The practicality of interactive multimedia integrated science based on guided inquiry with theme energy in the life that integrates of learning for the 21\textsuperscript{st} century

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Abstract. This research discusses the practicality of Integrated Natural Science interactive multimedia in the learning process with the theme of energy for grade VII students in junior high schools. Interactive multimedia is designed using a guided inquiry model where in its design interactive multimedia is also integrated with 21\textsuperscript{st} century learning. To see the level of practicality of this interactive multimedia, small and large group trials were conducted using instruments in the form of validated and distributed questionnaires to teachers and students. The results showed that the practicality level of Integrated Science interactive multimedia from teacher and student responses to the use of Integrated Science interactive multimedia in the learning process was in the practice category. So it can be seen that the use of integrated science interactive multimedia based on guided inquiry with the theme of energy in the integrated life of 21\textsuperscript{st} century learning is practically used in learning.

1. Introduction

Education is a conscious effort to create an atmosphere of learning and a fun learning process so that students actively develop their abilities to have spiritual strength, self-control, personality, intelligence and noble morals needed for society, nation and state[1]. In essence, education in Indonesia is an education with a unique character according to Indonesian culture itself, and in line with the 21\textsuperscript{st} Century skills record with all its challenges [2].

The 21st century is a century where everything is based on science and technology, so that it requires all citizens to master various forms of skills, including critical thinking skills and problem solving of various increasing problems [3]. 21st century education combines knowledge skills, skills, and attitudes, as well as mastery of information technology [2]. These skills can be developed through various activity-based learning models in accordance with the characteristics of competencies and learning materials in SMP. One of the subjects in junior high school that refers to the 2013 Curriculum and can play an important role in facing the challenges of the 21st century is Natural Sciences [4].

Natural Science is a branch of science that originated from natural phenomena. Through integrated Natural Science learning, students can gain direct experience, so that they can increase their strength to accept, store, and apply the concepts they have learned[5]. Learning experiences that show more linkage of conceptual elements will make the learning process more effective for students [6].
21st century learning aims to prepare Indonesian citizens to have the ability to live as citizens who are faithful, productive, creative, innovative, and affective and able to interact in social life [2]. In the era of the 21st century, science learning is carried out by: scientific inquiry with a student centered approach to give birth to creative thinking and critical thinking skills, be able to solve problems, train innovation skills and emphasizes the importance of collaboration and communication [7]. This spurs educators to be able to adjust learning activities in the classroom by using learning models that are in accordance with the demands of the government, using student worksheets, and accompanied by using learning media that attract students' learning interest in order to help students have a critical mindset in facing the challenges of 21st century learning [2]. 21st century so that they can increase their competence, both attitude competence, knowledge, and skills and can help students in learning the natural surroundings[2][4][8].

In addition to integrating the learning skills of the 21st century the role of teachers and teaching materials to be important to facilitate student learning both at school and during their studies in the home. Aprili (2020), Ayu (2020), Rahima (2020), Riza (2020) dan Zaitul (2020) It can be concluded from their study that the book teachers and the students have valid and feasible to be used or tested in the learning process[9][10][11][12][13]. However, books alone are not enough to increase student motivation, we need a learning media that can increase student interest.

Learning media is one of the supporting media in helping to create a fun learning process. Media is used as a tool to create an effective and efficient learning atmosphere, so that it can generate motivation and increase students' interest in learning in applying and integrating various concepts that have been learned, one of media is interactive media [14]. A good interactive learning media is a medium that creates interactivity that allows students to respond to the material presented[15].

This 21st century integrated learning can increase students' motivation to learn, so that students feel that science lessons are very close to their lives, such as plants, animals, the environment and themselves. Mangal (2009), Subramani (2017) and Asrizal (2018) claimed that the learning model could be defined as a plan that can be used to construct a topic, design learning material and integrate educator activities[16]. In its implementation using models, methods, and learning resources that are tailored to the characteristics of students. This can be done by educators in the physics learning process by using and applying learning models that vary according to the characteristics of students[17]. One learning model that can guide students to be actively involved in developing aspects of attitudes, knowledge, and skills one of them is the Inquiry Based Learning (IBL) model. This model makes students active in building knowledge-based on their experience in gaining that knowledge. Real-world phenomena become a reference to attract the interest and curiosity of students related to the problem at hand. The use of IBL in learning can create more meaningful and permanent knowledge in students[18]. This of course will have a good impact on the development of knowledge competencies, social and spiritual attitudes, and skills of students SMP if implemented using a suitable learning model, namely the guided inquiry model.

Guided inquiry model is an approach used in order to form science in the form of process skills, showing events, inductive and deductive learning, and learning to solve problems with the direction and guidance of a teacher [19]. Guided inquiry learning provides opportunities for students to find something new with the guidance of the teacher, thus students do more activities alone or in groups solving problems under the guidance of the teacher. So that integrated science interactive multimedia based on guided inquiry can improve the competence of students and in line with 21st century learning. This interactive multimedia will be practically used if it is designed in accordance with the indicators of the preparation of a medium, in terms of ease of use, attractiveness, efficiency and benefits of use.

