

# The Development of Integrated Science to Improve Students' New Literacy Skills in Cooperative Learning

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## ABSTRACT

Natural science is a science that provides important information related to natural phenomena, matter and energy. Learning science in the new literacy era requires students to master; data literacy, technological literacy and human literacy, which means that students are able to develop the ability to think, work and communicate well. But in reality it hasn't been done well. This study aims to determine the validity of science material and test the practicality and effectiveness of using science material in cooperative learning in the new literacy era. This type of research is research and development. Data collection instruments include validity, practicality and performance tests. The results show that the development of science in cooperative learning can improve the literacy skills of new students. this skill is needed for the next life.

**Keywords:** *Natural Science, Learning Science, New Literacy, Cooperative Learning.*

## 1. INTRODUCTION

The 21st century offers life in a borderless world, globalization, internationalization and the explosion of information and communication technology. Learning in the 21st-century should have contexts, be linked to community life, be student-centered, and be collaborative. it's means that the content of learning materials must be associated with the real world. In this way, the material discussed in the school is close to the daily life of the students.

Integrated science learning is a proper way to apply the essence of 21st-century learning. In integrated science learning, students are encouraged to connect the learning materials to real-world contexts. Students are involved actively in exploring the real-world contexts which one, the learning process can be implemented holistically, authentically, meaningfully, and actively (Wiyanto & Widiyat-moko, 2016).

The Indonesian Ministry of Education and Culture has established that science learning in the 2013 curriculum must be implemented in an integrated pattern. The content of the subjects comes from sub-discipline of science that is physics, biology, and chemistry. In other words, science learning should be integrated from those sub-discipline contents. One basic competence has been integrating the science concepts of the sub-discipline of physics, biology,

chemistry, and earth science and space (Pratiwi & Muslim, 2016). In addition, in science development framework, scientific competence is connected to daily life, technology, and environment. Therefore, the 2013 curriculum the importance of integration in science learning.

Therefore, in science learning, science teachers need to develop students' literacy so that they can obtain success either in their learning or real life. Integrated learning will gain knowledge and skills and make learning more meaningful to students as it is connected to the real world context. This integrated learning is more effective to improve the understanding and experience of students (Sunhaji, 2016).

Integration in the curriculum could result in a greater intellectual curiosity, improve attitude, enhance problem-solving skills, and heighten achievement (Alghamdi, 2017). Moreover, they are trained to discover the concepts by themselves holistically, meaningfully, authentically, and actively (Wiyanto & Widiyatmoko, 2016).

In learning, literacy is very important for students because literacy skills affect their learning success and their lives. Good literacy skills will help students understand various learning sources, both oral, written, and visual texts (RTI, 2014). Literacy skills play an

important role in determining student success in the learning process.

However, the actual conditions do not match with the expected conditions. Science learning was conducted separately (Pursitasari et al., 2015). Ardianto & Rubini (2017) also stated that lecturers continue to teach science as a separate science in the sub-disciplines of chemistry, physics, and biology. Science lecturers generally have difficulty implementing integrated science learning (Parmin et al., 2015).

One alternative solution to this problem is to develop integrated science learning materials equipped with new literacy. The important reason for this solution is that learning materials can be used to facilitate lecturers in implementing integrated science learning and students in learning science holistically and authentically. This instructional material must be linked to a real world context. On the other hand, the integration of new literacy in learning is also important to encourage student success in learning and daily life.

Starting from the ideal conditions and real conditions that have been described, it is found that there are problems in learning science integrated. It is important to make efforts to overcome this problem. As one solution to solving this problem is to develop integrated science teaching materials with new literacy content. This solution is in accordance with the curriculum design at the tertiary level which states that the science learning process is taught in an integrated manner.

From this solution a theoretical study need to do is teaching material. Teaching material is a generic term used to describe the use of learning resources by lecturers to convey learning. In this way, teaching materials can support student learning and increase their success. Teaching materials can be defined as a description of a set of materials arranged systematically, both written and unwritten, so that an environment or atmosphere is created that allows students to learn (Wahyuni, 2015).

Teaching materials are essential and important learning resources needed at the tertiary level to encourage efficient lecturers and improve student performance. With teaching materials to make learning more interesting, practical, and realistic. Besides, the use of teaching materials in learning enables both lecturers and students to participate actively and make learning more effective. Teaching materials can provide space to acquire knowledge and skills, develop self-confidence and self-actualization of students (Olayinka, 2016).

The use of teaching materials in learning can provide benefits to students. There are several advantages of using teaching materials, namely: 1). make students participate creatively and think

analytically when they are involved in learning, 2). The concepts learned using teaching materials become clearer to students because these concepts are taught through learning activities, 3). encouraging a systematic integration of various sources in a learning experience, 4). become actively involved in improvisation, the principles of work are studied and in this way There are students who acquire problem-solving skills, attitudes and scientific knowledge needed in solving scientific and technological problems (Akani, 2016).

The research data were analyzed through descriptive statistics and paired comparison test. The descriptive statistics analysis intended to describe more detailed information about the validity data from the experts, the practicality of the product according to the science teachers and students, also, knowledge and digital literacy of students. On the other hand, the paired comparison test was to examine the difference between the two groups of paired data after and before the treatment.

Integrated learning uses an interdisciplinary approach which is designed in the form of integrated themes or concepts. For example in the field of Science, science subjects can be conducted simultaneously with topics including Biology, Chemistry, and Physics (Yarker, 2012). Integration in science can help students to gain a strengthening of an understanding of the role and function of science in everyday life and the world in which they live (Afuwave, 2012: 127). With integrated science learning, learning is closer to life.

