Validity and practicality of science learning material by integrating new literacy based on thematic learning for grade VIII students

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Abstract. The industrial revolution 4.0 requires learning that can develop various literacy skills of students so that they can succeed in learning as well as in everyday life. To answer the challenges of the industrial revolution 4.0, the education world seeks to apply 21st-century learning. Through 21st century learning, science learning can be carried out in an integrated manner supported by thematic learning. However, the real conditions illustrate that the application of thematic learning and the integration of literacy skills in science learning is still low. This happens because the integration of literacy in learning is still very limited. One solution that can be done to overcome this problem is to develop new integrated science teaching materials based on thematic learning for grade VIII students. The type of this research was research and development. The development of integrated science teaching materials for new literacy based on thematic learning consists of seven stages, namely with potential and problems, information gathering, product design, product testing, product improvement. The instrument for collecting data consisted of two. First, validity sheets are given to experts. Second, practicality sheets are given to teachers and students. Data analysis techniques used descriptive statistical analysis. Based on data analysis, two research results were obtained. The first validation of science teaching materials about integrated with new literacy and component of validity science learning is good and very good with an average value of 75.17 and 80.15. Second, the practicality of integrated science teaching materials for new literacy based on thematic learning according to teachers and students is very good with an average value of 89.85 and 83.53. Based on the results of the study, it can be indicated that integrated literacy teaching materials for new literacy based on valid and practical thematic learning and can be used in science learning.

1. Introduction

The era of the industrial revolution 4.0 has changed the order of life, including in the world of education. To produce a great generation as capital to anticipate the 4.0 revolution, the world of education applies 21st-century learning. In junior high schools, science learning that is by 21st-century learning is based on the characteristics of integrated learning, namely: active, authentic, holistic, meaningful [1,2,3]. 21st-century learning needs to encourage active and meaningful student involvement in constructing their competences holistically. There are four principles of 21st-century learning,
namely: student-centered learning, carried out collaboratively, linked to real-world contexts, and associated with people's lives [4].

The Indonesian Ministry of Education and Culture has encouraged the implementation of integrated learning in SMP. In the 2013 curriculum, science learning in junior high schools needs to be implemented with an integrated science concept. One basic competency in the 2013 curriculum has integrated science concepts from the fields of Biology, Physics, Chemistry, and Earth and Space Sciences [5,6]. Integrated learning is intended to make science learning more meaningful, effective, and efficient.

Starting from the real conditions, it shows that the implementation of science learning still faces problems. First, science learning in schools is still implemented separately [7,8]. Second, science teachers still experience difficulties in implementing integrated science learning [5,9]. The third is the learning material in the integrated science textbook which is still written separately [8,10]. The fourth is that the integration of literacy in science learning is still limited to reading.

The existence of this gap indicates a problem in science learning. The impact is that learning is less meaningful and provides less experience to students. Another impact is the students weak ability to compete. The solution to the problem is the integration of new literacy based on thematic learning in science learning material.

Literacy comes from the word literacy which means literacy, literacy, literacy or proficiency in reading and writing [11]. New literacy is a renewal of old literacy adapted to the times in the 21st century. It can be said that new literacy is one of the skills needed in the era of the industrial revolution 4.0. Students who have new literacy skills have a greater opportunity to become more competent and competitive human resources [12]. New literacy skills consist of data literacy, technological literacy, and human literacy [13,14].

Data literacy is directed at the goal of increasing the ability to read, analyze, and use information in the digital world [13]. Technological literacy aims to increase the ability to use technology, especially in science learning [14]. Meanwhile, human literacy is related to creative, critical thinking, communicative, and collaborative abilities [12]. The integration of new literacy is expected to be able to produce competitive human resources and have skills that match the skills of the 21st century so that they can compete in the era of the industrial revolution 4.0.

Thematic learning is integrated learning that uses a theme to connect several branches of knowledge to provide meaningful experiences [15,16]. Thematic learning is defined as an integrated learning that uses themes to connect several subjects that allow students either individually or in groups to actively discover scientific concepts and principles in a holistic, meaningful, and authentic manner [17]. Themes can connect a variety of concepts, learning materials, and branches of knowledge to make learning holistic and meaningful. The purpose of thematic learning is to provide opportunities for active, interesting, and meaningful experiences to students [18]. Thematic learning can increase motivation, scientific work, and student learning outcomes [19].

