

Development of Interactive Learning Media Integrated with the Problem-Based Learning Model on Work and Energy Material.

Sulfa Ina^{*}, Nova Kafrita², Arif Wiratama³

^{1,2,3}Program Studi Tadris Fisika Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi, Jambi, Indonesia

**Corresponding author: sulfaina0723@gmail.com*

ABSTRACT

Article history:

Submitted: February 02, 2025

Accepted: March 05, 2025

Published: May 27, 2025

Keywords:

Problem-Based Learning model, ADDIE Development Model, work And Energy

This research aims to determine the development, validity, and practicality of interactive learning media integrated with the Problem-Based Learning model on work and energy material. The type of research in this study is Research and Development (R&D) using the ADDIE development model. The sample in this research consists of 5 students from class VIII A of SMP N 1 Muaro Jambi for the small group trial, and 29 students from class VIII B of SMP N 1 Muaro Jambi for the large group trial. The data analysis technique in this study is the Likert scale, used to measure the validity and practicality of the developed learning media. The results of this study show that the validity falls under the "Very Valid" category with an average percentage of 83,79% from media and material expert validation. The small group trial resulted in a percentage of 75,2% with the "Practical" category, requiring some improvements, while the large group trial showed a percentage of 86,6% with the "Strongly Practical" category. The teacher response survey yielded a percentage of 90.7%, categorized as "Strongly Practical." Thus, the interactive learning media integrated with the Problem-Based Learning model on work and energy material is feasible for use in research and can be effectively implemented by both students and teachers.

1. INTRODUCTION

Learning media is an essential instrument for achieving learning objectives effectively and efficiently. A deep understanding of the subject matter to be taught and the ability to create appropriate and adequate media as teaching aids are prerequisites for teachers who aim to develop effective learning media (Magdalena et al., 2021). One of the instruments that teachers can use to engage students and foster their interest in the learning material is instructional media. Teachers must be able to select learning materials that align with the subject matter being taught, accommodate students' learning styles, and comply with the requirements of the Merdeka Curriculum (Wulandari et al., 2023).

Based on the initial observations conducted on March 20, 2024, it was found that the school has supportive facilities, such as projectors and a nearly complete set of laboratory equipment. However, there are still shortcomings in the science learning process that hinder its effectiveness. Many teachers have not yet utilized interactive learning media, primarily due to a lack of proficiency in developing educational materials using software programs. Additionally, students show little interest in science subjects, and lecture-based teaching remains the predominant instructional strategy.

The researcher also examined the science learning outcomes of students at SMP N 1 Muaro Jambi. How did the science teacher of Grade VIII at SMP N 1 Muaro Jambi provide the learning outcomes to the researcher? **Table 1** below presents the learning outcomes:

Table 1. *Student Learning Outcomes Scores*

Score Range	Total Score	Description
0 – 25	4	Very poor
26 – 50	14	Poor
51 – 75	11	Good
76 - 100	3	Fairly good

Table 1 above shows that the average KKM (Minimum Competency Criteria) for science learning outcomes remains low or falls below the expected standard. Two factors contribute to the low student achievement: first, students generally lack motivation to read learning materials; second, teachers frequently rely on lecture-based teaching methods, resulting in limited use of interactive learning resources. This can lead to a decline in students' interest and engagement in the learning process. Therefore, students are expected to develop a solid understanding of science topics, such as work and energy, particularly the concepts of kinetic and potential energy. This affects their ability to overcome challenges encountered during the learning process.

Therefore, learning must be innovative by creating educational materials that are more engaging for children. Educational materials based on Adobe Flash CS6 are one of the resources currently being developed. This software serves as the foundation for creating media with action scripts, enabling animation changes, creating interactive buttons, and combining various elements including text, sound, video, and images (Awaliyah, 2021). One of the programs with many features commonly used to produce interactive learning materials is Adobe Flash CS6, which can integrate graphics, animations, and sound simultaneously. To produce captivating effects, Adobe Flash CS6 has enhanced its capabilities (such as 3D effects or transformations) (Aminah & Afrianis, 2023).

