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Innovation in Developing Nearpod Media to Improve Students' Metacognitive Skills and Learning Motivation at Lazuardi Tursina Middle School, Banyuwangi

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ABSTRACT

The low level of learning motivation and metacognitive skills among seventh-grade students in science learning highlights the need for innovative and interactive learning media. This study aimed to develop and examine the feasibility, effectiveness, and impact of web-based Nearpod learning media on students' metacognitive skills and learning motivation. The research employed a Research and Development (R&D) approach using the ADDIE model and a mixed-methods design. The validation results indicated that the Nearpod media was feasible for use, with material validity of 83.3%, media validity of 94%, and test-item validity of 77%. Readability testing involving 18 seventh-grade students yielded a score of 77.9%, categorized as good. The improvement in students' metacognitive skills, measured through pre-test and post-test scores, resulted in an average N-Gain of 0.71, indicating a high level of improvement, while students' learning motivation increased from 23.8% to 55.6% of highly enthusiastic learners. In conclusion, the Nearpod learning media is effective in enhancing students' metacognitive skills and learning motivation in science learning. This study recommends the wider implementation of Nearpod-based learning media and further development across different subjects and educational levels.

INTRODUCTION

Learning media play an important role in supporting successful learning by facilitating the delivery of information and increasing student engagement (Gustini et al., 2023). However, despite the availability of various learning media, classroom practices still frequently rely on conventional resources such as textbooks and worksheets, which limits student interaction and active learning. Although learning media are expected to overcome limitations of space and time and optimize learning outcomes (Ummi, 2018; Magdalena et al., 2021), their implementation often focuses more on content delivery than on developing higher-order thinking skills.

Previous studies have emphasized the importance of innovation in learning media, including technology-based, game-based, Android-based, and culture-based media (Lusiyani et al., 2021). Other research has also shown that learning media can stimulate students' motivation, which plays

a crucial role in student effort, persistence, and initiative in problem-solving (Siswati et al., 2021). Motivated students tend to be more cognitively engaged and better prepared to understand learning material. Nevertheless, most existing studies examine motivation and learning outcomes separately, without explicitly addressing how learning media support students' metacognitive regulation during learning.

Metacognitive skills are essential for helping students consciously plan, monitor, and evaluate their learning processes (Azizah et al., 2019; Andini & Azizah, 2021). Research by Mustapa and Qurbaniah (2017) confirms that metacognitive awareness is positively correlated with student learning achievement, while Amin et al. (2018) report a significant relationship between learning interest and learning outcomes. However, these studies mainly highlight correlational relationships and do not sufficiently explore the role of interactive digital learning media in simultaneously enhancing metacognitive skills and learning motivation, particularly in junior high school science learning.

Based on preliminary observations and questionnaire results involving 18 seventh-grade students at Lazuardi Tursina Middle School, Banyuwangi, most students showed low motivation and enthusiasm in biology learning, especially in food chain material adopted from a Cambridge curriculum-based textbook. This condition is influenced by the limited variation of learning media, where teachers predominantly use textbooks, worksheets, and conventional teaching methods, with minimal integration of interactive digital media.

Nearpod is a web-based digital learning application designed to increase student engagement and participation through interactive features such as quizzes, polls, and collaborative activities that can be accessed via multiple devices (Siswati et al., 2023). Compared to conventional learning media, Nearpod offers real-time interaction and formative feedback that support participatory learning and active student involvement (Feri & Zulherman, 2021). However, research on the systematic development and validation of Nearpod-based learning media that specifically targets both metacognitive skills and learning motivation remains limited, especially at the junior high school level. Therefore, this study addresses this gap by developing and testing Nearpod-based learning media as an innovative and urgent solution to enhance students' metacognitive skills and learning motivation in science learning.

METHOD

This study employed developmental research, commonly referred to as Research and Development (R&D), which aims to develop and evaluate an educational product in the form of Nearpod-based learning media. The developed media had not previously been implemented at Lazuardi Tursina Junior High School, Banyuwangi. This research focused on analysing the results of the media development in improving students' metacognitive skills and learning motivation.

