Effects of science learning material of motion in daily life theme on new literacy of students

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Abstract. The 21st century demands education graduates have various skills. One of the skills needed is literacy skills. This literacy ability can be instilled in the learning process. However, the integration of literacy and the implementation of integrated science learning is still low. The solution that can be done is to develop science learning material by integrating new literacy. This study aims to determine the effect of using natural science learning material with the theme of motion in daily life integrated with new literacy on increasing the knowledge and skills of new literacy students of class VIII. This study used a before and after design with one sample group. The research subjects were 32 grade VIII students of SMP Negeri 1 Solok. The instrument for data collection consisted of two instruments. First, the knowledge aspect assessment instrument in the form of a written test consisting of 10 questions in the form of essay questions. Second, the skills aspect assessment instrument in the form of a performance appraisal sheet to assess students' new literacy skills. The data analysis technique used descriptive analysis, normality test, homogeneity test, and correlated comparison test if the data were normally distributed and had the same variance. The Wilcoxon signed-rank test analysis is used if the data are not normally distributed and are not of the same variance. Therefore, an important result of this study is the use of science learning material on motion in daily life theme has a significant effect on increasing the knowledge and new literacy skills of grade VIII junior high school students at a 95% confidence level.

1. Introduction
The 21st century is marked by very rapid developments in aspects of science and technology. In this century also marked the transition or change of roles between humans with sophisticated technology or known as the industrial revolution 4.0. Thus humans need to have skills that can adjust to the development of the current era [1].

The four skills that education graduates need in the 21st-century ways of thinking, ways of working, tools for work, and skills for life [2] [3]. Besides, education must be able to create and develop new literacy skills that are needed to face the times. New literacy is a renewal of old literacy adapted to the times in the 21st century. Literacy skills are an important foundation in achieving success in school and life [4]. Also, the development of literacy skills is needed by students to improve and expand their abilities in the form of knowledge and concepts that can support their lives [5]. Therefore, new literacy is needed to face times like today.
The 2013 curriculum states that science learning is carried out in an integrated manner and is related to one another. The integration referred to is inseparable from the integrated concept of various disciplines such as Biology, Physics, and Chemistry [6]. This is confirmed by the opinion of Asrizal (2018) which states that science learning subjects must be adjusted to the demands of the 2013 curriculum which calls for the concept of integration [7].

The real conditions that occur in the field are still not in under expected ideal conditions. This can be seen from the preliminary studies that have been conducted and other relevant research. The preliminary study that has been conducted consists of three, namely: analysis of the implementation of science learning in junior high schools, analysis of the integration of material in teaching materials used in junior high schools, and analysis of student learning outcomes.

First, thematic learning and integration of new literacy in science learning have not been maximally implemented. The teacher delivers the learning material separately [8,9,10]. This is confirmed by the opinion of Asrizal (2018) which states that the integration contained in science learning material is still low [11]. Second, the integrity of the material in science textbooks is still low [12]. Third, student learning outcomes are still low.

One solution that can be done is to integrate new literacy into the learning process. New literacy indicators can be integrated into a science learning material. Having new literacy indicators in learning material can train students to be more competent and competitive.

Literacy is one of the basic skills that are important for students. Literacy is the ability to identify, understand, interpret, design, and communicate [13]. With literacy skills, students can interact and socialize with each other and can construct the ideas they have to convey to others. An effort needs to be made to create and develop literacy skills in students, one of which is by implementing a literacy culture. Literacy culture can be interpreted as an activity that aims to get used to thinking accompanied by reading and writing processes and the final result obtained from these activities is a work.

The era of the industrial revolution 4.0 is an era marked by the existence of digital industry references in life. In this regard, a renewable literacy skill is needed that is developed from previous literacy, namely new literacy. New literacy is one of the skills needed in the era of the industrial revolution 4.0. New literacy can encourage students to carry out lifelong learning so that they can adapt to the times. Students who have new literacy skills have a greater opportunity to become more competent and competitive human resources [14]. New literacy skills consist of data literacy, technological literacy, and human literacy [15,16].

Data literacy is the ability to read, analyze, and make a conclusion based on the data obtained. In other words, the data referred to here is not only quantitative data but also qualitative data. When examined more specifically, data literacy means the ability to read, analyze, and use information in the digital world [15].

Technological literacy is the ability to use, understand, organize, and assess innovations that involve processes and knowledge in solving problems and expanding one's abilities. The target of achieving technological literacy is the development of science, the application of the pillars of literacy from conventional to digital ones, and reading, writing, and disseminating information activities [15]. Another meaning of technological literacy is the ability to use technology, especially in learning [16].

Human literacy includes the ability to communicate, collaborate, think critically, creatively, and innovatively. The target of the application of human literacy is to make a person have leadership skills, teamwork, good adaptation, personality, and entrepreneurial spirit. The existing skills in human literacy are in line with the vision of the National Literacy Movement (GLN). The National Literacy Movement encourages the creation of literacy mastery that is adjusted to literacy in the 21st century which is summarized in 4C, namely creative, critical thinking, communicative, and collaborative [14].