The use of learning models to help students develop their conceptual understanding of existing information is another element that can enhance the learning process. Problem-based learning (PBL) is one such approach that can be beneficial for students. The learning approach known as "problem-based learning" encourages students to use critical thinking to solve problems and find solutions (Purwanto & W, 2016). This approach, referred to as Problem-Based Learning (PBL), can help students become more proactive and independent in developing their critical thinking skills (Rahmadani, 2019).

2. METHOD

The research methodology in this study is research and development, or in English, referred to as research and development. Producing a specific product and evaluating its effectiveness are two tasks conducted through research and development techniques. Validating an existing product and developing a new one, such as improving an existing product to make it more beneficial, efficient, and effective, or developing a completely new product, are functions of research and development (Sugiyono in Bilqis S, 2021). The ADDIE research and development model was applied in this study. One of the most common instructional design approaches is the ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation. ADDIE serves as a

guide to creating dynamic and efficient training program tools and infrastructure that enhance training implementation (Molenda in Mubarok, 2019). However, only four stages—analysis, design, development, and implementation—were conducted in this study. The evaluation stage was not carried out due to the time constraints faced by the researcher.

The data analysis method for this research and development study utilizes the Likert scale. The validity and usability of the developed instructional materials are evaluated using the Likert scale. Data for the analysis of this study were obtained from questionnaires completed by students and teachers, as well as validation sheets. The practicality analysis of the learning media is in the form of a questionnaire distributed to students to gather responses and to teachers to assess how the interactive learning media is used. The feasibility of the interactive instructional materials was ensured by analyzing data from the validation sheets that had been verified by validators. The collected data were numbered as alternative answers for each instrument item, and the measurement scale used is the Likert scale.

Table 2. *Feasibility And Practicality Scale Criteria*

Percentage	Validity Criteria	Practicality Criteria
76% - 100%	Highly Valid	Highly Practical
51% - 75%	Valid	Practical
26% - 50%	Invalid	Impractical
0% - 25%	Highly Invalid	Highly Impractical

Sumber: Nabila, 2020

3. RESULTS AND DISCUSSION

Using Adobe Flash CS6 software and the resources of work and energy, this interactive learning media was created in accordance with the ADDIE development model approach. Only four of the five ADDIE research stages analysis, design, development, and implementation—were utilized in this study. The following is an explanation of the results of the media development process at each stage:

a. Analysis Phase

In this stage, the researcher observed three different aspects: material analysis, competency analysis, and characteristic analysis. The researcher conducted an interview with a senior science teacher from SMP N 1 Muaro Jambi. The results of this analysis indicated that the cognitive, psychomotor, and affective aspects of students require special attention in developing instructional strategies. Based on the analysis results, to enhance student engagement in the learning process, the researcher must create interactive learning materials by utilizing Adobe Flash CS6, integrated with the Problem-Based Learning (PBL) model.

b. Design Phase

The design or planning stage is conducted after the analysis stage. In this phase, the researcher creates a storyboard. The cover page, main menu display, material menu display, and experimental page display are part of the storyboard created by the researcher using Adobe Flash CS6 instructional materials. This also includes the interactive evaluation question page display and other page displays.

c. Development Phase

To create Adobe Flash CS6-based learning materials integrated with the PBL model, the development stage is a crucial phase in this research. Two procedures will be applied in this stage: the development of learning media and validation.

1) Development Of Learning Media

The researcher will produce or design the media throughout the development stage according to the plan outlined in the design stage. The development stage implements the design created in the design phase into the software, namely Adobe Flash CS6, transforming it into a physical form or real system. The appearance of the designed learning media is then published as an Android application.

2) Validation

The validation stage is the process of assessing the quality of the instructional materials that have been validated by experts. The purpose of this validation is to ensure that the instructional materials or products produced meet the required quality standards. The validity of the interactive instructional materials is evaluated by expert validators, particularly experts in media and content.

a) Media Expert Validation

In the media validation stage, two aspects are evaluated: the technical quality and the design quality of the learning media display. After obtaining the media expert validation results, data analysis of the learning media validation results is conducted, and the analysis results are presented in the following **Table 3**:

Table 3. Data From Media Expert Validation Analysis

Aspect	Number Of Questions	Score Obtained	Maximum Score	Average Score	Percentage
Quality of learning media design	20	71	80	3,55	88,75%
Technical quality	8	26	26	3,25	100,0%
Average Percentage Criteria					94,38% Highly Valid