The research procedure followed the ADDIE instructional design model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was selected due to its flexibility and effectiveness in guiding the development of instructional products across various educational contexts (Molenda, 2003; Branch, 2009; Fareza & Zuhdi, 2023). The research was conducted in early December during the odd semester of the

2022/2023 academic year. The research subjects consisted of 18 seventh-grade students of SMP Lazuardi Tursina Banyuwangi. Seventh-grade students were selected because the developed Nearpod media aligned with the Food Chain topic in the Habitat and Environment chapter of the curriculum.

At the Analysis stage, preliminary research was conducted through targeted teacher interviews, classroom observations, and the distribution of student motivation questionnaires. This stage aimed to identify learning problems, student needs, and limitations of the existing learning media (Branch, 2009). The findings from this stage served as the foundation for determining appropriate media characteristics to support students' metacognitive skills and motivation.

During the Design stage, the structure and content of the Nearpod learning media were planned based on the existing learning matrix used at the school. At this stage, the researcher also designed learning activities, interactive features, and assessment components. In addition, validation instruments for media, materials, and test items were developed, along with a media readability questionnaire to be completed by students as part of the evaluation process (Molenda, 2003).

In the Development stage, the Nearpod media prototype was created and subsequently validated by experts using the prepared validation instruments. Validators provided qualitative feedback in the form of comments, suggestions, and critiques regarding content accuracy, media design, and assessment quality. Based on this feedback, revisions were made to improve the quality and feasibility of the media before classroom implementation (Branch, 2009).

The revised media was then applied in the Implementation stage, where it was tested in a broader classroom trial involving 18 seventh-grade students of SMP Lazuardi Tursina Banyuwangi. This stage focused on examining the quality of the learning process and media use, including aspects of readability, effectiveness, attractiveness, and learning efficiency. Students' learning motivation and metacognitive skills were measured at this stage through questionnaires and pre-test and post-test assessments.

Finally, the Evaluation stage involved a comprehensive review of the media implementation process. This stage aimed to determine the overall suitability and readability of the Nearpod media for seventh-grade biology learning on the Food Chain topic. Additionally, student responses to the developed media were analysed, and its impact on students' learning motivation and metacognitive skills was evaluated to determine the effectiveness of the developed learning media (Molenda, 2003; Branch, 2009). Quantitative data analysis consisted of the validation of materials, media, and test items by expert validators, analysis of students' metacognitive pretest and posttest results, and evaluation of students' readability responses to the Nearpod learning media. The validation sheet was used as an instrument to determine the validity of the developed product. The assessment criteria referred to a Likert scale, with scores of 1 = invalid, 2 = less valid, 3 = valid, and 4 = very valid, which is commonly used to measure attitudes, perceptions, and expert judgments in educational research (Joshi, 2015).

The data obtained from the validation process were analysed using descriptive quantitative techniques in the form of percentage analysis to determine the level of feasibility of the developed media. The percentage results were calculated using the Likert scale formula and then interpreted

based on feasibility criteria adapted from educational evaluation standards (Riduwan, 2015). The interpretation of the percentage scores is presented in Table 1. The results of the formula are interpreted into a table of media quality criteria, materials, and question items.

Table 1. Quality Criteria for Media, Materials, and Question Items.

No.	Score	Criteria
1	81.25 < *x* ≤ 100	Very Worthy
2	62.50 < *x* ≤ 81.25	Possible to do
3	43.75 < *x* ≤ 62.50	Less Worth Doing
4	25.00 < *x* ≤ 43.75	Not feasible

The instrument was used to determine the readability of the Nearpod learning media in the form of a questionnaire completed by 18 seventh-grade students of SMP Lazuardi Tursina Banyuwangi. The assessment on the questionnaire employed a Likert scale, with response categories of 1 = disagree, 2 = less agree, 3 = agree, and 4 = strongly agree, which is widely used to measure students' perceptions and responses in educational research (Joshi, 2015).

The questionnaire results were analysed using the Likert scale percentage formula to determine the level of media readability. The percentage scores were then interpreted based on readability criteria commonly applied in educational media evaluation studies (Riduwan, 2015). Based on the analysis results, the level of readability of the Nearpod media was categorized as shown in Table 2.