Thematic learning has been carried out in several studies. First, thematic learning can improve students critical thinking skills and character [7]. Second, the implementation of thematic learning can improve student learning outcomes in the dimensions of character, knowledge, and skills in elementary school [20]. Third, the application of integrated thematic learning through a scientific approach has a significant effect on student learning interest and learning outcomes [21]. Fourth, the theme network shows the relationship between material and sub-themes can make it easier for teachers to implement thematic learning [15].

New literacy and thematic learning can be integrated into a learning material that can be used in the science learning process. Learning material are important and meaningful material needed for learning, teacher learning efficiency and improve student performance [22,23].

Learning material play an important role in learning. Learning material serve as a channel between teachers and students in giving orders, providing motivation in the learning process, getting attention, and eliminating student boredom in learning [24]. In addition, learning material can make learning simpler, easier to understand, help retention, and recall something whenever needed [25].
Learning material integrating new literacy based on thematic learning are Learning material that emphasize the implementation of integrated learning and the achievement of new literacy skills that students must achieve. This science learning material has several advantages including. First, learning material can construct students science knowledge. Second, thematic learning is poured into learning material by presenting the material in the form of themes. Third, the learning material are adjusted to the demands of the 2013 curriculum. Fourth, the learning material are integrated with indicators of new literacy skills which are skills as provisions for facing the challenges of the 4.0 industrial revolution in the 21st century. The purpose of this study was to determine the validity and the practicality test results of science learning material to integrate new literacy based on thematic learning for Class VIII students.

2. Method
This type of research is Research and Development (R&D). R&D can be said as a method that can be used to develop a product and test the product's effectiveness [26]. The object of this research is natural science teaching materials integrating new literacy based on thematic learning for Class VIII students. The procedure in this study consisted of six steps. In this paper, what is presented is the validation of teaching materials and the practicality of teaching materials. Teaching materials consist of several elements, namely: learning instructions (student/teacher instructions), competencies to be achieved, learning materials, supporting information, exercises, worksheets, evaluation, and feedback on evaluation results [27].

Product validation was carried out by three Physics lecturers of the State University of Padang. The four components of the assessment are contained in the validity test sheet, namely: feasibility of content, presentation, language, and graphics. After obtaining the validation results from experts, the design revision stage is carried out. Furthermore, science teaching materials were tested to determine their practicality. Testing the practicality of science teaching materials was carried out by three science teachers and thirty students of SMPN 30 Padang. The practicality of science teaching materials was tested using a questionnaire sheet on the practicality test. The four components to measure the practicality of a product are ease of use, attractiveness, clarity, and benefits. Each of these components is translated into several more specific indicators aimed at making it easier to analyze the advantages and disadvantages of the science teaching materials that have been made.

The validity and practicality questionnaire sheet use a modified Likert scale with four alternative answers. The alternative answers are 4 = strongly agree, 3 = agree, 2 = disagree and 1 = strongly disagree. The data analysis technique used for the assessment of validity and practicality was using descriptive statistics. Descriptive analysis is displayed in tables or graphs so that researchers only look for the average value. In this analysis, a discussion was conducted regarding the assessment of the validity and practicality of science teaching materials integrating new literacy based on thematic learning. The data from the validity and practicality test results are presented in graphical form. The criteria used to determine the validation and practicality of science teaching materials integrate new literacy based on thematic learning as shown in Table 1 [28].

| Interval | Kategori   |
|----------|------------|
| 30 – 39  | Failed     |
| 40 – 55  | Less       |
| 56 – 65  | Enough     |
| 66 – 80  | Well       |
| 81 – 100 | Very well  |

Table 1. Validity and Practicality
3. Result and Discussion

3.1. The Validity Of The Integration Of New Literacy In Science Learning Material

The results of the validity of the integration of new literacy in science learning material were obtained from the validity sheet instrument. In the validity instrument, there are six components for the assessment of new literacy integration in science learning material, namely: data literacy (DL), technological literacy (TL), critical thinking skill (C1T), creative thinking skill (C2T), collaboration skill (C3S) and communication skill (C4S). From the six components, the value for each indicator is obtained. The average scores of data literacy, technology literacy, critical thinking skill, creative thinking skill, collaboration skill, and communication skill were 82.0; 77.0; 68.0; 68.0; 76.0, and 80.0. The results of the plot of the average value of each indicator can be seen in Figure 1.

![Average Score of Each New Literacy Component in Science Learning Material](image)

*Figure 1. Average Score of Each New Literacy Component in Science Learning Material*

Based on Figure 1, it can be concluded that the average value of each validation component ranges from 68.0 to 82.0. This means that the validation value of the components: data literacy, technology literacy, critical thinking skill, creative thinking skill, collaboration skill, and communication skill are in the good and excellent categories. After analyzing each component value, the mean value of the new literacy integration validity component in science learning material was 75.2. Based on this average value, the validity of the new literacy integration in science learning material is in a good category.

