

Integrating Scientific Principles with Character Development in the Student Worksheet on Change in Matter

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Abstract

Integration of scientific principles with character development in the student worksheet on change in matter is crucial for fostering a holistic understanding of chemistry, aligning academic knowledge with ethical considerations, and cultivating a well-rounded educational experience. The aim of this research is to develop character-integrated teaching materials in science subjects that are suitable for use as learning media. The development of character-integrated teaching materials in science subjects uses a 4D model, consisting of four stages (define, design, develop, and disseminate). Teaching materials developed are in the form of student worksheets. Data collection technique used a questionnaire with several instruments, which are material and media expert validation instruments, student worksheets eligibility instruments, and interview instruments. Analysis of the data using the calculation of the average, percentage, coefficient of validity, and descriptively. The results of the analysis of material expert validation data, obtained a validity level of 0.825 with a very valid category. Similarly, the results of the analysis of media expert validation data, obtained a validity level of 0.735 with a very valid category. The results of the analysis of the feasibility questionnaire filled in by the teacher obtained a score of 86.25% with a very decent category. It can be concluded that the student worksheets developed is very suitable to be used as a science learning media.

Keywords: character development, material change, science integrating, student worksheets

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1. Introduction

Learning resources are needed to support successful in the teaching process, also needed both for teachers and students in the learning process (Thariq, 2020). One of the learning resources is teaching materials (Surahman et al., 2020).

Teaching materials in accordance with applicable learning competencies make teachers easy in the process of delivering concept to students. Learning process at schools must be carried out in an interactive way, providing inspiration and challenges, and the implementation process must be happy. This has been regulated in Law no. 20 of 2003 which was later elaborated in PP No. 19 of 2015 concerning National Education

Standards article 19, first paragraph, to achieve the target of the learning process, which are designing learning activities using media and learning resources (Panggabean & Danis, 2020). Yati and Amini (2020) state that teaching materials are designed and developed in order to achieve learning objectives and help student achieving competencies to be more active. The use of these teaching materials certainly applies the existing curriculum (Gustiawati et al., 2020). Various learning problems will arise if the teaching materials used are not in accordance with the criteria and demands of basic competencies (Husada et al., 2020).

The application of an environment-based curriculum in shaping the character of students to be able to compete, be ethical,

moral, polite, and interact with the community is important and must be implemented systematically. This is because one's success is not determined solely by knowledge and technical abilities, but rather by the ability to manage oneself (Supriadi et al., 2020).

The results of interviews with several chemistry teachers at MTsN Langsa city, it is known that teachers have difficulty implementing character education in learning. This is because there are no teaching materials that integrate character education explicitly. In fact, students in MTsN Langsa city are required to have characters who behave according to the character of the nation and have 21st century skills. Based on the facts in the field, several problems were found, including the subject matter of chemistry combined with the subject matter of physics and biology as well as teachers teaching integrated science subjects. Only one teacher, who does not necessarily master the material either chemistry, physics or biology well.

Teaching materials that can be used to develop the character of students are through student worksheets. Student worksheets are one of teaching materials that can be made by educators or teachers to facilitate the learning process (Hairida & Setyaningrum, 2020). Student worksheets used by students so far only provides a collection of motor material and questions related to the cognitive development of students, not the emotional development or character of students.

Understanding a person's attitude and personality is important because everyone has a different personality, and it will affect how we interact and communicate with someone. The ability to understand a person's attitude and personality must be owned by people who want to be good at getting along and communicating with many people (Ruswandi et al., 2022). According to Thomas Lickona in Ma'muroh (2021), character education has several interrelated components and must be taught gradually, which are knowing moral values, feeling them, and practicing them. Therefore, learning is needed, one of which is through character-integrated student

worksheets. Khaidir and Suud (2020) state that character education is education to shape one's personality through character education, the results seen in one's actual actions, which are ethical behavior, honest, responsible, respecting the rights of others, and hard work.