Table 2. Media Readability Categories

No.	Score	Criteria
1	81% < *x* ≤ 100%	Very good
2	61% < *x* ≤ 81%	Good
3	41% < *x* ≤ 61%	Fair
4	21% < *x* ≤ 41%	Not good
5	0% < *x* ≤ 21%	Not very good

The analysis of students' metacognitive skills was conducted using a specific scoring rubric that integrates metacognitive skill assessment with essay-based achievement tests, as proposed by Corebima (2009). This rubric allows for the simultaneous measurement of concept mastery and metacognitive skills through students' written responses. The combined score of concept acquisition and metacognitive skills was calculated using the formula (1).

$$y2 = \frac{y1+2x}{3} \quad \ldots\ldots\ldots (1)$$

Description:

y1 : concept acquisition score
x : metacognitive skill score
y2 : combined concept acquisition score and metacognitive skills score

Furthermore, the improvement in students' metacognitive skills was analysed using the normalized gain (N-Gain) formula, which compares students' pretest and posttest scores to determine the effectiveness of the learning intervention (Marx & Cummings, 2007). The resulting N-Gain values were categorized into high, medium, and low improvement levels, as presented in Table 3.

Table 3. N-Gain Criteria

G-value	Criteria
g ≥ 0,7	High
0,3 ≤ g ≤ 0,7	Medium
g < 0,3	Low

In addition to metacognitive skills, students' learning motivation was also measured and analysed to address the research objectives. Learning motivation data were collected using a Likert-scale questionnaire administered after the learning intervention. The questionnaire measured students' motivational responses, including interest, enthusiasm, and engagement in learning activities. The use of Likert-scale questionnaires is widely accepted for measuring motivational constructs in educational research (Joshi, 2015; Riduwan, 2015).

The motivation questionnaire results were analysed using descriptive quantitative analysis in the form of percentage scores, which were then interpreted based on predefined motivation criteria. This approach is commonly used to assess changes in students' learning motivation following the implementation of instructional interventions (Uno, 2011). The analysis results were used to determine the effectiveness of the Nearpod-based learning media in enhancing students' learning motivation.

RESULTS AND DISCUSSION

The learning media developed in this study was produced using the ADDIE development model, which consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. According to Gay et al. in Fitriani and Krisnawati (2019), Research and Development (R&D) requires a systematic and scientific process that begins with identifying learning needs and proceeds to developing products that address those needs. Therefore, an illustration of the developed Nearpod media is presented to provide readers with a concrete representation of the product, enhance transparency, and support the validity of the development process.

The analysis stage was conducted through classroom observations and structured interviews with science teachers at Lazuardi Tursina Junior High School, Banyuwangi. The findings indicated that the variety of learning media used in science learning was still limited, and teachers predominantly relied on textbooks, worksheets, and conventional teaching methods. As a result, students' motivation and engagement in learning science were relatively low. Considering the availability of supporting facilities such as LCD projectors, computer laboratories, Chromebooks, and school-wide internet access, the use of Nearpod was identified as a feasible and relevant solution for developing technology-based learning media.

At the analysis stage, observations and interviews revealed that science learning at Lazuardi Tursina Middle School was still dominated by textbooks and worksheets, resulting in low student motivation and limited engagement. These findings justify the need for innovative digital learning media, particularly interactive platforms such as Nearpod. From the validator's perspective, this stage was crucial in ensuring that the developed media addressed real classroom problems rather than merely introducing new technology.

In addition, preliminary observations were conducted by distributing a student motivation questionnaire to 18 seventh-grade students prior to the implementation of Nearpod. The results showed that many students demonstrated hesitation in paying attention, remembering learning material, and actively participating in science learning activities. Overall, the questionnaire responses indicated that students required innovative learning media to enhance engagement, motivation, and understanding of science concepts.

At the design stage, the researchers prepared a detailed blueprint of the Nearpod-based learning media, including the selection of learning materials, interactive features, and assessment components. The Food Chain topic was structured into interactive slides integrating quizzes, polls, and formative assessments. In addition, validation instruments were designed to assess the quality of the media, materials, and test items, along with a readability questionnaire to evaluate students' responses to the developed media.