This interactive learning media is deemed suitable for use based on the average percentage score of each aspect, which is 94.38%, categorized as "Highly Valid." In addition to the information obtained from the media expert validation results, the researcher has also made several modifications based on recommendations provided by the media expert validators. These include improvements to the instructional page, where the researcher was advised to add indicators for each learning step that uses the media, specifying which steps they are associated with. Another suggestion was the addition of a page to provide an explanation of the work experiment before entering the experiment page. Regarding the work experiment, a change was recommended to set a limit on the force value to ensure that the animation moves according to the given force value. Additionally, the issue with the animation video not playing when opened has been resolved by adding the animation video during the media publishing process.

b) Material expert validation

The material validation was conducted by two subject matter experts. The aspects evaluated included language aspects to assess the appropriateness of the language used in the interactive learning media based on Adobe Flash CS6, presentation aspects to determine the completeness of the material delivery, and content aspects to evaluate the alignment of the material with the specified indicators. After obtaining the results from the subject matter experts' validation, the next step was to analyze the findings from both validations.

Validator I, a subject matter expert from the Physics Education Study Program at UIN STS Jambi, provided scores for the material validation in the interactive learning media. The scores ranged between 3 and 4 across 19 questions, resulting in a total score of 57. The data from the material validation conducted by Validator I is presented in Table 4 below.

Table 4. Data From Material Expert 1 Validation Analysis

Assessment Aspect	Number Of Items	Score Obtained	Maximum Score	Average	Feasibility Percentage
Material content aspect	7	24	28	3,4	85,7%
material presentation aspect	8	22	32	2,75	68,8%
language aspect	4	11	16	2,75	68,8%
Average Percentage Criteria					74,40% Valid

Based on the analysis of the learning material validation conducted by Validator I, the percentage scores for each aspect were obtained. The content aspect received a percentage score of 85.7%, categorized as "Highly Valid." The presentation aspect received a percentage score of 68.8%, categorized as "Valid," while the language aspect also received a percentage score of 68.8%, categorized as "Valid." Based on the scores from each aspect, the overall average percentage was 74.40%, which falls under the "Valid" category. Therefore, it can be concluded that the material in this interactive learning media is suitable for use.

Validator II, a subject matter expert from the Physics Education Study Program at UIN STS Jambi, also provided scores for the material validation in the interactive learning media. The scores ranged between 3 and 4 across 19 questions. The data from the material validation conducted by Validator II is presented in Table 5 below.

Table 5. Data From Material Expert 2 Validation Analysis

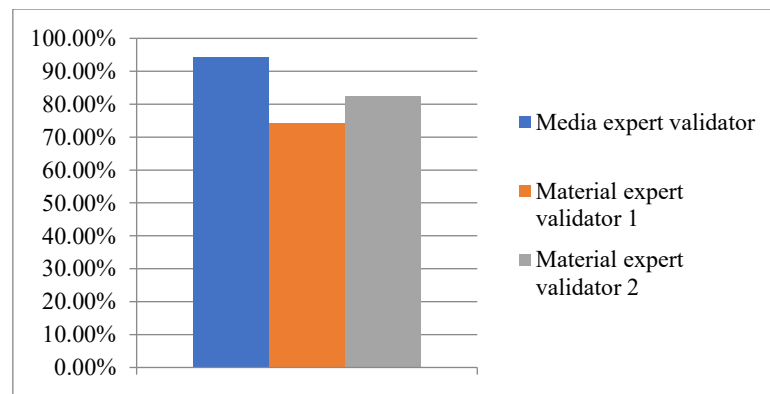
Assessment Aspect	Number Of Items	Score Obtained	Maximum Score	Average	Feasibility Percentage
Material content aspect	7	23	28	3,29	82,1%
material presentation aspect	8	27	32	3,38	84,4%
language aspect	4	13	16	3,25	81,3%
Average Percentage Criteria					82,59% Highly Valid

Based on the analysis of the learning material validation conducted by Validator II, the percentage scores for each aspect were obtained. The content aspect received a percentage score of 82.1%, categorized as "Highly Valid." The presentation aspect received a percentage score of 84.4%, also categorized as "Highly Valid," while the language aspect obtained a percentage score of 81.3%, categorized as "Highly Valid." Based on the scores from each aspect, the overall average percentage was 82.59%, which falls under the "Highly Valid" category. Therefore, it can be concluded that the material in this interactive learning media is suitable for use.

