



Implementation of Science Student Work Sheet Based on Multiple Intelligence Materials Temperature and Their Changes

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ABSTRACT

Purpose of the study: This study aimed to produce multiple intelligence-based science worksheets on temperature and change material, then to determine students' responses to science intelligence based on multiple intelligence.

Methodology: The research method used is the Research and Development (R&D) method and uses the Borg and Gall development model. This study's test subjects were Junior high school 1 Jambi City students. The research instrument was a validation questionnaire from the expert team and a student perception questionnaire. The specialist team's validation questionnaire data analysis technique used a qualitative description. The student questionnaire data analysis technique was used using a rating scale which was then interpreted qualitatively.

Main Findings: After validating the material once and validating the design three times, the Multiple Intelligences-based Science Worksheet is worth trying and gets an average percentage of student perceptions of 82% which states that this worksheet is in the "very good" category.

Novelty/Originality of this study: Know the implementation of science student worksheet based on multiple intelligence materials temperature and their changes. The impact of this research is as a reference for further research to carry out further research. Then this research impacts educators and teaching staff in improving and increasing student learning literacy and learning resources.

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1. INTRODUCTION

In the 2013 curriculum students are required to be active and optimize their intelligence and talents. Education must be in accordance with individual differences and teachers must pay attention to the uniqueness of students personally [1]–[3]. All children have the right to acquire expertise and skills that should be carried out by education providers [4]–[6]. Therefore, a learning strategy is needed that is able to facilitate all student activities, one of which is Multiple Intelligences [7]–[9]. This theory was coined by Howard Gardner, a psychologist from Harvard. Gardner initially identified seven types of intelligence but later expanded them to nine [10].

Student learning outcomes can be influenced by the intelligence possessed by students. The nine intelligences include: (1) logic/mathematics; (2) musical/ rhythmic; (3) verbal/language; (4) physical, body/movement; (5) visual/spatial; (6) intrapersonal; (7) interpersonal; (8) naturalists; and (9) existential [11].

The theory of Multiple Intelligences can be used as an alternative strategy in the teaching and learning process in schools that helps teachers teach and pay attention to the intelligence and needs of their students so as to obtain better learning outcomes [12]. Student intelligence can be influenced by parents' habits and genetics.

In the process and learning at school, one of the teaching materials that is often used by teachers is LKS [13]. LKS is a printed teaching material in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that must be done by students, which refers to the basic competencies that must be achieved [14]. According to the General Guidelines for the Development of Teaching Materials, student work sheets are sheets containing tasks that must be done by students. Student worksheets are usually in the form of instructions or steps to complete a task which must be clear about the basic competencies to be achieved. Learning is more effective by adding student worksheets which contain challenging student projects.

Seeing the importance of LKS in the world of education today, many people are doing research on LKS, one of which is LKS based on Multiple Intelligences. The goal is to make students learn more creatively. The Multiple Intelligences-based worksheets he made succeeded in increasing students' creative thinking abilities [15]. Therefore, researchers conducted research on the development of Multiple Intelligences-based Science Worksheets which can facilitate the various intelligences possessed by each student. In addition, this LKS can also be used as independent teaching material so as to increase student creativity. In this Multiple Intelligences-based Science Worksheet, each sub-chapter of learning material presents the 9 multiple intelligences mentioned by Gardner.

2. RESEARCH METHOD

This type of research can be interpreted as a process or steps to develop a new product or improve an existing product. This research is research and development (Research and Development). The steps in this development use the Borg & Gall model in Sugiyono [16]. This research model is a research model used to develop or validate products used in education and learning.

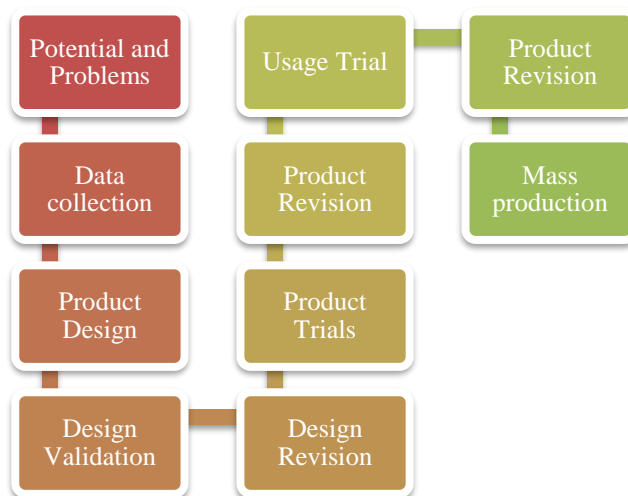


Figure 1 Research and Development research steps

Development Procedure

Potential and Problems, At this stage the researcher conducted research on teaching materials used at junior high school, common problems or obstacles faced by science teachers in teaching, selection of media or learning resources, and availability of worksheets. This stage was carried out by examining teaching materials used in schools, interviews with science teachers at junior high school, and observation.

