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The Feasibility of Interactive Multimedia Nearpod in Problem-Based Science Education at Elementary Schools

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ABSTRACT

Science and Social Studies (IPAS) learning in elementary schools faces challenges in presenting abstract concepts that require effective visualization and active student engagement. Therefore, the integration of interactive multimedia is essential to support meaningful learning. This study aims to examine the feasibility of using Nearpod as an interactive multimedia platform oriented toward Problem-Based Learning (PBL) to improve fifth-grade students' conceptual understanding and digital literacy skills. The study employed a research and development (R&D) approach using the ADDIE model, which consists of the stages of analysis, design, development, implementation, and evaluation. Product feasibility was evaluated through expert validation involving three validators: a subject matter expert, a linguistics expert, and a media expert. The validation results showed feasibility percentages of 93.33% for material aspects, 95.00% for language aspects, and 97.37% for media aspects, all categorized as highly valid. The overall average feasibility score reached 95.23%, indicating that the Nearpod-based interactive multimedia is valid and suitable for use. The findings demonstrate that this multimedia effectively supports problem-based science learning, facilitates the understanding of abstract concepts, and enhances students' digital literacy. Therefore, the developed multimedia is feasible for implementation in fifth-grade elementary schools with minor revisions based on expert recommends.

1. Introduction

The development of science and technology has brought the world of education into a period of transition from the 4.0 industrial revolution to Society 5.0, which demands a paradigm shift in basic education. In this context, the active use of technology is a must so that the learning process can be more active, enjoyable, and

effective (Usmaulidar, Fitria, and Darmansyah 2019). Teachers, as agents of change, play a key role in adjusting learning approaches and tools to the dynamics of existing technology. Technology-based learning media has developed as a response to the demands of this era. This media not only functions as a tool, but also creates an interactive, learner-centered learning environment that encourages exploration and problem solving (Fuadi and Sholihah 2024). This principle is in line with the characteristics of elementary school students who are in the concrete operational phase and need visualization to understand a concept.

Further technological developments have transformed learning media from conventional forms to digital platforms known as interactive multimedia. Interactive multimedia is an integrated synergy of text, images, audio, video, and animation designed to achieve specific educational objectives (Nurachmad 2021). Its advantage lies in its ability to present information audio-visually and, more importantly, enable direct interaction between users and learning content (Prasetyo 2020). This interactivity is the key that distinguishes it from conventional media and is believed to be able to increase motivation, independence, and active student involvement in learning (Wibawanto 2017). The implementation of interactive multimedia in Natural and Social Sciences (IPAS) learning in elementary schools is very relevant, especially for visualizing abstract and complex materials, such as the human respiratory system.

However, the reality in the field shows that the use of learning media in many elementary schools is still limited to blackboards, printed books, and simple videos. Preliminary studies in several elementary schools show that these media are not optimal in visualizing abstract material, causing students to quickly become bored and less active during learning. In addition, the science and digital literacy skills of Indonesian students, based on the PISA survey, are still relatively low (OECD 2019).

One platform that offers such solutions is Nearpod. Nearpod is a web-based application that provides an interactive learning environment with various features such as quizzes, 3D images, simulations, and collaborative discussion boards (Sarginson and McPherson 2021). This application makes it easier for teachers to create dynamic presentations and interactive lessons that can accommodate various learning styles (Shahrokni 2017). In order to make its use more structured and encourage higher-order thinking skills, the integration of Nearpod with an appropriate learning model is essential. The Problem-Based Learning (PBL) model was chosen because it places authentic problems at the core of learning, encouraging students to collaborate, seek information, analyze, and formulate solutions (Hosnan 2014; Sanjaya et al. 2024). The PBL orientation in interactive multimedia is believed to train students' 21st-century skills.

Based on the above description, this study aims to investigate the feasibility of using Nearpod interactive multimedia oriented towards the Problem-Based Learning Model to be applied in IPAS learning in fifth grade elementary schools. The focus of this study is on the feasibility of materials, media, and language in improving

students' understanding of the material and digital literacy skills, in response to the challenges of learning in the digital age.

2. Methodology

This type of research is Research and Development (R&D) research. The development model used in this research is the ADDIE model. The modifications made are intended to assist in developing learning media using the Nearpod application for human respiratory system material in fifth grade elementary school. The development steps of the ADDIE model according to Ahyar et al. (2023) are as follows: First, the analysis stage involves curriculum analysis, needs analysis, problem identification, and goal formulation. Analysis is needed to assist the design process and analyze various needs and limitations in the field. This stage is the data collection stage by conducting interviews, observations, and questionnaires in the field. At this stage, the researcher analyzes the needs, curriculum, student characteristics, facilities and infrastructure, and learning media used.