The overall percentage data from the media expert validator and the two subject matter expert validators can be seen in Table 6 and the percentage graph in Figure 1 below.

Table 6. *Validator Percentage Data*

No	Validator	Percentage (%)	Criteria
1	Media expert validator	94,38%	Very valid
2	Material expert validator 1	74,40%	Valid
3	Material expert validator 2	82,59%	Very valid
Average Total Percentage		83,79%	Very Valid



Gambar 1. *Validator Percentage Graph*

Based on the validation results of the interactive learning media, the Media Validator obtained a percentage score of 94.38%, categorized as "Highly Valid." The material validation by Validator I resulted in a percentage score of 74.40%, categorized as "Valid," while Validator II assigned a percentage score of 82.59%, categorized as "Highly Valid." With the "Highly Valid" classification, the media and its content achieved an average validity level of 83.79%. Therefore, the researcher concludes that, with minor adjustments in certain areas, the interactive learning resource developed using Adobe Flash CS6 is valid and suitable for use.

d. Implementation Stage

The interactive learning media will be evaluated in both small and large groups during the implementation phase, following expert validation and the declaration of its validity or suitability for use. The purpose of the small-group and large-group trials is to assess the effectiveness and usefulness of the developed educational material.

1) Small Group Trial Results

Five respondents, or five students from class VIII A at SMP N 1 Muaro Jambi, participated in the small-group trial. During the learning process, each student was instructed to observe the interactive learning material. After completing the learning session, students were asked to fill out a questionnaire to provide feedback on the interactive learning material. Table 7 below presents the findings from the questionnaire analysis for the small-group trial.

Table 7. *Data From Small Group Trial Analysis*

Aspect	Number Of Questions	Score Obtained	Maximum Score	Average Score	Percentage
Quality of material content	3	47	60	9,40	78,3%
Learning design	9	133	180	26,60	73,9%
Quality of instructional media design	7	101	140	20,20	72,1%
Technical quality	4	61	80	12,20	76,3%
Average Percentage Criteria					75,2% Practical

Based on the results of the small-group trial involving five respondents, the percentage score for each component was determined. Regarding the "Practical" criteria, the average percentage score for each component in the small-group trial was 75.2%. Following the completion of the smallgroup trial, the researcher made several modifications to various aspects of the interactive learning material. These included adjusting the size of buttons on each page within the learning media, resizing the animated problem-solving video, which was initially too small, by adding a new scene for the video, and incorporating sound effects for buttons to enhance the engagement of the learning media

2) Large Group Trial Results

A total of 30 students from class VIII at SMP N 1 Muaro Jambi will test the updated interactive learning material in a large-group setting after the material has been revised or modified based on the small-group trial. Students will complete a student response questionnaire regarding the learning media after the large-group trial is completed. Table 6 below presents the findings from the student response questionnaire analysis for the large-group trial.

Table 8 *Data From Large Group Trial Analysis*

Aspect	Number Of Questions	Score Obtained	Maximum Score	Average Score	Percentage
Quality of material content	3	308	348	10,62	88,5%
Learning design	9	918	1044	31,66	87,9%
Quality of instructional media design	7	698	812	24,07	86,0%
Technical quality	4	390	464	13,45	84,1%

Average Percentage	86,6%
Criteria	Highly Practical

Based on the analysis of the large-group trial with 29 respondents, the percentage score for each aspect was obtained. The average percentage score for each component in the large-group trial, according to the "Highly Practical" criteria, was 86.6%. Thus, it can be concluded that students are able to effectively utilize the Adobe Flash CS6-based interactive learning material for the topic of Work and Energy in class VIII at SMP N 1 Muaro Jambi.

3) Teacher Response Questionnaire Results On Media Implementation

Based on the research involving a science teacher in class VIII at SMP N 1 Muaro Jambi, who was given a teacher response questionnaire during the large-group trial, Table 9 below presents the results of the teacher response questionnaire analysis.