The use of learning material is a process in learning. Teachers can use learning material to facilitate students to understand the learning material. Learning material can be defined as essential and important tools to encourage teacher efficiency in learning and learning material can improve student performance [17,18]. Besides, learning material are objects that help teachers to present learning in a logical and orderly manner to students [19,20].
In the learning process, learning material play an important role [21,22]. The role of these learning material is first, they can make learning more interesting and meaningful [17,23]. Second, it can improve learning outcomes, save time, increase student interest, and facilitate student memory [24]. Third, to develop self-confidence, self-actualization, and student motivation [17,25]. Also, the role of learning material can develop the three competencies of students, namely knowledge competencies, skills competencies, and attitude competencies, and can increase values in the learning process [26].

Natural science learning material integrating new literacy are learning material that contain new literacy indicators. Each indicator will provide opportunities for students to be able to explore themselves regarding the interpretation of the data presented, the use of technology, and the ability to think that is within them. This science learning material has several advantages including. First, this learning material contains material in an integrated manner which is summarized in one theme and is grouped into several sub-themes. Second, by using these science learning material students can link concepts to everyday problems. Third, students can have the ability to analyze the data obtained. Fourth, students have the ability to innovate towards technology. Fifth, students become critical, creative, collaborative, and communicative. The results of research [30] state that new literacy can strengthen the abilities of teachers and students in the challenges of the industrial revolution era 4.0. So that the purpose of this study was to see the effect of using natural science learning material with the theme of motion in daily life to improve the competence of knowledge and new literacy skills of students grade VIII SMP.

2. Method
This type of research is a quasi-experimental research with a before and after research design with a sample group. Quasi-experimental research is research that cannot fully control the external variables that affect the implementation of the experiment [27]. Limited field testing with research subjects of class VIII SMP Negeri 1 Solok, totaling 32 people. The effect of using natural science learning material with the theme of motion in daily life integrating new literacy is seen from the comparison after and before treatment.

The first assessment instrument on the aspect of knowledge before and after using science learning material used a written test which consisted of 10 essay items. Second, the instrument for assessing the aspects of students' new literacy skills uses a performance appraisal sheet consisting data literacy, technological literacy, and human literacy.

Data analysis in this study used descriptive statistical analysis, normality test, homogeneity test, and correlated comparison test. Descriptive statistical analysis is used to describe an object being studied through sample or population data as it is and is generally accepted [28]. The normality test is used to prove if the population under study is normally distributed. The homogeneity test is carried out in order to determine whether the population under study is the same variant. If the research data is normally distributed and in the same variant, the appropriate test to use is the correlated comparison test. In this case, the correlated comparison test is a parametric statistical method. The correlated comparison test was used to determine differences in students' knowledge and new literacy skills after and before using science learning material. On the other hand, if the processed data does not meet the parametric statistical assumptions, it is possible to use the Wilcoxon signed-rank test [29].

3. Result and Discussion
The results of the study were data of new literacy knowledge and skills of students before and after being given treatment. Data regarding student knowledge were analyzed using descriptive statistics, normality test, homogeneity test, and Wilcoxon signed-rank test. The results of data analysis on student knowledge can be seen in Table 1.
Table 1. Data analysis of knowledge

| Statistical Parameters         | Knowledge Value | Reference Value |
|-------------------------------|-----------------|-----------------|
|                               | Before          | After           |
| Mean                          | 49.56           | 65.69           |
| Median                        | 48.50           | 66.67           |
| Mode                          | 34.00           | 60.00           |
| Standard deviation            | 14.67           | 20.65           |
| Variance                      | 215.16          | 426.46          |
| Minimum                       | 27.00           | 13.30           |
| Maximum                       | 81.00           | 91.11           |
| P-value of the normality test | 0.090           | 0.109           | 0.157 |
| P-value of the F test         | 1.982           | 1.822           |
| Wilcoxon signed-rank test     | -3.52           | 1.96            |

On students’ knowledge, the mean value of knowledge after treatment was higher. The results of the normality test show that the before and after treatment knowledge data groups have a normal distribution. Meanwhile, the results of the homogeneity test showed that the before and after knowledge did not have the same variance. So, with these two results, the Wilcoxon signed-rank test used. The Wilcoxon signed-rank test was used to analyze the difference between two paired data. The calculated Z value for 32 students was -3.52. The value of the Z table with a significant level of $\alpha = 0.05$, the half value of the significant level is 0.025 is 1.96. The results of the hypothesis test show that there is a significant difference between students’ knowledge after using science learning material. Thus the use of natural science learning material with the theme of motion in daily life is effective in increasing the knowledge students at the 95% confidence level.

Furthermore, the effect of using science learning material is determined by skill competencies, namely students' new literacy skills. There are three components to the new literacy used in science learning material with the theme of motion in everyday life, namely: data literacy, technological literacy, and human literacy. Data literacy includes: reading data, analyzing data, gathering data, and predicting the results of data analysis. Data literacy analysis can be seen in Table 2.