Several studies on the development of student worksheets for elementary school students in science learning have been carried out, including research by Aini et al. (2019) and research by Lestari et al. (2021) based on problem-based learning, research by Amali et al. (2019) based on community science technology, research by Dikta (2022) and research by Pikapratiwi et al. (2022) based on Tri Hita Karana, and research by Rofiah (2014) based on KIT. This study seeks to develop student worksheets in science learning based on the character-based profile of Pancasila students. This is because one of the visions and missions of national education in 2020 is to create a profile of Pancasila students.

Based on the description above, research and development was carried out entitled "Integrating Scientific Principles with Character Development in the Student Worksheet on Change in Matter".

2. Research Method

The method of is research and development (R & D). The product developed is integrated science teaching materials for character education in the form of student worksheets. The development model used is the 4D development model. Based on Figure 1 the 4D development model consists of four stages: define, design, development, and disseminate (Setyosari, 2010).

This research was conducted at MTsN Langsa city. The subjects involved were the seventh-grade science teacher as the user of the development product, selected by purposive sampling by considering the science subject teacher and the school that included character education in the school's vision and mission. This study involved three experts: science material experts, linguists, and teaching materials design experts.

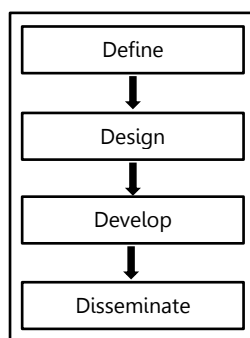


Figure 1. 4D Development Model

2.1. Data Collection Technique

This study collects data from validity and feasibility result of the developed student worksheet. Data were collected using the following instruments: interview guide, validation sheet, feasibility questionnaire sheet, and documentation.

The validation sheet consists of 14 statements in the media validation questionnaire and 19 statements in the material validation questionnaire. The answer choices for the questionnaire are in the form of a Likert scale. Validation sheets are filled out by experts in each field. The eligibility questionnaire sheet was filled out by three science subject teachers. The eligibility questionnaire sheet consists of 20 statements with a Likert scale.

2.2. Data Analysis Technique

The research data obtained were analyzed. The interview data were analyzed descriptively with the data triangulation method to obtain valid data. The data from the feasibility questionnaire were analyzed by descriptive statistics. The validation data were analyzed using the coefficient V formula (Wulandari & Oktaviani, 2021). The criteria for the range of Aiken's V numbers can be seen in Table 1.

Table 1. Validity Criteria

Validity Results	Validity Criteria
$0.80 < V \leq 1.00$	very high
$0.60 < V \leq 0.80$	high
$0.40 < V \leq 0.60$	high enough
$0.20 < V \leq 0.40$	low
$0.00 < V \leq 0.20$	very low

3. Result and Discussion

The results of each stage of the research are as follows.

3.1. Define Result

The results of the define stage in the student worksheets development research with the 4D development model obtained data on the needs of teachers and students for character-integrated student worksheets. The define stage is needed to analyze the objectives and limitations of the teaching materials developed. At this stage, an analysis of the need for the development of character integrated worksheets in science learning is carried out. The definition stage carried out is the analysis of core competencies, basic competencies, learning materials, indicators of competency achievement, and the values of the Pancasila profile character that are suitable for use.

Based on the results of the curriculum analysis, it is known that the curriculum applied at MTsN in Langsa City is the 2013 curriculum and is currently preparing for the implementation of an independent curriculum. The results of interviews with science teachers at MTsN in the city of Langsa obtained information that many students need character building, especially in science subjects.

Science is a branch of science in which the study of the natural surroundings and its application in human daily life. It can be concluded that science is one of the areas of learning where learning can be directly applied in everyday life and has a direct impact on life (Ngazizah et al., 2020; Mahmud et al., 2022). Therefore, the character values that indicate behavior of students in everyday life can be fostered through science learning.

