

# ANALYSIS OF PHYSICS TEACHING MATERIAL FOR GRADE XI IN THE DISTRICT OF NORTH INDRALAYA BASED ON SCIENTIFIC LITERACY THEMES

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## ANALYSIS OF PHYSICS TEACHING MATERIAL FOR GRADE XI IN THE DISTRICT OF NORTH INDRALAYA BASED ON SCIENTIFIC LITERACY THEMES

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### Abstract

The purpose of this research is to analyze whether high school physics teaching materials which used in grade XI in the District of North Indralaya already represent the Scientific Literacy themes , as well as obtain information on the scope of science of teaching materials in the form of books used in schools in the district of North Indralaya. This research was done using physics teaching materials in the form of books used in grade XI in the District of North Indralaya, namely in SMAN 1 North Indralaya and SMA PGRI. The research found out that the books used in high schools in the District of North Indralaya already represent scientific literacy themes with an average emergence percentage of 59.62 % for the themes of scientific literacy as a knowledge of science, 33.57 % for the themes of literacy sciences as a way of investigation, 5.73 % for the themes of scientific literacy sciences as a way of thinking, and 1.08 % for the themes of the interaction of science, technology with society. From the research, it is advisable to conduct further research on the level of scientific literacy of high schools' students in the district of North Indralaya that learning with books that have been analyzed .

**Key words** : teaching materials, scientific literacy themes.

## INTRODUCTION

### Background

The ability of students in the mastery of sciences in a learning process is often termed as scientific literacy. The ability of students to master and learn the science is closely related to the development of science and technology that is currently growing rapidly so that students are required to have good Scientific Literacy. Scientific literacy is a very important thing to master by each individual because it is closely related to how one can understand the environment and other issues faced by modern society that relies heavily on the development of science and technology, as well as social issues.

Based on the results of the PISA study in 2012, it is known that the ability of science students Indonesia is still low. PISA or the Programme for International Student Assessment itself is an international assessment programs developed and followed by the countries participating in it, and held against children 15 years of age. The results of this study can be used as a reference of the low ability of science Indonesian children as compared with other countries. In reporting the results of PISA 2012 (OECD, 2013) wrote that the scientific literacy of Indonesian students' average value is 382, where Indonesia ranks 64 out of 65 participating countries, or in other words, is ranked second lowest of all the participating countries in PISA.

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The low ability of Indonesian students' scientific literacy is influenced by many things, among others, curricula and educational systems, selection methods and models of teaching by teachers, infrastructure and learning facilities, learning resources, teaching materials, and so forth. One of the factors that directly intersect with the learning activities of students and affect low ability students' scientific literacy Indonesia is the existence of a source of student learning, in this case teaching materials in the form of books, which is still the main source of student learning in schools. From the results of the pre-survey study conducted by researchers at the schools in the District of North Indralaya, most teachers still based on the use of books in delivering course material. According to Stake and Easley in the research journal written by Adisendjaja (2009:2), 90% of science teachers still use the book in the process of learning and teaching. Given the importance of book learning, it is necessary to develop research on teaching materials which form the book is still very limited.

The research question in this research is whether high school physics teaching materials used in class XI in the District of North Indralaya already represent the categories of scientific literacy and how is the scope of the categories found in scientific literacy instructional materials in the analysis?

The aims of this study is to analyze whether high school physics teaching materials used in class XI in the District of North Indralaya already represent the categories of Scientific Literacy, as well as obtain information on the scope of science in the form of teaching materials physics books used in school districts as North Indralaya

## THEORITICAL BACKGROUND

### Teaching Material

In the Technical Guidance High School Instructional Materials Development (Directorate of School, 2010:27) teaching material is defined as any form of material in the form of the material are arranged systematically used to assist teachers in implementing the learning activities and enable learners to learn. In addition, Zulkamain (2009:1) states that teaching materials are all forms of material used to help teachers or instructors in carrying out teaching and learning activities in the classroom. Teaching materials have a variety of types, based on the technology used, teaching materials can be grouped into four categories, namely printed instructional materials include handouts, textbooks, modules, textbook, student worksheets, brochures, leaflets, etc., hear teaching materials (audio), such as cassette, radio, compact disc and others, teaching materials of view heard (audio-visual) as a video compact disc, and interactive multimedia teaching materials such as CAI (Computer Assisted Instruction), a web-based teaching materials, and others. In accordance with the rules of clustering scientific papers, textbooks, textbooks, modules, and dictates belong to the class of books, and only distinguished from the sense and shape respectively.

### Scientific Literacy

In language, Scientific Literacy is composed of two words, namely literacy and science. Literacy is derived from the English language, literacy and Shadily according Echols (2002) in an English-Indonesian dictionary meaning of literacy while science itself means knowledge. While Widyatiningtyas (2008:2) states that scientific literacy (scientific literacy) can be interpreted as an understanding of science and its application to the needs of the community. In PISA 2009 Assessment Framework Key competencies in reading, Mathematics and science, the OECD stated definition of scientific literacy as follows:



An individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.”

