage 1. Analysis

The analysis phase encompassed both needs analysis and feasibility analysis. The needs analysis was conducted

through teacher interviews at SMAN 2 Palu. It included three key components: Learning Outcome Analysis focused on assessing the distribution and management of forestry, mining, marine, and tourism resources according to sustainable development principles. Problem Analysis identified several challenges: Students struggled to understand natural resources concepts, and their understanding of natural resource material remained abstract. They had low motivation in geography learning and lacked engaging, effective, efficient, and interactive learning media. Student Analysis revealed that: Students were passive, with limited confidence in expressing opinions or asking questions; students preferred concrete and tangible learning materials; students enjoyed learning through play and team collaboration, though requiring guidance and support. The feasibility analysis evaluated the compatibility of snake ladder game media with natural resource material, student learning preferences, and time constraints.

The analysis results highlighted that addressing geography learning challenges is crucial for achieving educational objectives - developing students' knowledge, understanding, critical thinking, creativity, innovation, and collaboration abilities, as supported by research from Darung et al. (2020) and Suarsini et al. (2020). Learning success heavily depends on appropriate media selection. Wirjawan et al. (2020) and Wulandari et al. (2023) noted that learning media facilitates material delivery and enhances student engagement. Research by Damayanti et al. (2023), Darung et al. (2020), Norviana (2015), and Suarsini et al. (2020) demonstrates that effective learning media improves efficiency, activity, student interaction, concentration, motivation, interest, and learning outcomes. Media selection must consider multiple factors: learning outcomes, teaching materials, student preferences, and time availability. Based on the needs and feasibility analysis conducted at SMAN 2 Palu, the snakes and ladders media was identified as an appropriate tool for improving geography learning outcomes.

Snakes and Ladders Game as a learning medium provides space for students to express themselves, communicate, cooperate, and improve student cognition based on research results (Damayanti et al., 2023; Ester & Puteri Ramadhani, 2020). Snakes and Ladders media provides the concept of learning while

playing, which is entertaining and fun, according to the results of previous research (Norviana, 2015).

Stage 2 Design

This stage involved creating Snakes and Ladders media using natural resource materials, modifying the learning objectives using the Snakes and Ladders game media materials, formulating the rules of the Snakes and Ladders game to obtain educational objectives, creating media for the Snakes and Ladders game, explicitly establishing the number of squares, incorporating snakes and ladders, crafting squares with questions about natural resources, designing bonus squares, developing supplementary media (question cards and alternative dice spins), and producing visually appealing images and colours that align with the natural resources theme.

Stage 3. Development

The development stage involved creating the snake ladder game media according to the established design, followed by validity testing. The testing process included three validations: 1) Material validity assessment by natural resource material experts. 2) Learning media validity evaluation by learning media experts. 3) Practitioner validity review by SMAN 2 Palu teachers. The Snakes and Ladders game media was developed using the Canva application. The expert validator assessment yielded a percentage of 100% for material validity, placing it in the very high category. This result confirms that the material content in the developed Snakes and Ladders game media is valid.

Media Validity Assessment. Based on the media specialist validation, the developed snakes and ladders learning media received a percentage value of 100%, placing it in the very high category and confirming its validity. The validator provided enhancement recommendations, specifically suggesting more engaging images and harmonious colour combinations.

Practitioner Validity Assessment. The practitioner expert validation yielded a percentage value of 97.91% for the developed snakes and ladders learning media, placing it in the very high category and confirming its validity. The validator recommended reducing the game duration from 45 to 30 minutes to maintain student engagement. Following the media development process and validation testing, improvements were implemented based on validator feedback, including revising images and colours to enhance the

visual appeal and adjusting the game duration to 30 minutes.

Stage 4. Implementation

The implementation stage was conducted by small-group trials at SMAN 2 Palu. The purpose of the small group trial was to determine the effectiveness of the game media developed by Snakes and Ladders. The effectiveness is also seen from the results of observations and questionnaires given to students and geography teachers**.** Implementation Steps of Snakes and Ladders Media: 1) Ensure that teachers can use Snakes and Ladders media in geography learning so that they can act as facilitators in learning 2) Prepare a Snakes and Ladders media package consisting of a ladder, spinner, question cards, and rules of the game. 3) When starting the implementation in the classroom, the teacher explains the game's rules to the students. 4) Students learn while playing using the Snakes and Ladders game media. 5) The teacher's role is to monitor and assist the students. 6) The teacher helps liven up the class and encourages student collaboration in playing snakes and ladders. 7) Teachers and researchers observe students' activities, enthusiasm, and involvement in playing snakes and ladders. **Table 4** presents the results of the small- group trial for the developed Snakes and Ladders learning media.