Based on the results of the answers to the needs analysis questionnaire, information was obtained about the state of the use of teaching materials at MTsN Langsa City.

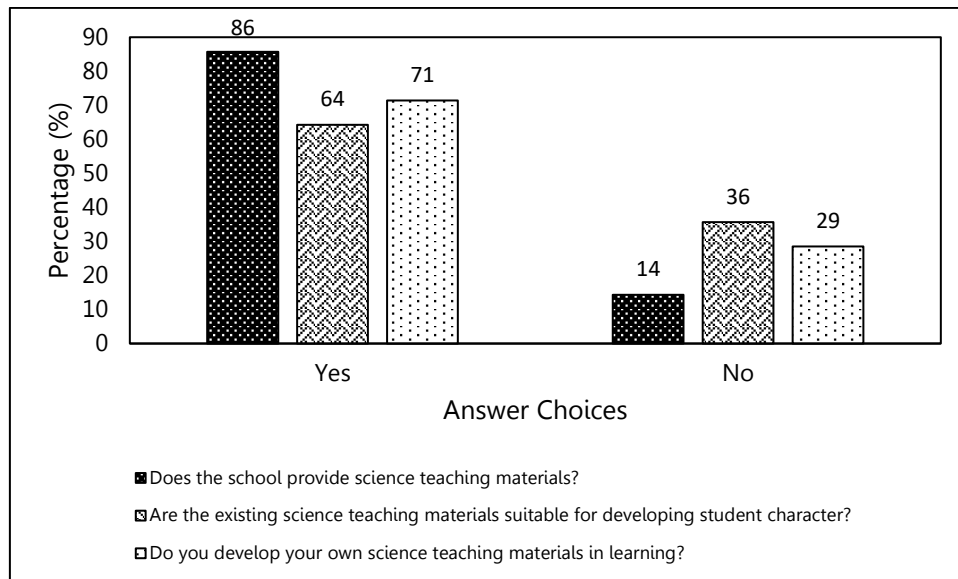


Figure 2. Needs Analysis Results

Based on Figure 2, 86% of teachers stated that the school provided science teaching materials. In addition, according to 64% of MTsN teachers in Langsa City, the available science teaching materials are suitable to be used to develop students' character. However, in the interview, the teacher stated that the character in question was the attitude of courtesy and concern for students towards science lessons. The readiness and ability of teachers to develop student worksheets is known from the high percentage (71%) of teachers who stated that they had developed their own science teaching materials in learning.

need to be developed in science learning at MTsN Langsa city.

3.2. Design Result

In the design stage, materials, tools, designs, and references are collected to develop student worksheets. The materials used in the student worksheets design are learning syllabus, learning competency standards, learning indicators, and learning concepts from several references. The tools used to design worksheets are Canva and Microsoft word applications. The outline for the initial draft student worksheets can be seen in Table 2.

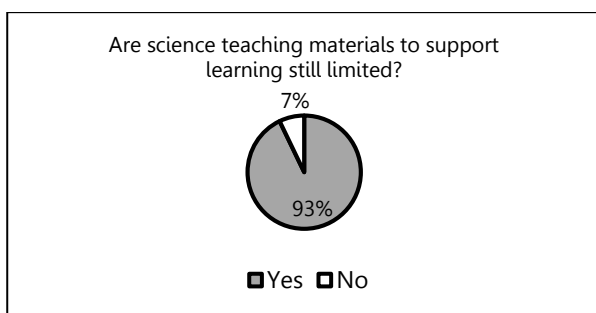


Figure 3. Science Teaching Material Needs

From the needs analysis questionnaire, it is also known that most (93%) teachers stated that science teaching materials as learning support were still limited as shown in Figure 3. Therefore, character integrated worksheets

Table 2. Student Worksheets Outline

No	Page
1	Cover
2	Foreword
3	Table of contents
4	Instructions for use
5	Learning materials
6	Apperception
7	Theoretical basis
8	Group activities
9	References

3.3. Development Result

The activities carried out at the develop stage are making student worksheets and conducting validation tests and feasibility tests. The validation stage is carried out by submitting the student worksheets draft and

validation questionnaire to media and material experts. Next, revise the validated character integrated student worksheets. The

student worksheets display can be seen in Figure 4.