Therefore, the title taken in this study is the Practicality of Integrated Science Interactive Multimedia based on Guided Inquiry with the theme Energy in Life, Integrated 21st Century Learning.
2. Research Method
This research is a descriptive study using a qualitative approach and the research methodology of the Plomp development model. The instrument used in this study was a questionnaire using a Likert scale to analyze the validity and practicality of the developed Integrated Science interactive multimedia. The Plomp model consists of 3 phases, namely preliminary research, development or prototyping phase, assessment phase [20]. The procedure for developing interactive multimedia on Integrated Science based on guided inquiry with the theme of energy in the integrated life of 21st century learning is carried out in accordance with the Plomp development model phase using 2 initial stages to achieve product practicality.

2.1.1. Preliminary Research Phase
This stage is needed to obtain information about problems in the field of education. The activities that must be carried out at this stage include needs analysis. Needs analysis includes analysis of SKL, analysis of students, and analysis of learning media. Needs analysis becomes a benchmark in decision making so that products are made according to the needs in the field and the demands of competencies that must be mastered by students.

2.1.2. Development or Prototyping Phase
This stage is carried out after the initial investigation stage is carried out. At this stage the prototype is developed, evaluated, revised repeatedly (cycle). The design results at this stage produce a prototype. Then performed a formative evaluation of the prototype. Formative evaluation has several stages[21], namely:

a. Self evaluation, which is revising the designed multimedia yourself.
b. Expert review is an activity to consult and discuss multimedia learning that has been designed with experts.
c. One-to-one evaluation is carried out by asking product users for suggestions, namely students to assess the products that have been designed.
d. Small groups are carried out using the product to a group of students.
e. Field test, which is using the product in learning in one class of students

A product is called practical if educators and students can use the product in classroom learning practically and efficiently, that is, if the practicality indicator meets the criteria. The indicators for evaluating the practicality of interactive multimedia that were developed were easy to use, interesting, efficient in learning time and there were benefits in use[22]. The practicality of a product is analyzed based on a questionnaire that has been filled in by educators and students. Analysis of the practicality questionnaire of Integrated Science Interactive Multimedia which is filled out by educators and students with the following steps[22]:

a. Give a score for each answer, where the answer strongly agrees will get a score equal to 4, the answer agrees will get a score equal to 3, the answer is quite agree will get a score equal to 2 and the answer less agree will get a score equal to 1.
b. Add up the total score of each validator for all indicators
c. The practical value obtained using the formula:

$$ P = \frac{f}{N} \times 100\% $$  \hspace{1cm} (1)

Information :

\begin{align*}
P & : \text{Final Grade} \\
f & : \text{Score obtained} \\
N & : \text{Maximum score}
\end{align*}

The practicality category of data can be seen in Table 1.
Table 1. Practicality Categories [23]

| Interval (%) | Categories          |
|--------------|---------------------|
| 0 – 20       | Very Impractical    |
| 21 – 40      | Not Practical       |
| 41 – 60      | Less Practical      |
| 61 – 80      | Practical           |
| 81 – 100     | Very Practical      |

3. Results and Discussion
The results of the analysis of the questionnaire and instruments used in the study can be seen as follows:

3.1. Preliminary Study Analysis
A preliminary study has been carried out using a questionnaire distributed at SMPN 4 Pasaman [2], where the results of the analysis of the instruments carried out can be seen in Table 2:

Table 2. Preliminary Study Analysis

| Indicator                  | Percentage | Category |
|----------------------------|------------|----------|
| SKL Analysis               |            |          |
| Attitude Dimension         | 54         | Less     |
| Knowledge Dimension        | 67         | Less     |
| Skill Dimension            | 58         | Less     |
| Student Analysis           |            |          |
| Interest                   | 64         | Less     |
| Motivation                 | 66         | Less     |
| Learning Style             | 63         | Less     |
| Attitude                   | 65         | Less     |
| Knowledge                  | 65         | Less     |
| Skill                      | 65         | Less     |
| Learning Media Analysis    |            |          |
| Quality of Content         | 76         | Enough   |
| Quality of Learning        | 71         | Enough   |
| Technical Quality          | 74         | Enough   |

Preliminary analysis was carried out to see how important interactive multimedia is to be developed so that it can have a positive impact in improving learning based on the 2013 curriculum. Observations were also made on the use of learning media in schools, and it was found that the media used by schools did not contain 21st century skills, teachers and students still having difficulty in carrying out experiments in the laboratory due to limited space and time, so it is likely to develop learning media to overcome these problems.