During the development stage, the Nearpod media prototype was validated by expert validators. The validation process generated quantitative data from validation questionnaires and qualitative data in the form of comments, suggestions, and criticisms. The qualitative feedback was used as a basis for revising and improving the media before classroom implementation.

During the design and development stages, the Nearpod media was structured to integrate interactive features (e.g., quizzes, polls, and games) with food chain material. The validation results showed high feasibility scores across material, media, and test item aspects, indicating that the content accuracy, presentation, and technical design met educational standards. These findings demonstrate that the developed media was pedagogically appropriate and technically reliable, supporting the argument that Nearpod can function as an effective instructional tool rather than a supplementary add-on.

The media validation consisted of 19 indicators that represent the quality and feasibility of the developed Nearpod media, including: 1) Clarity of learning objectives, 2)Relevance of material to learning indicators, 3) Accuracy of scientific concepts, 4) Suitability of content with students' cognitive level, 5) Systematic presentation of material, 6) Integration of metacognitive activities, 7) Alignment of activities with learning objectives, 8) Quality of visual design, 9) Readability of text and instructions, 10) Use of appropriate images and illustrations, 11) Interactivity of learning activities, 12) Effectiveness of quizzes and formative assessments, 13) Feedback provided to students, 14) Ease of navigation, 15) Technical functionality of the media, 16) Accessibility across devices, 17) Attractiveness of the media layout, 18) Support for student engagement, 19) Overall feasibility for classroom implementation.

These indicators were used to ensure that the developed media met pedagogical, technical, and usability standards. The quantitative results of the material validation conducted by two validators demonstrated that the Nearpod media was feasible for use in science learning, while revisions based on qualitative feedback further enhanced the quality of the product before implementation.

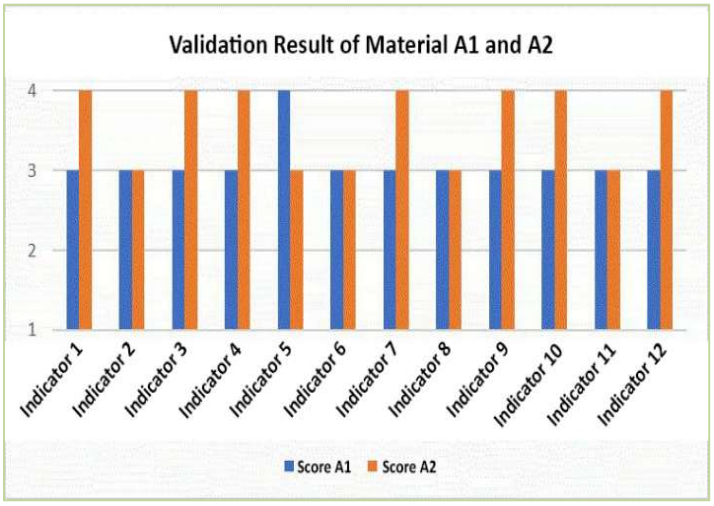

Figure 1. The Validation Material Results

The final percentage of material validation is 83.3% and includes a decent category with a few shortcomings and the need for a little justification, but can still be used with minor improvements. Media validation with 2 validators can be seen in the Figure 2.