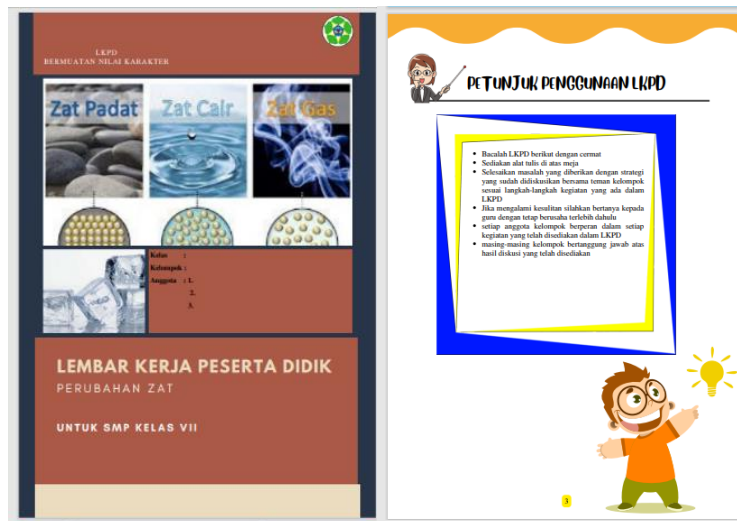


Figure 4. Student Worksheets Display

The validation results from material experts can be seen in Figure 5.

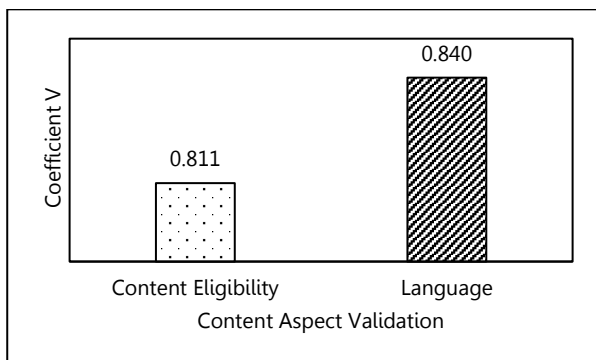


Figure 5. Content Validation Results

Material validation is seen from the aspect of content and linguistic feasibility, Aiken's V value in material validation is 0.825, according to Table 1 in the very high validity category. The results of the validation by material experts showed that the integrated character worksheets were feasible to use. These findings are similar to those of Akbar et al. (2022) where the inquiry-based student worksheets which was developed on additive material to grow the character of health care shows the feasibility of the material presented is accurate, sustainable with basic competencies, and encourages students' curiosity.

The feasibility of the material becomes important in the development of this student worksheets because the integration of character values is shown by linking the concept of lessons with character values. Alwi et al. (2019) stated, by preparing teaching materials that contain character education values that are in line with learning and curriculum achievements, graduates will be produced who not only have high knowledge and skills, but also have a capable, personal and social attitude. In addition, Karo-Karo et al. (2020) stated, in addition to family and society, schools are a place to shape character, schools are seen as being able to successfully improve the quality of life of students not only measured by numbers but also from character, attitudes and ways think.

As for suggestions for improvement from material experts, which is correcting sentences that are not in accordance with grammar. In addition, the validator suggests improving the writing of physics formulas and units and the use of examples of presenting problems that are adapted to the content of science material that is relevant to life.