3.2. Validity of Science Learning Material

The results of the validity of science learning material were obtained from the validity sheet instrument. In the instrument, there are four components of the assessment, namely content component (CC), presentation component (PC), language component (LC), graphics component (GC). Of the four components, several assessment indicators make it easy to assess science learning material.

The first is content component. The component values for the content eligibility range from 72.0 to 92.0. The lowest score is on the indicator of the truth of the substance of the learning material with a value. The highest score of 92.0 is found in the indicator of the suitability of the content of learning material with core competencies and basic competencies. The average value of the content component is 80.0 which is in the very good category.

The second is presentation component. The value of the serving components ranges from 76.0 to 84.0. The lowest value is on the indicator of stimulus and response with a value of 76.0. The highest score is obtained from three indicators, namely: the clarity of the learning objectives to be achieved, the suitability of the learning material sequence and the completeness of information with a value of 84.0. The average value of the presentation component is 81.7 which is in the very good category.

The third is language component which has four assessment indicators. The values for language component ranged from 76.0 to 84.0. The lowest score is obtained from the indicator of conformity with the rules of Indonesian which is good and correct as well as indicators of language use effectively and efficiently with a value of 76.0. The highest value, 84.0 is found in the readability indicator.
on the value of the four assessment indicators, the average value in the language component is 79.0. This average value is in the good category.

The fourth is graphics component which has four assessment indicators. The range of values for the graphics component is between 76.0 to 84.0. The lowest value is on the layout or layout suitability indicator with a value of 76.00. While the highest value, 84.0, is in the attractive display design indicator. The average score for the graphic component is 80.0 with very good category.

From the four components of the validity of science learning material integrating new literacy values obtained for each component. The mean value of component (CC), presentation component (PC), language component (LC), graphics component (GC) respectively was 80.0; 81.6; 79.0 and 80.0. The results of the plot of the average value of each component can be seen in Figure 2.

**Figure 2.** The Average Value of Each Component of the Validity of Science Learning Material

Based on Figure 2, it can be concluded that the validity of science learning material is in the good and excellent category. The average value of the validation components for science learning material was 80.1. Based on this average value, it can be said that science learning material integrating new literacy are in the valid category but still require revision. One of the goals of the revision is so that the material in science learning material can be presented more meaningfully and systematically. Learning material should be arranged systematically starting from simple material to more complex material [29]. This revision is adjusted to the suggestions and comments provided by the validator as an expert.

### 3.3 Practicality of Science Learning Material According to the Teacher

The results of the practicality of science learning material according to the teacher are obtained from practical instruments according to the teacher. The practicality test instrument according to the teacher consists of four components, namely: usable (US), easy to use (EU), appealing (AP), and clear (CL). In each component, there are several assessment indicators that relate to teacher responses to science learning material. The teachers involved in this assessment were three science teachers at SMPN 30 Padang.

The first component of practicality is usable. The utility component values ranged from 75.0 to 91.7. The lowest score of 75.0 is on the indicator of increasing the productivity of learning activities and helping to improve student data literacy. While the highest score is in indicators of helping achieve learning objectives, making learning in accordance with the real-world context, making learning better, learning students in real-world contexts, controlling learning time, helping to improve students’ technological literacy, and helping to improve students’ critical thinking skills with grades. 91.7. The average value of the usable component is 86.5 with a very good category.

The second component of practicality is easy to use. The range of scores for the easy to use component was between 83.3 to 91.7. Indicators that get a value of 83.3 are indicators of controlling student activity, remembering the context and learning material, and facilitate the implementation of learning. The value of 91.7 is obtained from the indicators of guiding students in learning science, understanding the steps of the activity, and guiding students in the scientific process. Based on the value obtained, the six indicators on the convenience component are already in the excellent category.
The average value of the easy to use component is 87.5. This indicates that the average value of the easy to use component is in the excellent category.

