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2 Content analysis of science material in junior school-based inquiry and science process skills

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Abstract. The purpose of this research is to obtain the characteristic map of science material content in Junior School which can be optimized using inquiry learning model to tone the science process skill. The research method used in the form of qualitative research on SMP science curriculum document in Indonesia. Documents are reviewed on the basis of the basic competencies of each level as well as their potential to trace the skills of the science process using inquiry learning models. The review was conducted by the research team. The results obtained, science process skills in grade 7 have the potential to be trained using the model of inquiry learning by 74%, 8th grade by 83%, and grade 9 by 75%. For the dominant process skills in each chapter and each level is the observing skill. Follow-up research is used to develop instructional inquiry tools to trace the skills of the science process.

1. Introduction

Scientific process skills become an important part of science learning that needs to be trained to students. Science process skills can be learned by students [1,2]. A good mastery of these skills can equip the student to solve the problems of life [22]aces[3]. Conversely, the failure to teach it can cause students to be left behind for independence, the science literacy among students is still low [4]. Learning science without tracing the skill of the process of science, also does not teach the true nature of science.

Science learning consists essentially of 4 components, namely as cognitive dimension, process dimension, product dimension, and human dimension [5]. Each component is a unity that cannot be separated. In fact, science learning is still dominated by certain components. The weak linkage of the three components in learning creates a gap that results in a lack of integrated student skills.

The lack of student ability is also demonstrated by the position of IPA at the PISA level indicating rank 38 of 39 countries. The lack of students' ability is also demonstrated by the position of IPA at the PISA level showing the rank of 38 out of 39. This is inseparable from the low level of science learning so that their ability is still limited considering it has not become everyday behaviour. The learning of science that can create the integrity of students' ability can be pursued through inquiry learning. In the inquiry learning students can find a concept like a scientist [6,7]. Therefore each stage of inquiry automatically trains the [12] of the science process [8,9,10]. It is very necessary to know the relevance of inquiry learning with science process skills in science curriculum in junior high school and then can be developed into learning tools. Teachers who master the skills of the science process are very influential in trained the process skills in students [11].

Inquiry [5] a learning model has a varied syntax from its inventors. There are 5 essentials [3] inquiry learning: Students engage in scientific questions, prioritize evidence to answer the questions,



formulate scientifically oriented explanations, evaluate explanations already made and communicate them scientifically [12]. The basic skills needed to conduct a scientific investigation at the 5-8 level, covering: (1) identify questions that can be answered through scientific inquiry, (2) design and conduct scientific inquiry, (3) use appropriate tools and techniques to collect, analyze and interpret data; (4) develop descriptions, explanations, predictions, and (5) to identify and analyze alternative explanations and predictions, (7) to communicate on scientific procedures and explanations, and (8) to use mathematics in all aspects of the investigation scientific. In a different study, inquiry is laid out in a spectrum of learning [13].

Table 1. A basic hierarchy of inquiry-oriented science teaching practice Resource (Wenning 2011)

Discovery Learning	Interactive Demonstration	Inquiry Lesson	Inquiry Lab	Real-world Application	Hypothetical Inquiry
Low Teacher		Intellectual Sophistication			High Student
		Locus of Control			

Each spectrum has the same stages of observation, manipulation, verification, generalization and application. For each stage it has different weights from each level. The syntax of inquiry study is shown in figure 1.

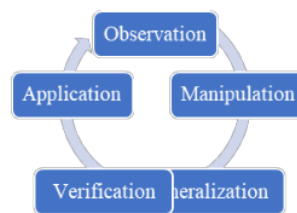


Figure 1. Syntax pembelajaran inquiry by Wenning

At the observation stage, students observe a phenomenon that involves curiosity to be acted upon. The stage of manipulation, students discuss ideas that may be followed up to study the phenomena that have been observed. Here students make plans to carry out various data collection efforts that can be done. Generalization stage, students build a principle or law based on the phenomenon encountered then clarify it with a rational argumentation. Stage verification, students make predictions based on laws and principles that have been built previously. The last stage is the application stage, the students make a conclusion.

Scientific process skills are a series of activities that can be transferrable and applicable to all disciplines [6]. Scientific process skills are divided into 2, namely basic and integrated process skills. Basic science process skills (BSPS) include 6 activities, namely: observing, measuring metrically, classifying, inferring, predicting, and communicating [6,14]. While integrated science process skills (ISPS) include: interpreting data, identifying variables, formulating hypotheses, planning operationally, experiments, formulating models [15]. From the study of inquiry learning and science process skills, it is proposed that the second slice in Figure 2. The purpose of this research is to analyze the material content of science in junior high viewed from the availability of science process skills in inquiry learning.