Second is the design stage, the purpose of which is to ensure that the learning design meets the needs and objectives through appropriate testing. The design stage includes several interactive multimedia development plans, including several activities, namely: compiling research instruments, creating teaching modules, creating flowcharts and storyboards. Then comes the multimedia design stage, the creation of interactive multimedia.

Third, the development stage, which involves the validation of Nearpod-based interactive multimedia using the Problem-Based Learning model by experts consisting of subject matter experts, language experts, and media experts. This continues until the product is validated. Then the fourth stage is the implementation stage, which aims to test the product in the learning process that has been designed and validated. This stage begins with preparing all the necessary facilities and infrastructure and conditioning the classroom environment to suit current conditions. Once everything is in place, researchers can use the developed product in the learning process. The final stage is the evaluation stage. This stage is the final stage in the ADDIE model. The interactive multimedia that has been developed is evaluated based on practicality and effectiveness. The practicality test aims to evaluate the practicality of using Nearpod-based interactive multimedia products oriented towards Problem-Based Learning. Meanwhile, the effectiveness test aims to test or observe the impact of Nearpod-based interactive multimedia products oriented towards Problem-Based Learning on conceptual understanding and digital literacy skills.

Research subjects

The research subjects consisted of three education experts, who were selected using non-probability sampling techniques, specifically purposive sampling. This was based on the expertise of each expert and their experience in relevant fields. The names of the validators are as follows: expert in Integrated Science Learning, expert

in Educational Technology, Curriculum, and Interactive Multimedia Development, and expert in language and literature education, learning media development, and children's literacy based on local culture. All three validators hold doctoral degrees (Ph.D.), and one of them even holds the position of professor. They also have research experience, are actively involved in research development and academic publications in their fields, and are active in community service.

Research location

Product feasibility testing was conducted directly (offline) at Universitas Negeri Padang. Validation testing by material experts was conducted at the Faculty of Natural Sciences. Validation testing by language and media experts was conducted at the Faculty of Education. The interactive multimedia tested for feasibility was a product designed as interactive multimedia. It was presented in the form of a thesis research proposal and its attachments, which had been disseminated.

Data Collection Instruments and Techniques

Data collection was carried out using a validation questionnaire instrument. The validation instrument consisted of material validation, media validation, and linguistic validation sheets. The material validation instrument contained information about the suitability of the interactive multimedia developed with the learning materials in accordance with the curriculum. The data obtained from the analysis of the interactive multimedia was analyzed into all sections in the form of a table using a Likert scale with a scale of one to four (1 to 4). Based on the validation, the scores for each category can be seen in the following table 1.

Table 1. Assesment Scores Categories of Feasibility

Score	Category
4	Highly suitable
3	Suitable
2	Not suitable
1	Highly unsuitable

Based on the scores obtained, the following formula can be used to calculate:

$$P = \frac{f}{n} \times 100\%$$

Description:

P : Percentage of questionnaire data

f : Total score obtained

n : Maximum score

The categories for the scores obtained are as follows. This can be seen in Table 2 below.

Table 2. Interactive Multimedia Feasibility Category

Range %	Category
81.0% - 100.0%	Highly valid
61.0% - 80.9%	Valid
41.0% - 60.9%	Less valid
21.0% - 40.9%	Not valid

Qualitative Analysis

Comments and suggestions from validators to improve the quality of interactive multimedia are analyzed in an integrated manner to strengthen and clarify quantitative results. The steps taken include analyzing the validation results from each aspect, then processing lower scores in the form of product revisions to optimize the quality of interactive multimedia. Researchers use input from validators as a basis for improving the multimedia products developed.