The third component is appealing. The range of value for the appealing component is between 83.3 to 100.0. The range of values of the six indicators is in the excellent category. The indicator that scores 83.3 is an indicator, exploring the context of science in everyday life, and linking the exercise to the real-world context. The value of 91.7 is found in the indicator linking science learning material with real-world contexts, using science learning material with real-world contexts, and communicating the results of the investigation. While the value of 100.0 is obtained on the indicator linking the exercise with the real-world context. Based on these values, the average value of the appealing component is 90.3 with a very good category. The fourth component of practicality is clarity. The variations in the values obtained were 91.7 and 100.0 with very good categories. The score of 91.7 was obtained on the science learning objective indicator, the science phenomenon in the real world, and the relation between the learning material and the real world. While the value of 100.0 is obtained in the science learning material indicators, and the work steps of science investigations. The average value of the five clarity component indicators is 95.0. This indicates that the clarity component of science teaching materials is in a very good category.

Analysis of the average value of the practicality assessment of science learning material integrating new literacy according to the teacher is determined from each component value. The results of the plot of the average value of each component can be seen in Figure 3.

![Figure 3](image-url)

**Figure 3. The Average Value of Each Component of The Practicality of Science Learning Material According To The Teacher**

Based on Figure 3, it can be concluded that the average score of each practicality component according to the teacher ranges from 86.5 to 95.0. This means that the practicality value according to the teacher from the components of usable, easy to use, appealing, and clear is in the very good category. After analyzing each component value, the average value of the practicality component of science learning material integrating new literacy according to the teacher was 89.8. Based on this average value, the practicality of natural science learning material integrating new literacy according to the teacher is in the excellent category.

### 3.4 Practicality of Science Learning Material According to Students

The results of student practicality were obtained from practicality instruments according to students. The practicality test instrument according to students consists of four components. The practicality test instrument according to the students consists of four components, namely: usable (US), easy to use (EU), appealing (AP), and clear (CL). In each component, there are several assessment indicators related to student responses to science learning material.

The first component of practicality according to students is usable. The usable component values ranged from 75.0 to 88.3. The lowest score is 75.0 obtained on indicators that help control learning time. The highest score is 87.5 obtained on indicators helping to accelerate the process of scientific investigation. Based on the value of the thirteen indicators, the average value for the components is 83.0 with a very good category.
The second component of practicality according to students is easy to use. The range of values obtained from the easy to use component indicator is between 77.5 to 85.0. The lowest value is 77.5 obtained on the indicator controlling the investigation activity. The highest score is 85.0 obtained on the indicator using it in learning and investigation. The average score for the easy to use component is 81.8 with a very good category.

The third component of practicality according to students is appealing. The scores ranged from 83.3 to 86.7. The indicator that scored 83.3 was the packaging of science teaching materials. While the indicator that received the highest score, namely 86.7, was the cover display of science learning material. The average score for the attractiveness component is 85.1. These results indicate that the average value of the components of the appealing of science learning material is in the excellent category.

The fourth component of practicality is clear. The values obtained ranged from 80.0 to 90.8. The value of 80.0 is obtained on the indicator of the objective of the scientific investigation. The value of 90.8 is obtained on the indicator of work steps in science investigation activities. Overall the six indicators of the clear component are in the excellent category. Based on the calculation of the average value of the clarity component, it was obtained 84.2. This indicates that the average value of the clarity of science learning material is in the excellent category.

Analysis of the average value of the assessment of the practicality of science learning material integrating new literacy according to students is determined from each component value. The results of the plot of the average value of each component can be seen in Figure 4.

![Figure 4. Average Value of Each Component of Science Learning Material Practicality According to Students](image)

Based on Figure 4, it can be stated that the average value of the four components of the practicality of science learning material integrating new literacy according to students is 83.5. Based on this average value, the practicality of science learning material integrating new literacy according to students is in the excellent category. The results of the practicality analysis according to the teacher and students showed that science learning material were practically used in the science learning process for grade VIII students.

The use of science learning material integrates new literacy in learning activities to become more practical because it pays attention to the principles of properly structuring learning material. Learning material can be interpreted as a part that contains learning material that students must master and the material is arranged in a practical and interesting manner. Basically, in learning material there is a detailed explanation of the learning material followed by concrete examples, descriptions can be supported by the presence of interesting pictures, charts or graphs. The presentation of attractive teaching materials can make learning meaningful for students. So that students can develop their abilities and skills.

4. Conclusion
Based on the research that has been done, there are two important conclusions from this study. First, the validity of new literacy in science learning material is in the good category with an average value
of 75.2. Meanwhile, the validity of science learning material integrating new literacy based on thematic learning is in a very good category with a value of 80.1. Second, the practicality test obtained that the practicality value according to the teacher was 89.8 and the practicality value according to the students was 83.5. Thus the science learning material integrating new literacy based on thematic learning for grade VIII SMP students are valid and practical to be used in the science learning process at school.

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