After obtaining potentials and problems based on the results of observations, interviews, and curriculum analysis, the next thing to do is collect data. According to Sugiyono the data collection carried out can be used as material for planning certain products that are expected to overcome these problems [16]. This data collection is carried out to find out what students need in learning which will then be used as the basis for making the initial product of the Multiple Intelligences LKS. . In addition, researchers also collect material from various sources that will be presented in the LKS that will be developed.

Product Design

The steps involved in designing this product are as follows:

- a) Material analysis stage, Material analysis aims to identify, detail, and systematically arrange the relevant main parts that students will learn. The first step taken is to identify the core competencies, basic

competencies, indicators and learning objectives and their changes based on the syllabus used at the school as details in compiling the LKS and secondly making an arrangement or sequence of sub-materials which will later become the content of the material in the LKS.

b) Format selection, The choice of format in the development of LKS is adjusted to the factors described in the learning objectives. The format chosen is to design the appearance, content, and selection of learning strategies.

c) The design phase of the Multiple Intelligences-based Science Worksheet, After analyzing the material and selecting the format for preparing the LKS, the next step is to make or design the Multiple Intelligences LKS with temperature material and its changes. The material in this LKS is prepared using language that is easily understood by students and includes pictures related to the material. In addition, this LKS is equipped with practicum sheets and practice questions.

Design Validation

According to Sugiyono (2013), design validation is an activity process for assessing product designs that is carried out by giving judgments based on rational thinking, not yet tested in the field. Product validation is carried out by experts or experienced experts to assess new products that have been designed in such a way.

Product trials

Science worksheets based on Multiple Intelligences on temperature and its changes that have been validated were then tested on 67 students in junior high school.

The research instrument used was a questionnaire (questionnaire). According to Sugiyono (2013), a questionnaire is a data collection technique that is carried out by distributing a set of questions or written statements to respondents to answer. In this study, the questionnaire used was divided into two based on the filler/respondent, namely: 1. Validation questionnaire for material and design experts; 2. Perception questionnaire for students.

Data analysis technique

Expert Team Validation, The questionnaire used for experts uses a structured questionnaire method where the answers available are "yes" or "no" and are equipped with a column of suggestions from experts. The worksheet will be declared eligible to proceed to the next stage if the expert team answers "yes" to all the statements provided in the questionnaire.

An instrument is said to have an adequate level, if the instrument is used to measure aspects that are measured several times, the results are the same or relatively the same (Sukmadinata, 2012). Reliability is expressed by the reliability coefficient, namely the correlation coefficient which shows the degree of relationship between the two measurement results obtained from the same instrument or procedure. The reliability coefficient on an instrument can be calculated using the Alpha coefficient formula. The Alpha formula is as follows:

$$r_{11} = \left[\frac{k}{k-1} \right] \left[1 - \frac{(\sum \sigma_b^2)}{\sigma_t^2} \right] \dots \dots \dots (1)$$

$$\sigma_b^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{N}}{N} \dots \dots \dots (2)$$

With information r_{11} : The correlation coefficient of the instrument, k : the number of questions or the number of questions, $\sum \sigma_b^2$: the number of item variants, σ_t^2 : the total variance, N : the number of questions. The test reliability coefficient ranges from 0.000 - 1.00 with details of the correlation:

Table 1. Questionnaire reliability correlation

Interval percentage (%)	Criteria
$0.000 \leq r_i \leq 0.200$	Very Low
$0.201 \leq r_i \leq 0.400$	Low
$0.401 \leq r_i \leq 0.600$	Enough
$0.601 \leq r_i \leq 0.800$	High
$0.801 \leq r_i \leq 1.000$	Very High

The reliability of the student perception questionnaire is 0.67 which is included in the high category. Data analysis using a Likert scale. The trial questionnaire instrument has answers in the form of quantitative data with the following answer choices. The calculation of perception is done by calculating the average and compiling the assessment criteria on a Likert scale. To calculate the percentage of students who respond according to certain criteria, that is by using the formula:

$$RS = \frac{F}{N \times \text{jumlah siswa}} \times 100 \% \dots \dots \dots (3)$$

With:
 RS : Percentage of answers
 F : The number of trial scores
 N : Total maximum score