3. Results and Discussion

Result

This research was conducted based on the stages of ADDIE model development, which include (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. The analysis was conducted through a preliminary study in the form of observations, interviews with homeroom teachers and fifth-grade students at each school, and the distribution of questionnaires. The material to be presented in the development of this interactive multimedia is IPAS material, the human respiratory system in chapter 5. The objectives of this lesson are a) by observing 3-dimensional images of respiratory organs on Nearpod, students are able to identify and name the human respiratory organs correctly. b) Through group discussions, students will be able to describe the functions of each human respiratory organ accurately. c) By observing instructional videos, students will be able to describe the human respiratory process accurately. e) Through group discussions, students will be able to analyze the human respiratory mechanism accurately. Based on the results of observations, interviews, and questionnaires at three schools, SDN 03 Koto Tengah, SDN 12 Pagaruyung, and SDN 11 Tanjung Barulak, it is known that the use of media in schools is not yet optimal and that innovation in the form of interactive multimedia is needed for abstract material so that it can be visualized properly.

In the second stage, the design stage, researchers designed the instruments needed to develop Nearpod interactive multimedia oriented towards the PBL model in IPAS subjects. These instruments consisted of product validity instruments, product practicality instruments, and product effectiveness instruments. Researchers compiled test questions to measure how effective PBL-oriented interactive multimedia was in improving students' understanding of IPAS concepts in fifth grade elementary school. In addition, the researcher created a learning design in the form of a teaching module that contained important components, including general information, core competencies, and attachments. Then, the researcher created a

flowchart that served as the main basis for compiling the storyboard and visual display of the interactive multimedia. The final step in this stage was to design interactive multimedia using the Nearpod application. In this planning stage, the researchers prepared materials, various image, audio, and video media, student worksheets, games, and evaluation questions to be included in the interactive multimedia they created. The following is an example of the interactive multimedia display that the researchers created. It can be seen in Figure 1.

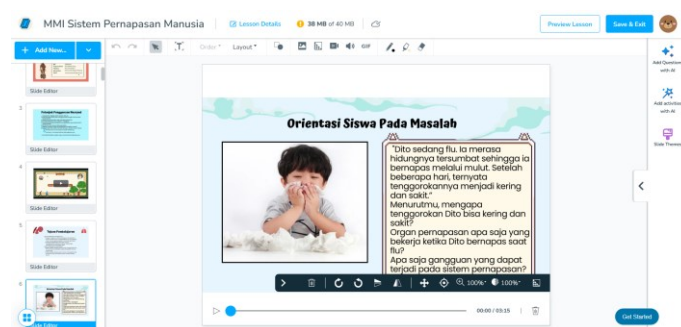


Figure 1. Syntax display of PBL in Nearpod-assisted interactive multimedia

This study aims to test the feasibility of previously developed learning media, namely Nearpod Interactive Multimedia oriented towards the PBL model. This interactive multimedia was developed to be applied in science learning at the elementary school level, with an emphasis on mastering concepts and students' digital literacy skills. Therefore, to determine whether this multimedia is feasible to be applied in IPAS learning in elementary schools, a validity test was conducted. This Nearpod interactive multimedia underwent a validation process by experts to ensure the suitability of its content, language, and media. The validation was carried out by education experts, each of whom has expertise in science, educational technology, linguistics, and learning media development. This interactive multimedia was developed based on the ADDIE development model, which consists of five stages

The interactive multimedia that was developed contains material related to the human respiratory system with sub-material on the respiratory organs and respiratory mechanisms for two learning sessions. The interactive multimedia consists of a multimedia introduction (cover), instructions for use, learning objectives, and learning stages oriented towards the PBL model based on the steps according to Hosnan (2014), namely orienting students, organizing students to learn, guiding individual or group investigations, developing and presenting work results, and finally evaluating the problem-solving process. Learning with the PBL model encourages students to work together to identify problems, seek relevant information, and formulate solutions based on their analysis (Sanjaya et al., 2024).

Interactive multimedia was validated in one stage with revisions. This was done because the results of the validation test in the first stage had a score of over 81%. Therefore, after the first validation test, the author continued with revisions according to the validator's improvement instructions without having to proceed to

the second or subsequent validation test stages. The following is an explanation of the results of the interactive multimedia feasibility test conducted on the content/material aspect, which can be seen in Table 3.

Table 3. Content Validation Results

Material/Content Validation Indicator	Questionnaire Score
Suitability of material	12
Presentation of material content	22
Currency of material	11
Suitability for students	11
Total score obtained	56
Maximum score	60
Percentage	93,33%

Based on the table 3 above, the average validation score by subject matter experts reached 93.33%, which is classified as very suitable for use in the field, although there are still some aspects that need improvement. The expert validators suggested that the PBL model steps should be clearly visible in the Nearpod interactive multimedia, paying attention to the learning media criteria and a more practical way to access the application. The results of the language expert validation can be seen in Table 4 below.