Table 4. Pretest and Post-test scores

No	Achievement Level	Description	Pretest	Post-test
1	80,1%-100%	Very High		24
2	70,1%-80%	High		10
3	60,1%-70%	Medium	23	
4	50,1%-60%	Low	10	
5	1%-50%	Very Low	1	
		Total	34	34

The post-test results revealed outstanding student performance. 24 students achieved scores in the very high category, while the remaining 10 students scored in the high category.

Table 5. N-gain Calculation

	Pretest	**Post-test**	**N-gain**
Total Score	2.185	3.048	24,16
Mean	64,26	89,65	0,71

The N-gain calculation results substantiate the effectiveness of the developed snakes and ladders media, which yielded an average value of 0.71, placing it in the very high criteria category (see **Table 5**). This significant improvement in geography learning outcomes aligns with findings from multiple recent studies, including research by Efnandyah & Yulia (2022), Irvan & Marwan (2023), and Kholidah & Fitrah (2024), all of which demonstrated the effectiveness of snake ladder game media in enhancing learning outcomes.

The observational results during small-group trials revealed several key findings: 1) Student Engagement and Interaction. Students actively participated in geography learning through the snake ladder game media, supporting Efnandyah & Yulia's (2022) findings on enhanced social interaction. The turn-based group gameplay ensured universal participation, while group discussions during question-answering sessions promoted active learning and collaborative skills. Multiple studies (Damayanti et al., 2023; Ester & Puteri Ramadhani, 2020; Inka, 2021; Kholidah & Fitrah, 2024; Norviana, 2015; Suarsini et al., 2020) have similarly documented how snake ladder game media increases student motivation and participation in learning. 2) Material Comprehension.

The game media facilitated an easier understanding of learning materials through its concise, simplified presentation format. Daloukas et al. (2012) noted that the combination of appealing visual design and accessible language enhanced student engagement. The game's core mechanics - climbing ladders and descending snakes - created an enjoyable learning environment while maintaining educational focus through concentrated information points. 3) Progressive Challenge Structure. The game incorporated an escalating difficulty system, with question complexity increasing as players advanced through higher numbers. This progressive challenge system aligns with Petrus et al.'s (2023) research, showing how such mechanics enhance student motivation through engaging problem-solving exercises. 4) Usability and Collaborative Learning. The game media proved user-friendly and effective at fostering student collaboration, particularly during group problem-solving sessions. These findings support Hanif Safitri's (2019) research, which highlighted the game's accessibility and positive impact on student collaboration.

Teacher questionnaire responses highlighted several key benefits of the Snakes and Ladders media. Teachers reported that the game effectively facilitated student comprehension of natural resources while enhancing learning motivation and understanding. They particularly valued its innovative approach and alignment with curriculum requirements. The overall questionnaire results demonstrated the media's multiple strengths as an educational tool, confirming findings by Hanif Safitri (2019) and Petrus et al. (2023). Specifically, teachers noted that the game media created an interactive learning environment, promoted collaborative learning, enhanced student activity and engagement, improved material comprehension, and generated a more positive and enjoyable learning atmosphere. Teachers suggested simplifying the game rules for future improvement to enhance student usability. The student feedback on questionnaires revealed overwhelmingly positive responses to the Snakes and Ladders game media across multiple dimensions: Learning Experience that 87% of students reported that the game media made learning more engaging and interactive, eliminating classroom boredom, and 85% indicated that it facilitated easier comprehension of learning materials. Visual Design and Usability: 86% praised the attractive and entertaining design, noting that the illustrations sparked interest and curiosity, and 78% found the game rules easy to understand. Student Engagement and Collaboration: 85% reported increased motivation in geography learning when using the game medium, and 82% noted that the game encouraged peer cooperation. Anggraeni et al. (2023) observed that the discussion-based question-answering format strengthened student interactions.

The questionnaire results identified one area for improvement: some students indicated a need for more detailed explanations of the game rules to enhance clarity. Regarding learning effectiveness, the small-group trial results provided strong evidence of the snake ladder game media's impact on student achievement. The analysis yielded an average N-Gain value of 0.71, placing it in the very high category. This significant improvement in learning outcomes demonstrates that the developed snake ladder game media effectively enhanced student academic performance. These findings suggest that while the educational tool is highly effective at improving learning outcomes,

minor refinements to the game instructions could further enhance its usability and effectiveness.