Table 2. Data analysis of student data literacy

| Statistical Parameters         | Data Literacy Value | Reference Value |
|-------------------------------|---------------------|-----------------|
|                               | Before              | After           |
| Mean                          | 54.53               | 72.03           |
| Median                        | 53.50               | 73.00           |
| Mode                          | 37.00               | 66.00           |
| Standard deviation            | 16.26               | 20.99           |
| Variance                      | 264.45              | 440.68          |
| Minimum                       | 30.00               | 25.00           |
| Maximum                       | 89.00               | 98.00           |
| P-value of the normality test | 0.096               | 0.108           | 0.157 |
| P-value of the F test         | 1.67                | 1.82            |
| Correlated comparison test    | -4.76               | 1.69            |

From Table 2, it can be seen that the average value of data literacy after treatment is higher. The results of the normality test showed that the data group before and after treatment had a normal distribution. Meanwhile, the data literacy homogeneity test before and after has the same variance. So, with these two results, a correlated t-test is used. The correlated comparison test was used to analyze the difference between the two paired data. The t value for data literacy is -4.76. The value of the t table with the degree of freedom of the number of students minus one and a significant level of 0.05 is
1.69. Based on the acquisition of the t value is negative, the left side test is used. So that the t table yield becomes -1.69. The results of the hypothesis test show that there is a significant difference after using science learning material on the student data literacy component at the 95% confidence level.

The second new literacy component is technological literacy. Indicators on technological literacy include: understanding the work of human technology, connecting science with technology, using the internet, using appropriate technology. Technological literacy data analysis can be seen in Table 3.

Table 3. Data analysis of student technology literacy

| Statistical Parameters          | Technology Literacy Value | Reference Value |
|--------------------------------|---------------------------|-----------------|
|                                | Before | After | Before | After |
| Mean                           | 57.81  | 89.06 |       |       |
| Median                         | 62.50  | 100.00|       |       |
| Mode                           | 50.00  | 100.00|       |       |
| Standard deviation             | 8.25   | 14.11 |       |       |
| Variance                       | 68.04  | 199.09|       |       |
| Minimum                        | 50.00  | 62.50 |       |       |
| Maximum                        | 75.00  | 100.00|       |       |
| P-value of the normality test  | 0.297  | 0.219 | 0.157 |       |
| P-value of the F test          | 2.926  | 1.822 |       |       |
| Wilcoxon signed-rank test      | -4.94  | 1.96  |       |       |

Based on the Table 3, it can be seen that the average value of technological literacy after treatment is higher. The normality test results showed the technology literacy data group before and after were not normally distributed. Meanwhile, the results of the homogeneity test of technology literacy data before and after do not have the same variance. So, from these two results, the Wilcoxon signed-rank test was used. The calculated Z value for 32 students was -4.94 and the Z table value was 1.96. Hypothesis test results show that there is a significant difference between students' technological literacy after and before treatment. Thus the use of natural science learning material with the theme of motion in daily life is effective for increasing the new literacy of students at the 95% confidence level.

The third component of new literacy used in human literacy is human literacy. Human literacy has four assessment indicators. The four assessment indicators are critical thinking, creative thinking, collaboration, and communication. Analysis of human literacy data can be seen in Table 4.

Table 4. Data analysis of student human literacy

| Statistical Parameters          | Human Literacy Value | Reference Value |
|--------------------------------|----------------------|-----------------|
|                                | Before | After | Before | After |
| Mean                           | 35.35  | 73.24 |       |       |
| Median                         | 31.25  | 75.00 |       |       |
| Mode                           | 31.25  | 81.25 |       |       |
| Standard deviation             | 10.12  | 8.73  |       |       |
| Variance                       | 102.34 | 76.20 |       |       |
| Minimum                        | 18.75  | 50.00 |       |       |
| Maximum                        | 56.25  | 81.25 |       |       |
| P-value of the normality test  | 0.458  | 0.179 | 0.157 |       |
| P-value of the F test          | 0.745  | 1.822 |       |       |
| Wilcoxon signed-rank test      | -4.94  | 1.96  |       |       |

Based on Table 4, it can be seen that the average value of human literacy skills after treatment is higher. The results of the normality test of 32 students showed that human literacy before and after was not normally distributed. Meanwhile, the results of the homogeneity test showed that the two data had the same variance. So, with these results, the Wilcoxon signed-rank test was used. The calculated
Z value for 32 students was -4.94 and the Z table value was 1.96. Hypothesis test results show that there is a significant difference between students' human literacy after and before treatment. Thus the use of natural science learning material with the theme of motion in everyday life is effective in increasing students' human literacy at the 95% confidence level.

From the results of other research, the effect of science learning can indicate the effect of using science learning material and integrating new literacy seen in several aspects such as it can strengthen the ability of teachers and students [30], students' knowledge and digital literacy [31], knowledge, attitudes, and skill competencies. student literacy [7]. This means that the results of the research conducted are relevant to the results of other studies.

4. Conclusion
The conclusion of this study is that the application of science learning material with the theme of motion in daily life provides a significant difference in students knowledge and new literacy skills at the 95% confidence level. Therefore, the application of science learning material with the theme of motion in life has an effect that can increase the of knowledge and new literacy skills of students of class VIII SMP.

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