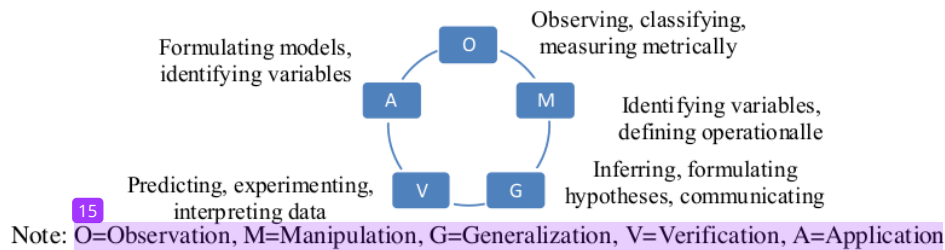


Figure 2. Intersexion of Inquiry Learning and Science Process Skill

2. Methods

This research is a qualitative research, a case study on science curriculum document in junior high school based on revised 2013 curriculum year 2017, teacher book, and student book. The researcher reviewed the document to see the availability of science process skills using an inquiry model in each class and compared with different classes. Every grade analyzed by research team.

3. Results and discussion

3.1. *Content of science materials in junior high school at Curriculum 2013 Revision 2017 based on teacher book and student book*

The content of the science material is shown in Table 2.

Table 2. Science Content in junior high school based on teacher book and student book

7th Grade	8th Grade	9th Grade
1. Objects of Science and Observations	1. Movement of things and creatures in the environment	1. Reproductive System in humans
2. Classification of Objects	2. Force and Aircraft Simple in everyday life	2. Reproduction System in plants and animals
3. Classification of Material and its change	3. Structure and Function of Plants	3. Population and environment
4. Temperature and change	4. Food Digestion System	4. Particle compilers of inanimate and living things
5. Heat and Transfer	5. Additives and addictive substances	5. Electricity and electric power in the environment
6. Energy in living systems	6. The Human Circulatory System	6. Magnetism and its utilization in technology products
7. Organizational systems of life	7. Pressure of substance and its application in daily life	7. Inheritance of nature in humans
8. Interaction of Life and its environment	8. Human Respiratory System	8. Food Biotechnology
9. Environmental Pollution	9. Human excretion system	9. Eco-friendly technology
10. Global warming	10. Vibrations, waves, and sounds in everyday life	10. Land and Life Sustainability
11. The structure of the earth and its dynamics	11. Light and Optical Instruments	
12. The Solar System		

3.2. *The linkage of syntax learning inquiry of science materials and science process skill*

The relevance of the syntax in learning inquiry in tracing the science process skills is shown in Table 3, 4 and 5.

Table 3. The linkage of syntax inquiry and science process skill of 7th grade in Junior School

Basic Competent and Subject Matter	BSI ^{1,3}						ISPS						%	
	1	2	3	4	5	6	a	b	c	d	e	f		
3.1; 4.1 (1. Objects of Science and Observations)														75
3.2;4.2(2. Classification of Objects)														83
3.2;4.2(3. Classification of Material and its Change)														75
3.3;4.3(4. Themperature and Change)														92
3.4;4.4(5. Heat and Transfer)														83
3.5;4.5(6. Energy in Living System)														58
3.6;4.6(7. Organizational System of Life)														75
3.7;4.7(8. Interaction of Life and Enviromental)														75
3.8;4.8(9. Environmental pollution)														75
3.9;4.9(10. Global warming)														66
3.10;4.10(11. The structure of earth and dynamics)														66
3.11; 4.11(12. The Solar System)														75
	Average												75	

Note: 1: Observing, 2: measure metrically, 3: 24 classifying, 4: prediction, 5: inferring, 6: communicating
 a: interpreting data, b: identifying variables, c: formulating hypotheses, d: defining operationally, e: experimenting, f: formulating models

Table 4. The linkage of syntax inquiry and science process skill of 8th grade in Junior School

Basic Competent and Subject Matter	BSI ^{1,3}						ISPS						%	
	1	2	3	4	5	6	a	b	c	d	e	f		
3.1;4.1;3.2;4.2 (1. Movement of things and creatures in the environment)														92
3.3;4.3(2. Force and Aircraft Simple in everyday life)														92
3.4;4.4(3. Structure and function of plants)														83
3.5;4.5(4. Food Digestion System)														
3.6;4.6(5. Additives and addictive substances)														
3.7;4.7(6. The Human Circulatory System)														92
3.8;4.8(7. Pressure of substance and its application in daily life)														92
3.9;4.9(8. Human Respiratory System)														75
3.10;4.10(9. Human excretion system)														75
3.11;4.11(10. Vibrations, waves, and sounds in everyday life)														92
3.12;4.12(11. Light and Optical Instruments)														92
	Rata-rata												83	