Observational results revealed that the developed Snakes and Ladders media fostered active student involvement in the learning process, enhanced collaboration and social interaction, and increased student enthusiasm. The progressive challenges within the game motivated students to engage in problem-solving tasks. These outcomes demonstrate that the developed Snakes and Ladders media created an interactive, challenging, and enjoyable learning atmosphere.

The teacher questionnaire feedback indicated that the developed Snakes and Ladders game media proved interactive and innovative, facilitating better student comprehension of materials while increasing motivation and creating an enjoyable learning atmosphere. Teachers recommended simplifying the game rules for improvement.

The student questionnaire feedback revealed that the Snakes and Ladders game media made learning more enjoyable and enhanced student collaboration. For improvement, students suggested providing more detailed explanations to make the game steps easier to understand and implement.

Overall, the implementation stage evaluation indicated that minor revisions to the game rules were needed. These revisions focused on simplifying the rules and providing more precise explanations, ensuring students could easily understand the game mechanics and focus on learning without technical distractions.

Stage 5. Evaluation

The evaluation phase assessed the effectiveness and appropriateness of the developed Snakes and Ladders game media for learning geography, explicitly focusing on natural resources material. This comprehensive evaluation occurred throughout each development stage to address potential weaknesses and ensure continuous improvement. The evaluation process revealed several key findings across stages: Stage 1 (Analysis): The game media aligned well with both needs analysis and feasibility requirements at SMAN 2 Palu. Stage 2 (Design): Adjustments were necessary to optimize the balance between educational content, board layout (number of boxes), gameplay duration, and visual design elements, including colour schemes. Stage 3 (Development): Modifications were implemented based on validator feedback

and recommendations. Stage 4 (Implementation):

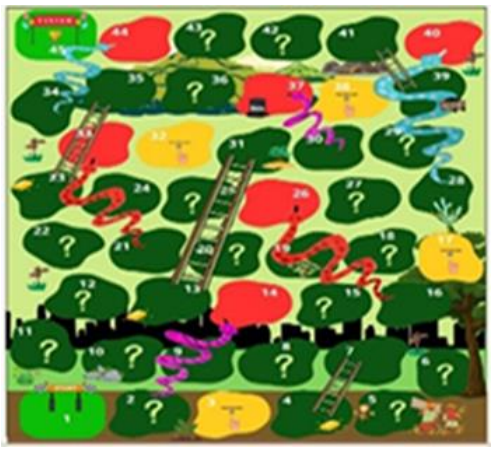

Figure 1. Snakes and Ladder Board

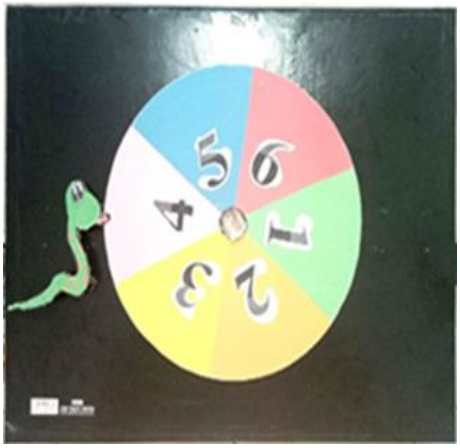

Figure 2. Spiner (Alternatives to dice)

The game media effectively enhanced learning outcomes, student motivation, and collaborative skills. Based on teacher and student feedback, minor modifications to game rules and instructions were made. Overall, evaluation results confirmed that the Snakes and Ladders game media successfully met student and teacher needs, demonstrated feasibility for implementation at SMAN 2 Palu, and effectively improved student learning outcomes. These findings align with previous research by Chabib et al. (2017), Efnandyah & Yulia (2022), Irvan & Marwan (2023), and Masrukah et al. (2020), which similarly found that snakes and ladders media enhances student learning outcomes, social interaction, and collaboration. The developed game features innovative elements, including a spinner mechanism as a dice alternative, as illustrated in **Figures 1** and **Figure 2**. This modification adds a unique dimension to the traditional game format while maintaining its educational effectiveness.

CONCLUSION

The research and development results conclusively demonstrate that the snake ladder game media is a valuable educational tool worthy of further development. Our comprehensive validation process yielded exceptional results across all evaluations. Material experts awarded it a perfect score of 100%, placing it in the very high category and confirming its content validity.

Learning media specialists also gave it 100%, validating its effectiveness as an educational medium. Practitioner assessments were nearly perfect at 97.91%, further substantiating its validity. The implementation achieved an average N-gain value of 0.71 in small-group trials, falling into the very high category. The developed snake ladder game media effectively enhances geography learning outcomes. Recommendations for future researchers include the development of novel Snakes and Ladders game media using diverse educational resources.

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