Table 9. Data From Teacher Response Questionnaire Analysis

Aspect	Number Of Questions	Score Obtained	Maximum Score	Average Score
Media implementation	6	22	24	91,7%
Media implementation in learning	7	26	28	92,9%
Media compatibility with the PBL model	8	28	32	87,5%
Average Percentage				90,7%
Criteria				Highly Practical

Based on the analysis of the teacher's response data, the percentage score for each aspect was obtained, with the average percentage score for each aspect being 97.7%, meeting the "Highly Practical" classification. Therefore, it can be concluded that both teachers and students are able to use the interactive learning material effectively.

4. CONCLUSION

The following can be concluded from the author's explanation or description of the research titled "Development of Integrated Interactive Learning Media Using the Problem-Based Learning Model on the Topic of Work and Energy":

In this study, the researcher followed a series of product development stages, starting with an analysis that included competencies, characteristics, and content. After the analysis stage, the researcher proceeded to the design phase by creating a storyboard for the Adobe Flash CS6-based learning media, which included various displays such as the cover, main menu, content, experiment pages, and interactive evaluation. The development stage was a crucial step where the researcher designed the media according to the previous plan and implemented it physically using Adobe Flash CS6 software. Subsequently, to ensure quality criteria were met, specialists, including media and content experts, evaluated the media quality during the validation phase. After the media was validated, the implementation phase involved testing the developed learning media in small and large groups to assess its effectiveness. Therefore, the goal of this entire

process is to create interactive learning materials that are beneficial and appropriate for supporting the Problem-Based Learning (PBL) model.

Based on the average percentage of validation by media and content experts for the Adobe Flash CS6-based interactive learning material, which falls under the "Highly Suitable" criteria, the percentage score is 83.79%. Therefore, this Adobe Flash CS6-based interactive learning material is deemed suitable or practical for use in the research at SMP N 1 Muaro Jambi.

Based on the student questionnaire data, 74.3% of the participants in the small-group trial met the "Practical" criteria, while 83.5% of the participants in the large-group trial met the "Highly Practical" criteria. According to the teacher feedback survey regarding the use of the interactive learning material, 90.5% of the teachers met the "Highly Practical" criteria. Therefore, it can be concluded that both teachers and students can effectively use the Adobe Flash CS6-based interactive learning material.

5. REFERENCES

- Aminah, S., & Afrianis, N. (2023). Desain dan Uji Coba Buletin Berbasis SETS (Science , Environment , Technology and Society) dengan Menggunakan Adobe Flash Cs6 Pada Materi Larutan Elektrolit dan Nonelektrolit. *Jurnal Pendidikan Kimia Dan Terapan*, 07(01).
- Awaliyah, N. (2021). *Pengembangan Media Pembelajaran Menggunakan Adobe Flash CS6 Pada Materi Segi Empat Dengan Pendekatan Kontekstual*.
- Bilqis S. (2021). *Pengembangan Media Pembelajaran Matematika Berbasis Macromedia Flash Pada Materi Transformasi Kleas IX Di SMP Negeri 5 Pekanbaru*.
- Magdalena, I., Shodikoh, A. F., Pebrianti, A. R., Jannah, A. W., & Susilawati, I. (2021). *Pentingnya Media Pembelajaran Untuk Meningkatkan Minat Belajar Siswa SDN Meruya Selatan 06 Pagi*. 3, 312–325.
- Mubarok, M. (2019). *Pengembangan Media Pembelajaran Macromedia Flash Berbasis Web Pada Materi Bangun Ruang Sisi Lengkung Kelas IX SMPN 1 Brangsong*.
- Nabila, S. (2020). *Pengembangan Media Pembelajaran Interaktif Berbasis Adobe Flash CS6 Pada Materi Struktur Atom Di MAN 3 Banda Aceh*.
- Purwanto, W., & W, E. T. D. R. W. (2016). Penggunaan Model Problem Based Learning Dengan Media Powerpoint Untuk Meningkatkan Minat Belajar Siswa. *Teori, Penelitian, Dan Pengembangan*, 1(9), 1700–1705.
- Rahmadani. (2019). Metode Penerapan Model Pembelajaran Problem Based Learning (PBL). *Lantanida Journal*, 7(1).
- Wulandari, A. P., Salsabila, A. A., Cahyani, K., & Shofiah, T. (2023). *Pentingnya Media Pembelajaran dalam Proses Belajar Mengajar*. 05(02), 3928–3936.