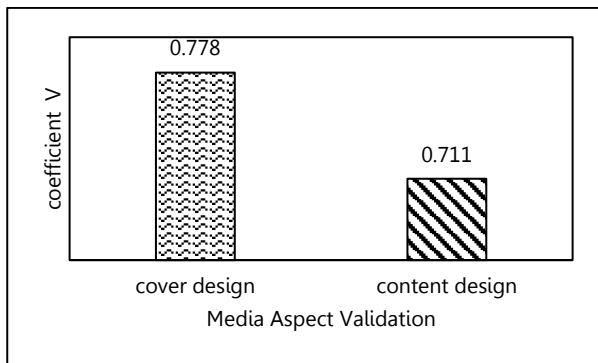


Figure 6. Media Validation Results

Student worksheets validation on the media aspect is measured in two indicators, which are the cover design and the content design of the student worksheets. The validation results from media experts can be seen in Figure 6.

According to the findings of the media validation results in Figure 6, the integrated character worksheets produced according to Table 1 are in the very high validity category, at a coefficient value of 0.735. The high value of media validation indicates that character-integrated student worksheets can be used in science learning. A high validation value was also obtained in Sari et al. (2020) in her research in developing the development of worksheet in the experiment of creating indicator papers, and Maulana et al. (2021) research which developed the development of a REACT-based e-worksheet that is feasible to use to stimulate the critical thinking, creativity, collaboration, communication (4C) skills and determine student response.

Based on Figure 6, the value of the V coefficient on the cover design indicator is higher than the V coefficient value on the content design indicator. The cover design is an important part of a student worksheets. The student worksheets cover is designed with an attractive background and in accordance with the title of the material (Ani & Lazulva, 2020). Similarly, the content design, the content design of the student worksheets underwent several revisions in the use of colors, themes, and the use of character images. Revisions are made according to the validator's input on the student worksheets media design aspect as shown in Table 1.

A good teaching material or product is a product that is easy to use by teachers and students in the learning process (Priscylio et al., 2019). Therefore, the student worksheets that has been validated and revised is tested for eligibility for teachers as users.

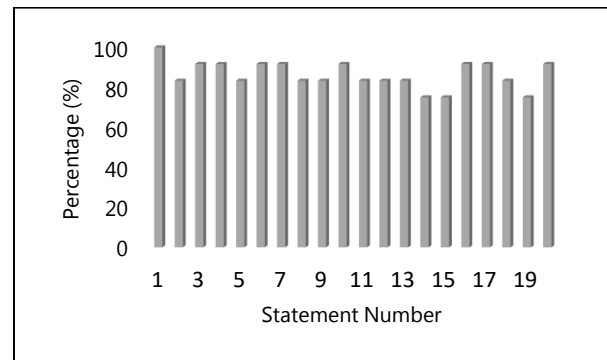


Figure 7. Teacher's Response to the Eligibility Questionnaire

Based on Figure 7, it is known that the teacher's response to the character-integrated student worksheets eligibility questionnaire is above 50% in all statements. The average percentage on all statements is 86.25%. The high percentage value indicates that the character-integrated student worksheets is suitable for use in learning according to the teacher's perception. This finding was also obtained in previous research of Rohman and Ritonga (2020) where the results of data analysis obtained from teacher assessments of student worksheets gave a positive response.

3.4. Dissemination Results

The final product developed after being revised is distributed in the form of a print out of student worksheets integrated characters in the material changes in substances. The distribution of student worksheets was carried out to MTsN 1 in Langsa City and regional libraries in Langsa City. Dissemination is done with the hope that student worksheets can be used to improve students' mastery of concepts and develop students' character.

4. Conclusion

Based on the results of the research and discussion, several conclusions can be drawn. The level of validity of the integrated character

worksheet on the substance change material based on the validity test by material experts and media experts including the very valid category with a coefficient of V of 0.825 and 0.735. The level of feasibility of student worksheets integrated character on changes in substances by science learning teachers is 86.25%. This research is expected to be continued to the implementation stage of student worksheets to increase the character values and students' critical thinking skills.

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