3.2. Expert Validation Analysis
After the first stage of the Ploomp development model, namely the Preliminary Research Phase or a preliminary study of several aspects, the results of the analysis state that interactive multimedia can be developed to overcome limitations in school. So the development of integrated science interactive multimedia products based on guided inquiry with the theme of energy in the integrated life of 21st century learning is carried out in accordance with the second stage of the Ploomp development model, namely the Development or Prototyping Phase. At this stage the researcher designs and develops products according to multimedia characteristics which are evaluated and revised periodically, after the product has been developed, the product is evaluated by experts whether the product is valid or not to be tested.
Before conducting a product assessment by an expert, an assessment instrument is necessary. This instrument is useful for assessing whether the quality of the product being developed is valid, practical and effective. Expert validation is carried out by three expert lecturers who assess the validation instrument and the practicality instrument, before assessing the product being developed. From the results of the expert validation analysis, the following validation and practicality instruments were assessed as follows.

| Table 3. Evaluation Results of Interactive Multimedia Validation Instruments |
|------------------------|-------|----------|
| Validator              | Average | Criteria |
| Validator 1            | 0.99   | Valid    |
| Validator 2            |        |          |
| Validator 3            |        |          |

| Table 4. Results of Assessment of Teacher Response Practical Instruments |
|------------------------|-------|----------|
| Validator              | Average | Criteria |
| Validator 1            | 0.96   | Valid    |
| Validator 2            |        |          |
| Validator 3            |        |          |

| Table 5. Results of Assessment of Student Response Practical Instruments |
|------------------------|-------|----------|
| Validator              | Average | Criteria |
| Validator 1            | 0.96   | Valid    |
| Validator 2            |        |          |
| Validator 3            |        |          |

Based on the three tables above, it can be seen that the instruments for product assessment and practicality assessment that will be distributed to teachers and students are valid for use. After the instrument to be used is valid, an assessment or product validation is carried out to the experts using the instrument. The results of expert validation analysis can be seen in the table.

| Table 6. Results of Interactive Multimedia Validation Assessment by Experts |
|------------------------|-------|----------|
| Component              | Value Validation | Criteria |
| Content Validation     | 0.89   | Valid    |
| Construct Validation   | 0.89   | Valid    |
| Linguistic Validation  | 0.85   | Valid    |
| Graphic Validation     | 0.89   | Valid    |

Based on table 6, it can be seen that the Integrated Science interactive multimedia product developed is valid in terms of content, construct, linguistic and graphic feasibility. This suggests that the integrated IPA interactive multimedia products developed can be used and evaluated by small groups.

3.3. Practicality Analysis by Teachers and Students
After the Integrated Science interactive multimedia product was declared valid by the experts, a small group trial was carried out on several respondents, where the researcher took a sample of 12 students and three science teachers at SMPN 4 Pasaman. The results of the assessment were obtained by distributing a practical instrument in the form of a questionnaire to 12 students who were taken based on different levels of ability and to three science teachers who taught at the same level, namely grade VII SMP. The results of practicality analysis can be seen in table 7.
Table 7. Results of the Practicality Assessment of Small Group Student Responses

| Indicator                  | Value (%) |
|----------------------------|-----------|
| Ease of use                | 80.56     |
| Interesting               | 86.81     |
| Efficient Learning Time    | 80.56     |
| Benefit of use             | 87.50     |
| **Average**               | **83.85** |
| **Categories**            | **Very Practice** |

The results of the practicality of students' responses to interactive multimedia shown in Table 7 show that the interactive multimedia developed is very practical for use in the Integrated Science learning process with a practicality value of 83.85%. For more details, practicality by students which is divided into two stages can be seen in Figures 1 and 2.

![Figure 1](image1.png)

**Figure 1.** Practicality Assessment Results One to One Evaluation Phase

![Figure 2](image2.png)

**Figure 2.** Results of the Practicality Assessment of the Smallgroup Evaluation Stage

Table 8. Results of Assessment of Teacher Response Practicality

| Indicator                  | Value (%) |
|----------------------------|-----------|
| Ease of use                | 86.11     |
| Interesting               | 83.33     |
| Efficient Learning Time    | 83.33     |
| Benefit of use             | 83.33     |
| **Average**               | **84.03** |
| **Categories**            | **Very Practice** |
The results of the practicality of the teacher's response to interactive multimedia shown in Table 8 show that the interactive multimedia developed is very practical for use in the Integrated Science learning process with a practicality value of 84.03%.

Based on the stages of the research method that has been carried out, the integrated science interactive multimedia based on guided inquiry with the theme of energy in the integrated life of 21st century learning developed with the Plomp development model can be categorized into interactive multimedia with valid and practical criteria.

4. Conclusion
The preliminary research is the first step to ascertain whether the product to be developed is in accordance with the needs and innovation in the learning process. Based on the results of the preliminary analysis, it was found that interactive multimedia integrated science based on guided inquiry with the theme of energy in the integrated life of 21st century learning is very good to develop to help teachers and educators in facing global challenges. Therefore, an Integrated Science interactive multimedia was designed using the Plomp development model, so that a product in the form of Integrated Science Interactive Multimedia based on Guided Inquiry with the theme of Energy in Integrated Life 21st Century Learning has valid categories of assessment results from experts and practical categories of results assessment of the responses of students and teachers in small groups, so that interactive multimedia is feasible to be tested in the field in large groups, namely into the learning process.

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