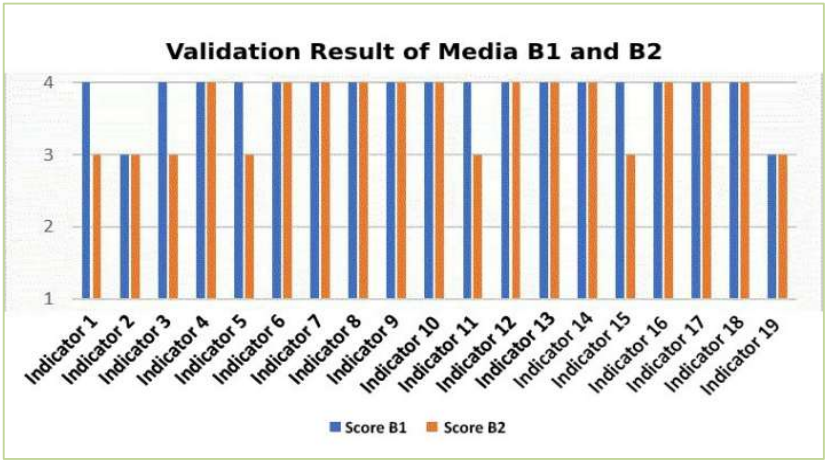

Figure 2. The Validation Media Results

The final percentage of media validation is 94% and includes a very feasible category with no deficiencies so that it can be implemented to students with minor improvements based on input from validators. Item validation with 1 validator can be seen in the Figure 3.

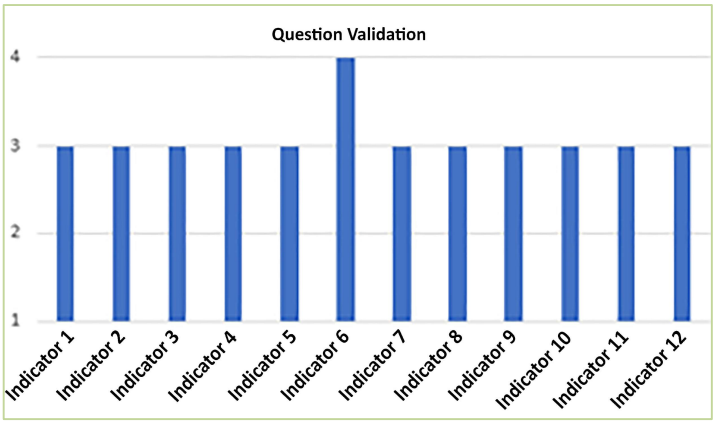

Figure 3. Question Validation

The final percentage of item validation is 77% and falls into the decent category with some shortcomings and needs a little justification, but can still be used with a little improvement. The validated and revised product was then implemented in real classroom learning on the Food Chain material using Nearpod media. Researchers also provided a media readability questionnaire, pre-test and post-test questions on the food chain material, and a student learning motivation questionnaire after learning with Nearpod. The results of the readability questionnaire in a wide trial involving 18 students showed a score of 77.9% in the good category, so that science learning on the Food Chain material using Nearpod media was declared to have a good level of readability. The results of the pre-test and post-test questions for 18 students can be seen in the Table 4.

Table 4 Acquisition of pretest and post-test scores

No.	Name	Value *pre-test*	Value *post- test*	Score N-Gain	Category
1	YU	10,13	95,3	0,94	High
2	FI	70,3	83,87	0,45	Medium
3	AJ	50,56	70,47	0,4	Medium
4	AD	17,08	84,28	0,81	High
5	SH	22,4	73,26	0,74	High
6	AK	15,65	76,53	0,72	High
7	KE	13,8	71,42	0,67	Medium
8	KN	11,97	73,74	0,7	High
9	AB	45,5	54,82	0,17	Low
10	BI	20,19	94	0,92	High
11	NA	23,4	89,79	0,86	High
12	SI	24,8	94	0,92	High
13	AI	27,5	95,8	0,94	High
14	KH	47,8	82,3	0,66	Medium
15	TR	19,79	79,42	0,74	High
16	AQ	18,83	72,31	0,65	Medium
17	LI	28,84	84,75	0,78	High
18	FI	19,79	78,29	0,72	High
		Average		0,71	High

The increase in metacognitive skills can be seen from the increase in the results of students' pretest and post-test questions calculated using the N-Gain value which gets an average score of 0.71 with a high category.

The results of the student learning motivation questionnaire administered before and after the implementation of Nearpod showed a clear increase in students' learning motivation. Prior to learning with Nearpod, only 23.8% of students strongly agreed with the statement "I am very enthusiastic about learning science," whereas after the use of Nearpod, this percentage increased to 55.6%. Similarly, for the statement "I enjoy learning science because the teacher's teaching method is fun," 38.1% of students strongly agreed and 28.6% agreed before learning, while after the implementation of Nearpod, the percentage of students who strongly agreed increased to 61.1%. In addition, students' need for innovative learning media was evident, as 61.9% of students strongly agreed with the statement "I need new things in the learning process (innovative learning media)" before learning, and after using Nearpod, 44.4% strongly agreed and 38.9% agreed.