Table 5. The linkage of syntax inquiry and science process skill of 9th grade in Junior School

Basic Competent and Subject Matter	BSPS						ISPS						%
	1	2	3	4	5	6	a	b	c	d	e	f	
3.1;4.1(1. Reproductive System in humans)	■	■	■	■	■	■	■	■	■	■	■	■	58
3.2;4.2(2. Reproduction System in plants and animals)	■	■	■	■	■	■	■	■	■	■	■	■	75
3.3;4.3(3. Population and environment)	■	■	■	■	■	■	■	■	■	■	■	■	75
3.4;4.4(4. Particle compilers of inanimate and living things)	■	■	■	■	■	■	■	■	■	■	■	■	58
3.5;4.5(5. Electricity and electric power in the environment)	■	■	■	■	■	■	■	■	■	■	■	■	100
3.6;4.6(6. Magnetism and its utilization in technology products)	■	■	■	■	■	■	■	■	■	■	■	■	100
3.7;4.7(7. Inheritance of nature in humans)	■	■	■	■	■	■	■	■	■	■	■	■	58
3.8;4.8(8. Food Biotechnology)	■	■	■	■	■	■	■	■	■	■	■	■	66
3.9;4.9(9. Eco-friendly technology)	■	■	■	■	■	■	■	■	■	■	■	■	83
3.10;4.10(10. Land and Life Sustainability)	■	■	■	■	■	■	■	■	■	■	■	■	75
													Rata-rata 75

3.3. Discussion

Table 2 shows that the distribution of subject matter in class 7 is higher than in grade 8 and 9. Class 7 is 12 chapters, 8th grade there are 11 chapters, and class 9 there are 10 chapters. Only grade 7 has more chapters than the basic competencies 3 and 4. While for grades 8 and 9 the basic competencies of 3 and 4 are the same as the number of chapters.

In Table 3, there are 12 chapters derived from the 11 basic competencies 3 and 4. There is a total of 74% of the skills that can be trained as a whole, with the smallest percentage in the chapter "Organizational System in Life", Only 58%. Of all the topics of process skills that always exist in each chapter and there is an observation stage (100%) whereas making the model is the smallest potential (30%). For chapters that have the potential to train many of the science process skills are found in the "Heat and Transfer" chapter.

In table 4, the distribution of science subject chapters in junior high school for grade 8 is 11 derived from 12 basic competencies 3 and 4. Process skills can be trained optimally in the chapter "Movement things and creatures in the environment", "Force and Aircraft Simple in Everyday life", "Vibrations, waves, and sounds in everyday life", "Vibrations, waves, and sounds in everyday life", and "Light and optical Instruments", respectively 92%. As for the material that has little potential to trill the skill of the science process is in the chapter "Additives and addictive substances", only 50%. The average potential of science process skills that can be trained through inquiry learning is 83%. For the dominant process skill in each chapter is the observation skill (100%), while the skill of the process that is still minimally trained is to define the operation, only 27%.

In table 5, the distribution of chapters on science subjects in the 9th grade of SMP consists of 10 chapters derived from the 10 basic competencies 3 and 4. Based on the percentage, the chapter "Electricity and electric power in the environment" and chapter "Magnetism and its utilization in technology Products" has a great potential (100%) to be able to trace the skills of the science process. While the smallest potential is in the chapter "Particle compilers of inanimate and living things" and "Inheritance of nature in humans", by 58%. The average potential of science process skills trained using inquiry learning is 75%. For dominant science process skills at each stage and each chapter is a observational skill (100%), while the least is the formulating model (20%). For basic science process skills dominate all chapters at all levels (100%) while integrated process skills vary depending on their basic competencies.

The results of this study enrich previous research that the basic science process skills are more dominant than the integrated science process skills on the SMP science level curriculum [16,17]. From

14 results of the research for further research can be further to develop learning tools that can enhance the skills of the science process based 14 the potential its. In addition, this result can also be followed up by examining the existence of teacher books and student books issued by the Indonesian government education department on the availability of trained science process skills.

4. Conclusion

2 Inquiry learning in general has great potential to trained the skills of the science process. The easiest skill of the science process to be trained is observing skill while the least to trained is a skill in defining operations and modelling. The dominant process skills to be trained in all chapters and all levels of science subjects junior high in the 2013 curriculum. Revision 2017 is a basic science process skill including observing, measuring, classifying, predicting, concluding and communicating.

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