(2009 :128)

<sup>3</sup> *National Research Council (NCR)* also defines scientific literacy defines scientific literacy as the ability to use evidence and data to evaluate the quality of science information and arguments put forth by scientists and in the media (Gormally, et al.,2012:364).

<sup>8</sup> Dimensional and Assessment Literacy Science

Scientific literacy involves the use of scientific concepts important to understand and help make decisions. It also involves the ability to identify scientific questions, using evidence, draw conclusions and communicate scientific conclusions. Scientific concepts relevant to students both now and in the specified time will be used. PISA 2000 and 2003 set a three-dimensional scientific literacy in its judgment, the competence/science process, content/context of scientific knowledge and scientific applications. In PISA 2006 scientific literacy dimension developed into four dimensions, namely additional aspects students' attitudes to science (OECD 2007 in Zuriyani, 2012:5). Likewise, the PISA 2009 and 2012 that still uses 4-dimensional in terms of it judgment, context, content aspect, competence, as well as aspects of attitude.

### Scientific Literacy Themes

#### Categories for Analyzing Science books

Analyzing the science text books, especially for physic is conducted by the procedure developed by Chiappetta, Fillman & Sethna (1991b) quoted from Udeani (2013:41) mentions that some categories to analyze science textbooks as follows :

1. The Knowledge of Science.  
Check this categories if the intent of the text is to present, discuss or ask the student to recall information facts, concepts, principles, laws, theories etc. textbook material in this category
  - a. Presents facts, concepts, principles and laws.
  - b. Presents hypotheses, theories and models
  - c. Asks students to recall knowledge or information.
2. The Investigative Nature of Science  
Check this categories if the purpose of the text is to encourage students to thinking and doing and asking students to find out. It reflects aspects of active learning involving students in the methods and processes in science. This category includes the contents of the book that asks students to:
  - a. Requires students to answer questions through the use of material.
  - b. Requires students to answer questions through the use of graphs, tables, and others.
  - c. Requires students to make calculations.
  - d. Require students to explain answers.<sup>10</sup> involving students in the experiment or activity of thinking.
3. Science as a Way of Thinking



Science is a human activity which is characterized by the presence of the thought processes going on in the minds of anyone involved in it. This category is stated there if the purpose of the text is analyzed in the book:

- a. Describing how a scientist doing experiments.
  - b. Shows the historical development of an idea.
  - c. Emphasizes the empirical nature of science and objectivity.
  - d. Illustrates the use of assumptions.
  - e. Demonstrate how science goes with inductive and deductive reasoning.
  - f. Provide causality.
  - g. Discuss the facts and evidence.
  - h. Presenting the scientific method and problem solving.
4. Interaction of science, technology, and society

This category is stated there if the purpose of the text is analyzed in the book:

- a. Illustrate the usefulness of science and technology for society,
  - a. Shows the negative effects of science and technology for society,
  - b. Discussing social issues related to science or technology,
  - c. Mention careers and jobs in the field of science and technology.

#### RESEARCH METHOD

This study used a descriptive method. The research is conducted at all the senior high school in The District of North Indralaya on even semester. The schools are :

1. SMAN 1 Unggulan Indralaya Utara
2. SMA PGRI

The research object in this study were all teaching materials physics in the form of books and meet the criteria and were analyzed based on the basic competencies that apply to first semester of class XI predetermined by BSNP.

#### Data Analysis Techniques

The data were analyzed further is the material covered in high school physics text book of class XI. Data processing is done by qualitative analysis. Data were analyzed descriptively by classifying data according to research problems and translated into words. In addition, to determine the percentage of appearance in the category of scientific literacy in the physics textbook, performed data analysis techniques as well as the following:

1. Summing up the appearance of scientific literacy indicators for each category in each book analyzed.
2. Calculating the percentage emergence scientific literacy indicators for each category in each book analyzed.

$$\text{The percentage of scientific literacy category} = \frac{\text{number of indicators per category}}{\text{total number of indicator categories}} \times 100\%$$

3. Discussion
4. Conclusion Withdrawal

#### RESULTS AND DISCUSSION

The results of the research conducted is the percentage of appearance in the book category of scientific literacy, and scientific literacy category page which is found in the book. The results of the

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analysis of scientific literacy categories on the book used in SMA N 1 North Indralaya and SMA PGRI Indralaya can be seen in the table presented below:

**Table 1.** Data Analysis Results of Scientific Literacy in Both of Books

No.	Scientific Literacy Themes	Books' Title						Average (%)
		SMA N 1 Indralaya Utara (A)			SMA PGRI Indralaya (B)			
		Total Page	Σ	%	Total Page	Σ	%	
1	The Knowledge of Science	60	231	85,24	310	547	34,00	59.62
2	The Investigative Nature of Science		36	13,30		867	53,88	33.60
3	Science as a Way of Thinking		2	0,73		172	10,69	5.70
4	Interaction of science, technology, and society		2	0,73		23	1.43	1.08
<b>Total</b>			<b>271</b>	<b>100</b>		<b>1609</b>	<b>100</b>	<b>100</b>

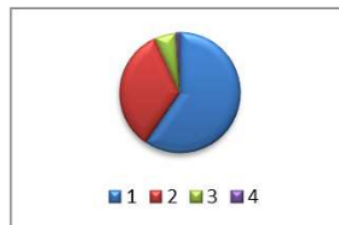
The results of the analysis of the second category of scientific literacy books used in schools in the district north Indralaya can be described in the diagram below :



**Picture 1.** The Diagram Shows Percentage of Scientific Literacy Themes That Appear in Book A



**Picture 2.** The Diagram Shows Percentage of Scientific Literacy Themes That Appear in Book B



**Picture 3.** The Diagram Shows The Average Percentage of Scientific Literacy Themes That Appear in Both of Books

Based on the results of the analysis are illustrated in the diagram above, it can be seen that the two books that have analyzed the entire load categories of scientific literacy. Scientific literacy categories that appear in both books have a different percentage appearance. The largest average appearance of scientific literacy category is the first category of scientific literacy, the knowledge of science with an average of 59.62% emergence. In general, this illustrates that both books tend to

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emphasize the presentation of the material in the form of scientific knowledge. However, although the average percentage of both books prove so, it should be noted that the percentage of occurrences for the second category of scientific literacy in the book shows the different percentage appearance. A book that is used in SMA Negeri 1 seed North Indralaya more dominant emphasis on knowledge of material science (body of knowledge), which is equal to 85.24%, while for the same category in the books used in high school B PGRI North Indralaya shows the percentage of 33.98%. Meanwhile, the book emphasizes the category B science as a way of investigating the more dominant category in the presentation of his book, which is equal to 53.85%, while for this category, the book A shows the percentage of 13.30%. As for the other two categories, the second book nearly equal in its presentation. Book A statement gave rise to 173 or 10.74% for the category of science as a way of thinking, and 23 statements or 1.43% for the category of science interactions. The book led to a second category B itself is in equal portions, ie 0.73% or there are only two statements for each category.

The main cause of different number occurrences of the first scientific literacy categories in the both of books is that book A is not giving task questions and exercises as well as the final exam in each chapter, while the B book gives practice questions and the final exam question number per-chapter ranged from 55 to 80 questions. The types of questions are covered in the book B is the questions that are included in the category of indicators of science as a way of investigating, because every question that one of the indicators included in the category of science as a way of investigating occurrences counted as one indicator. Based on interviews conducted by the researcher to the teachers who teach physics subjects using the book, both teachers admitted to teach the subjects of physics, they also have other sources in addition to the current teaching.

The study also found that the second book already contains the categories used in the presentation of material science literacy, but not include the dimensions of scientific literacy is defined by the OECD as a whole, ie aspects of the context, the content aspect, the aspect of competence and attitude aspects. The study found the lack of context in the second aspect of the book. As noted by the OECD, covering aspects of the context of application areas, namely in health science, natural resources, environmental quality, hazards, and the development of cutting-edge science and teknologi. namun whole field of science applications are included into the context aspects not found in the second book were analyzed. The next dimension defined by the OECD is the aspect of content covering the key concepts of the science needed to understand natural phenomena and changes to the nature through human activities. This aspect, together with aspects of competence and attitude aspects are aspects that are found in both books, though only in small portions. Aspects of competence can be found in the book B, especially the aspect of identifying scientific questions, explain fenomena scientifically, and using scientific evidence on the existence of a book illustrated by practical activities and discussion activities are recommended to be done by the student. Find activities and discussions that do student activities, is expected to generate student interest in science and supporting scientific investigations.

## CONCLUSION

From the research that has been conducted, it could be concluded that the books that used in the schools in the district of north indralaya is already represents all the scientific literacy themes with average percentage 59.62% for knowledge of science, 33.57% for sciences as way of investigating, 5.73% for sciences as way of thinking, and 1.08% for interaction of science, technology and society.



## SUGGESTION

From this research, the authors propose the following suggestions:

1. For further research, the results of this study can be used as a basis for research on the level of scientific literacy in students high school in the district of North Inderalaya that learning with books that have been analyzed.
2. To those teachers at both schools to add other learning resources to further related emphasizes learning Scientific Literacy in the category that they appear less on the books analyzed.
3. To those teachers who wish to develop or create teaching materials that form the book should consider the categories of existing scientific literacy so that they appear within the scope of the book has its share of impartial.

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