Table 4. Linguistic Validation Results

Linguistic Validation Indicator	Questionnaire Score
Readability of text in Nearpod media	20
Clarity of language	19
Compatibility with language rules	17
Effective and efficient use of language	20
Total score obtained	76
Maximum score	80
Percentage	95,00%

Based on the table 4 above, the average validation score by linguists reached 95.0%, which is classified as valid. This shows that, overall, the multimedia product has met the linguistic feasibility criteria for use in IPAS learning in fifth grade elementary school. The results of the media expert validation can be seen in Table 5 below.

Table 5. Media Validation Results

Media Validation Indicator	Questionnaire Score
Media content suitability	8
Learning design	16
Interactivity and Navigation	11
Audio quality	7
Clarity and Readability	8
Suitability for student characteristics	8
Media functionality	16
Total score obtained	74
Maximum score	76
Percentage	97,37%

Based on the table 5 above, the average validation score by media experts reached 97.37%, which is classified as very suitable for use in the field, although there are still some aspects that need improvement. The media validation of Nearpod interactive multimedia shows highly valid results, making it suitable for use in IPAS learning in fifth grade elementary schools. Recommendations from media expert validators include adding background music, adding animations, and considering the inclusion of evaluation questions in interactive multimedia. For details, see Table 6.

Table 6. Suggestions and Product Improvements Before and After Revision

By Subject Matter Experts	
Before Revision	After Revision
Activities with phases from the PBL model are not visible in the interactive multimedia.	In the interactive multimedia, the researcher has added explanations to the activities with phases from the PBL model.
By Language Experts	
Before Revision	After Revision
Pay attention to the right and left alignment in the research sentences.	Researchers had revised the sentences in the table using left alignment.
By Media Expert	
Before Revision	After Revision
It is recommended to add animation and audio to the multimedia.	Researchers added animation and audio to the initial display of the multimedia.
Add background music to the problem orientation page	The researcher had added background music to the problem orientation page.
Consider adding an evaluation to the multimedia.	The researcher had added evaluation questions to the multimedia.

The results of the implementation and evaluation stages of ADDIE are not yet available and have not been presented.

Discussion

Based on the validation results by subject matter experts, the interactive multimedia received a total score of 56 out of a maximum score of 60, with a percentage of 93.33%, which is classified as highly valid. In terms of content feasibility, the material received a very good rating. The material was deemed to be in line with the learning outcomes (CP), the topics in the interactive multimedia were in line with the learning objectives, and the material presented was also in line with the learning objectives to be achieved. This assessment shows that the content of the material meets the expected feasibility criteria in terms of suitability, relevance, and alignment with the learning to be taught. Overall, these results are in line with the opinion of Armadhani et al. (2025), which states that interactive multimedia is valid if the developed material is in accordance with the curriculum, learning objectives, and the learning context of the students, so that it is pedagogically appropriate and supports meaningful learning in elementary schools. In addition, (Pebrianti and Zainil 2022) emphasize that the suitability of the content of learning media is determined by the integration of learning objectives, material, and learning

activities that are systematically arranged, so that the media developed can be used effectively in the learning process in elementary schools.

In terms of material presentation, most indicators received excellent scores. The material was presented systematically, containing various forms of media, text images, and videos, presenting multimedia that was appropriate to the material, and successfully presenting the material in accordance with the topic. In addition, two indicators in this aspect received good scores, namely that the material in interactive multimedia was presented completely and the images and videos in multimedia were accurate. However, the completeness of the material can still be improved to enhance student understanding. This is in line with the opinion of Dwiqi, Sudatha, and Sukmana (2020), who stated that combining several aspects of image, text, sound, animation, video, and interactivity can attract students' interest and motivation so that the material can be mastered well.

In terms of material relevance, two indicators received excellent scores. The material presented was in line with scientific developments in respiratory system education for elementary school students, and it was also presented interactively, making it easy and quick to understand. The up-to-date nature of the material in multimedia learning also needs to be balanced with the presentation of contextual problems so that students can understand scientific concepts through meaningful real-life experiences (Gunawan, Soepriyanto, and Wedi 2020; Zairana, Djulia, and & Harahap 2020).