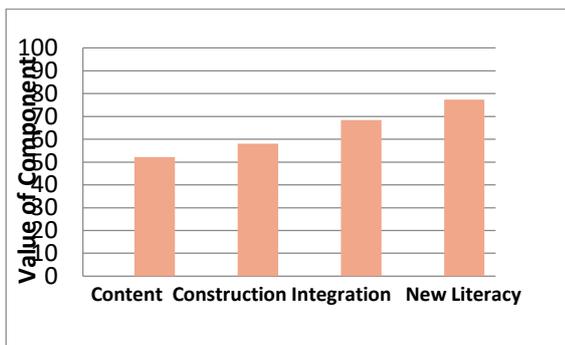
Literacy is related with a competency in a given field. For example, 1. Technological literacy implies human skills in the field of technology to be able to compare and analyze evidence and facts, and to evaluate and make responsible decisions. Students also need to develop critical thinking skills and be open to seeing the world of technology from various perspectives (Axell & Lars, 2018). 2. Data literacy is a standard used to evaluate how well a student understands quantitative data such as statistics or graphs that they are studying or sharing. Skills in data literacy according to Doyle (2019) can include 1) understanding the information represented by data; 2) reading charts, graphs, and visualizations; 3) think critically about sources, accuracy, and / or methods; 4) identify filtered, persuasive, or subjective data; and 5) evaluate.

3. Human literacy is often interpreted as human literacy where humans (students) must be aware of the potential for intelligence that they have in themselves greater than the potential for artificial intelligence that emerged in the era of the industrial revolution 4.0. This literacy is more focused on improving collaborative skills (humanities), communication, and being creative and innovative which allows students to contribute to their environment (Aoun, 2017).

Starting from the background of the problems described, it can be stated that preliminary research (preliminary research) to develop science teaching materials to improve new literacy skills in cooperative learning needs to be done. The objectives of the research are to: describe-Ensure the integration of basic competences from science subjects, the application of integrated science learning, available teaching materials for learning, and new student literacy.

**2. RESULTS AND DISCUSSION**

The first research result was the validity of integrated science instructional materials which determined from two indicators, relevance and consistency. Relevance refers to content validity, while consistency relates to construction validity. Based on the validity assessment instrument from the experts, obtained the relevance and consistency value of integrated science instructional materials. The score of each validity assessment component is seen in Figure 1.



**Figure 1** Validity Assessment Component

The average validity values of integrated science instructional materials varied from 51.0 to 79.0. two components of the assessment criteria have been in a very valid category; those were integration and new literacy. On the basis of the validity test, the experts' suggestions could be grouped into three parts. The first suggestion was to show the relationship among sub-disciplines from physics, biology, and chemistry. To improve the integration within the sub-themes. The second suggestion was to re-read the materials as there were some typographical errors. The third suggestion was to provide/create figures relevant to the learning materials since the initial figures were taken from internet sources.

Analysis of pre-research data include problem item analysis, normality test analysis and population homogeneity test analysis. The results of the analysis of the item obtained are as follows:

No	level of difficulty	Different	Validitas	conclusion
1	Easy	Medium	Enough	Used

2	Easy	Medium	Enough	Used
3	Easy	Bad	Low	Disposable
4	Average	Medium	Enough	Used
5	Difficultly	Bad	Enough	Corrected
6	Easy	Bad	Enough	Corrected
7	Easy	Medium	Low	Disposable
8	Easy	Medium	Enough	Used
9	Medium	Medium	Low	Disposable
	Medium	Medium	Enough	Used

**Table 1** Problem Analysis Results Item

Based on table 1 above, of the 10 tested questions, only 7 questions are used for the pre-test and post-test in which each consists of 5 items. While the other 3 problems are not used because they do not meet the feasibility requirements.

To determine the increase in students' understanding of science after being given treatment, the pre-test and post-test results data were tested using paired t-test, then look for how much the achievement of increasing student understanding of concepts by using the acquisition of normalized scores.

Before paired t-test can be used to test data of pre-test and post-test results, then test the normality of research data first. The results of normality test data pre-test and post-test are as follows;

Test			Keterangan
Pre-Test	4,43	11,10	Normal
Post-Test	0,48		Normal

**Table 2** Results Calculation of Normality of Pre-Test and Post-Test

The data characteristics have met the statistical parameters. For this reason, a paired comparison test can be used to determine the difference of students' new literacy after and before using the integrated science instructional materials.

In other words, the use of integrated science learning materials equipped with new literacy can give a meaningful impression in encouraging new literacy of students. The significant growth in literacy symbolizes that the use of science teaching materials is effective, especially to improve new, functional, and visual literacy of students.

From the results that have been achieved, it can be stated that the use of integrated science teaching materials equipped with new literacy in a practical and effective scientific approach to increase knowledge in cooperative learning. As an implication of the research results, science lecturers can use the material as an

alternative source of learning in science learning. In addition, students can also use integrated science teaching materials as a learning resource to construct new knowledge and literacy in science subjects. Therefore, this research product is an alternative solution in implementing integrated science learning and encouraging literacy programs at the tertiary level.

### 3. CONCLUSION

The results of the study concluded that the integrated science teaching materials have generic criteria for high quality products in terms of validity, practicality, and effectiveness in the scientific approach. Validity is described in 4 components, namely content, construction, integration and new literacy. These findings indicate that the integrated science teaching materials have met the criteria of relevance and consistency. The use of integrated science teaching materials is practical in a scientific approach according to science lecturers and students in terms of usability, convenience, and attractiveness. In addition, science lecturers and students agree that the use of teaching materials is useful, comfortable, and interesting to support the teaching and learning process. In addition, the use of integrated science teaching materials is effective in a scientific approach to improve aspects of digital knowledge and literacy which include scientific, functional, and visual literacy.

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