These findings are consistent with previous studies that reported a positive impact of Nearpod on student motivation and engagement. Research by Feri and Zulherman (2021) found that Nearpod's interactive features, such as quizzes, polls, and real-time feedback, significantly increased students' participation and enjoyment during learning activities. Similarly, Siswati et al. (2023) reported that the use of Nearpod promoted active learning and improved students' motivation by allowing learners to interact directly with learning content using their personal devices.

Compared to conventional learning media, Nearpod provides greater opportunities for student interaction and engagement, which explains the increase in enthusiasm observed in this study. This finding aligns with the results of Rachmadtullah et al. (2020), who emphasized that interactive digital learning media are more effective in stimulating students' motivation than traditional teacher-centered approaches. Therefore, the results of this study strengthen existing evidence that Nearpod-based learning media can serve as an effective tool for enhancing students' learning motivation, particularly in science learning contexts that require active participation and engagement.

The implementation stage provided empirical evidence of how the developed media performed in real classroom settings. The readability questionnaire yielded a score of 77.9%, categorized as good, indicating that students found the language, layout, and instructions clear and easy to understand. This confirms that the media design successfully supported accessibility and usability, which are essential for sustaining student engagement (Rochma & Ibrahim, 2019).

From the students' perspective, Nearpod offered clear advantages. Students reported increased enthusiasm, curiosity, and active participation during science learning activities. However, students also noted that continuous use of Nearpod in every lesson could lead to boredom. This finding highlights an important limitation of the media: while Nearpod is effective in enhancing engagement, it should be used strategically and combined with other instructional approaches to maintain novelty and learning effectiveness.

One of the most significant findings of this study is the improvement in students' metacognitive skills, as indicated by an average N-Gain score of 0.71, categorized as high. This result suggests that Nearpod-supported learning activities encouraged students to reflect on their

understanding, monitor their learning progress, and actively engage with learning tasks. This finding aligns with previous studies showing that metacognitive skills are positively associated with improved learning outcomes (Mustapa in Andini et al., 2021).

In addition, the motivation questionnaire results showed a clear increase in students' learning motivation after using Nearpod. Students expressed greater enthusiasm for learning science and acknowledged the need for innovative learning media. These findings support the argument that interactive digital media can provide motivational energy and direction for students to achieve learning goals (Aina et al., 2021). From the teacher's perspective, Nearpod facilitated classroom interaction and supported active learning, although technical limitations such as feature capacity and internet dependency were identified as challenges.

Overall, the advantages of the developed Nearpod media include its interactivity, ease of use, ability to increase student motivation, and effectiveness in improving metacognitive skills. However, the study also identified several limitations, including technical constraints, dependency on internet access, and the potential for reduced student interest if used excessively. These findings suggest that Nearpod is most effective when implemented as part of a blended instructional strategy rather than as the sole learning medium.

In conclusion, the implementation of Nearpod-based learning media resulted in positive outcomes for students, including improved metacognitive skills, increased learning motivation, and more active classroom participation. The findings from validators, students, and teachers collectively indicate that the developed media is feasible, effective, and pedagogically valuable. Nevertheless, careful planning and selective use are necessary to maximize its benefits and minimize its limitations. This discussion demonstrates that the research findings meaningfully contribute to both theory and practice in science education and justify the integration of Nearpod as an innovative learning medium.

CONCLUSION

This study concludes that the developed Nearpod-based learning media successfully met the research objectives by providing a feasible, interactive, and pedagogically appropriate learning tool for science instruction on food chain material. The development process using the ADDIE model contributed to a systematic and validated product that supports students' metacognitive skills and learning motivation, while facilitating more active and engaging classroom learning. The findings highlight the contribution of this study to educational practice by demonstrating the potential of Nearpod as an effective digital learning medium that can be implemented to enhance student engagement and higher-order thinking in junior high school science learning. For future research, it is recommended to apply the developed media to different topics, grade levels, and learning settings, as well as to explore its long-term effects and integration with other instructional strategies.

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