The final aspect, namely the suitability of the material for students, showed that most indicators scored very well. The interactive multimedia developed is suitable for the characteristics of students, as well as their needs. However, in this aspect, the interactive multimedia indicator stimulates students' curiosity with a good score. To increase students' curiosity, the researcher also presented media accompanied by 3-dimensional images, audio, video, and quizzes. This is in line with the opinion of Limbong et al. (2022) that interactive multimedia designed according to student characteristics and enriched with audiovisual elements and interactive activities can increase student curiosity, motivation, and active involvement in the learning process.

Based on the results of linguistic validation, the interactive multimedia developed received a total score of 76 with a feasibility percentage of 95.00%, which falls into the highly valid category. These findings indicate that the use of language in multimedia has met the aspects of text readability in Nearpod, fluency, conformity with language rules, and effective and efficient use of language. However, there is a suggestion to pay more attention to the left and right strata in writing. In terms of text readability in Nearpod, it received an excellent rating. The language used is easy to understand, the text is presented in an interesting way, the text is interactive and clear, it uses good and correct language rules, and the information presented by the text is clear. According to Sarip et al. (2022), text readability can increase students' interest in learning because the material is presented in an attractive way and uses simple language. Idhoofiyatul and Sofi (2019) also argue that good reading texts must be appropriate for the reader's educational level and not difficult for

students to read. This enables students to understand the material texts in the learning process well.

The next linguistic aspect is clarity. The validation results show that most indicators received excellent scores. Interactive multimedia already uses the correct sentence structure, the terms used are standard, the words used in constructing sentences are also correct, and the sentences in the multimedia do not cause double interpretations. However, there is one indicator in the clarity aspect with a good score, namely sentence effectiveness. According to Baltu & Irawan (2025) sentence effectiveness refers to sentences that use simple language so that students can learn independently and effectively. In terms of compliance with language rules, two indicators received excellent scores.

The spelling of words in interactive multimedia is correct, and the use of letters is also correct. However, there are three indicators in the aspect of conformity with language rules that received a good score. The grammar, spelling, and use of punctuation in multimedia are correct. The use of capital letters and punctuation can affect the message that the writing conveys to the reader (Silalahi 2020). In addition, the language used in interactive multimedia is communicative, uses correct and proper spelling (EYD), the sentence structure in the paragraphs is coherent, and the words used are concise, straightforward, and familiar to students so that they can easily understand the information conveyed.

Based on the results of media validation, the interactive multimedia developed obtained a total score of 74 with a feasibility percentage of 97.37%, which is classified as highly valid. These findings indicate that the media has been able to support the learning process. In terms of content feasibility, the media displayed is in line with the learning outcomes and objectives. Information about the competencies and topics to be achieved is presented clearly, so that students can understand the direction of learning from the outset. This clarity of purpose is in line with the opinion (Mayer 2024) which emphasizes that multimedia designed in accordance with learning objectives will be more effective in helping students build a deep understanding. This is also in line with the findings Fitriya et al. (2024) which state that material is considered appropriate if it is in line with core competencies and learning objectives.

The multimedia developed is appropriate for elementary school students and tailored to their needs. Students are in the concrete operational stage, requiring learning media that can help them visualize abstract material that cannot be seen directly with the eyes so that it is easier to understand. This is also in line with the results of research Gunawan et al. (2014), which shows that people who learn using interactive multimedia have a higher mastery of concepts than those who learn conventionally. To meet the diverse needs and learning styles of students, various forms of media are needed, such as three-dimensional images that allow students to see shapes and concepts more realistically, instructional videos, digital teaching materials, and other supporting media. The final aspect is functionality. This aspect is one of the strengths of this media. The application can be used properly without experiencing errors, is easy to operate, and is efficient in terms of time usage.

However, this multimedia can only be accessed using a stable internet network. Shabrina et al. (2025) stated that learning media designed with responsive principles can increase accessibility and user satisfaction because it can be used smoothly on various devices.

4. Conclusion

Based on the results of validation by subject matter, language, and media experts, it can be concluded that the interactive multimedia developed is highly valid and suitable for use in elementary school learning. The material has been compiled in line with learning outcomes and objectives, is relevant to scientific developments, and is appropriate to the characteristics and needs of students, supported by systematic and interactive presentation. From a linguistic perspective, the multimedia uses communicative language that is easy to understand and conforms to linguistic rules, thereby supporting the readability and clarity of information. Meanwhile, from a media perspective, the interactive multimedia is able to visualize concepts concretely, is easy to operate, and functions optimally in supporting the learning process, although its use still depends on the availability of a stable internet connection.

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