To determine the category of responses or responses given by students to a criterion, it can be seen from the scale table as follows:

Table 2. Percentage Scale

Achievement percentage (%)	Criteria
81.0 – 100.0	Very good
60.1 – 80.0	Good
40.1 – 60.0	Enough
21.0 – 40.0	Not good
0.0 – 20.0	Very not good

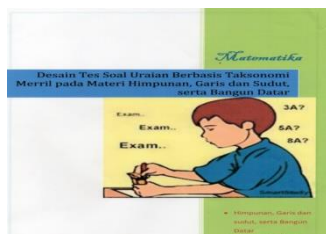
3. RESULTS AND DISCUSSION

The results of the development of Multiple Intelligences-based IPA worksheets on temperature material and its changes using the Borg and Gall development model obtained the following results.

Science worksheets based on Multiple Intelligences that have been developed will be validated. Validation is carried out to obtain approval from the validators that have been determined. To obtain this approval, the electronic module will receive an assessment and suggestions for improvement. After getting the assessment and suggestions from the validators, the next step is to revise or improve the electronic module. In this research, material and media validation was carried out by two validators. The following is an example of a science worksheet cover design that the researcher made.

Table 3. Cover Worksheet Science

Visual	Information
The initial cover design was designed in such a way as to attract students' attention to see it	On the cover, pictures related to the lesson are given, such as a picture of a student studying. There is also a material title, and a description test that is used based on Merrill's taxonomy.



The material validation process was carried out once, while the design validation was carried out three times. From the process of material and design validation, the validators have stated that the developed Multiple Intelligences-based Science Worksheet is feasible to try out.

The worksheet was tested on VII D class students at Junior High School 1 Jambi City for a questionnaire reliability test. Calculations using the alpha formula obtained a reliability of 0.67 in the high category. So it was concluded that this research questionnaire can be trusted and used to collect non-test data on the feasibility of Multiple Intelligences-based Science Worksheets. Furthermore, trials were carried out on 35 students of class VII C and 32 students of class VII B at Junior High School 1 Jambi City to see students' perceptions or responses to worksheet. The following are the results of the perception questionnaire that has been distributed.

Table 2 Results of Perception Questionnaire Analysis of students

No.	Statement	Category	Class VII C presentation	Class VII C presentation
1	Worksheet Multiple Intelligences is interesting so it's not boring.	Good	79,43%	78,03%
2	The cover of the Multiple Intelligences LKS is interesting.	Very good	85,71%	85,00%
3	LKS Multiple Intelligences makes it easier for me to learn the subject matter.	Very good	81,71%	79,65%
4	The language used in the Multiple Intelligences LKS is not confusing.	Very good	84,00%	80,78%
5	The pictures on the Multiple Intelligences LKS look clear and help me understand the material.	Very good	85,14%	82,24%
6	LKS Multiple Intelligences helps me remember the material.	Very good	84,57%	84,00%
7	There are activities related to Multiple Intelligences (plural intelligences) in the Multiple Intelligences LKS.	Good	78,86%	78,77%
8	The size of the letters in the Multiple Intelligences LKS is not too small and not too big.	Very good	84,00%	82,00%
9	Practicum activities on the Multiple Intelligences LKS are easy to do and can help me conclude concepts.	Very good	83,43%	80,45%

The trial was carried out by distributing perception questionnaires to students. From the trials that have been carried out, it was obtained data on students' perceptions of the developed Multiple Intelligences-based Science Worksheets. The results of the analysis of students' perceptions showed 83% for class A and 81% for class B which were in the "very good" category. So that the average percentage of students at junior high school is 82%. This is in accordance with the very good category percentage scale, which is in the range of 81.00% - 100%. Overall, it can be concluded that the Science Worksheet based on Multiple Intelligences has a very good response from students so that it can be used in the learning process, especially on temperature and its changes.

The impact of this research is as a reference for further research to be able to carry out further research. then this research has an impact on educators and teaching staff in improving and increasing student learning literacy and student learning resources.

4. CONCLUSION

Based on this research, science education-based worksheets based on Multiple Intelligences were produced on temperature and its changes in class VII. The resulting worksheet consists of 5 pages consisting of outer and inner covers, preface, table of contents, general and specific instructions for using the worksheet, KI and KD, concept maps, the core contents of the worksheet along with symbols of intelligence, bibliography, and the back cover of the worksheet. After validating the material once and validating the design three times, the Multiple Intelligences-based Science Worksheet is feasible to try out and gets an average percentage of student perceptions of 82% which states that this worksheet is in the "very good" category.

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