STUDENT'S SCIENCE LITERACY IN THE ASPECT OF CONTENT SCIENCE?

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ABSTRACT

The fundamental issue is the growing use of scientific information possessed by students to solve problems in daily lives and can produce useful scientific sourced from scientific literacy. The purpose of the research is to analyze and describe the ability of a student science concepts from the aspect of scientific literacy that includes aspects of scientific knowledge, scientific competence, scientific context as well as the factors that influence the students' science literacy skills. Design of this research is quantitative descriptive analysis. The instrument used is a matter of objective 40 along with the reasons of the concepts of physics and biology concepts that are used to measure aspects of scientific knowledge, scientific competence and scientific context, while the students' attitudes towards science and science teaching and learning strategies measured by questionnaire instrument. Measuring instruments used include multiple-choice test questions reasoned and questionnaires (the attitude of science and science teaching and learning strategies). Based on data analysis known that the ability of science literacy PGSD UMK students varies, 66.2% of students at the level of nominal and 33.8% of the students are at the functional level. It shows that 66.2% of students already have a concept for connecting science with other disciplines, can write a scientific term, but students still have misconceptions or misconceptions, while 33.8% of students considering the theory and explain concepts correctly, but has a limited understanding and difficult to connect between the concept of his own opinion.

Keywords: Science literacy; skill; content aspect

INTRODUCTION

Every individual needs to determine option or decision based on his scientific information to solve daily life problems and to produce beneficial scientific product which has source from science literacy. Science literacy is one of science education's target (Hoolbrook & Rannikmae, 2009). Norris & Philips (2003) found that one of the main purposes is to establish scientific literate society. Scientific literacy consists of knowledge and understanding of scientific concepts and scientific process that needed someone in decision making, cultural and economic productivity (Dani, 2009).

Futhermore, scientific literacy can be promoted by solving someone in personal and social problems (Lederman et al, 2013). Therefore, its development on every individual is extremely important.

Each individual is demanded to have scientific literacy covers its scientific knowledge, science skill process and scientific attitude. Scientific literate society will be able to use scientific knowledge, identify questions, and draw a conclusion based on the evidence, in accordance to understand as well as to create decision related to nature and its changes done

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towards nature through human activities. By this, scientific literacy development is important. Every individual is obligated to have scientific literacy covers scientific knowledge, scientific skill process and scientific attitude. Scientific literate society is able to use scientific knowledge, identify questions, and draw a conclusion based on the evidence, in accordance to understand as well as to generate decision related to the nature and its changes done to nature through human activities.

Laugsch (2000) suggested that the development of scientific literacy is very important because it can contribute to the social and economic life, as well as to improve decision making at the community level and personal. In can be strengthened with Poedjiadi statement (2005) that an individual has scientific literacy ability and technology is an eligible person to solve problems by using scientific concepts gained in education based on his level, recognizing product of technology around him, and its positive impact, or the use of the product and its maintenance, creative in creating simplified product technology so his learners are able to decide based on local values and custom.

PISA-OECD (Program for International Student Assessment-Organization for Economic Cooperation and Development) in 2006 has measured scientific literacy that shows low level of Indonesia, 29% for the content, 34% for process, 32% for context (Balitbang Kemdikbud, 2011). Its low level is caused by the understanding about science learning which leads students to incomplete science literacy formation of the students understood by the teachers. In the aspect of content, it is caused by science learning process which still emphasizes on memorizing aspect, so the students do not understand what they learn but only its memorization (Jufri, 2013). This low scientific literacy on learning process aspect is focused on the teachers (Ekohariadi, 2009). The student's activity is only listening and nothing teacher's explanation, then students learn science as products instead of process, attitudes and applications. The next aspect is on contextual aspect, teachers are not fully connecting the material with the student's surrounding (Tjalla, 2009). Whereas, phases of teaching and learning in scientific literacy according to Holbrook (2011), are includes contact phase, curiocity, ellaboration, decision making and recontextual. In addition, according to Rubini et al' (2016) The problem about the low scientific literacy abilities of students can not only be solved by applying the model/method/strategy of science learning based on constructivism. The classroom environment and climate is an important component to the students' literacy skills. Likewise, the school infrastructure, human resources, organization and management bring a very significant influence to students' achievement literacy. Other factors affecting the ability of students' scientific literacy is teacher. Therefore, it is need scientific literacy measurement to figure out its improvement of human source quality especially the students of primary educational department as candidate of primary teachers.

The measurement is important to figure out its improvement on human source quality of the students as teacher candidate. The expectation on the students is to create innovative learning and support scientific literacy, so the next generation (primary educational students) will have higher competitive power. It is based on the field reality and becomes demand to promote learning process activity. The initial learning which focused on knowledge needs to move on holistic learning based on skills, attitudes, and literacy to solve various problems. Through this, the students must be capable

to deal with the way of teaching science appropriately. This is according with the opinion of Putra et al' (2016) which revealed that learning science should equip prospective teachers with professional knowledge.

Focused problem in the research is How the scientific literacy skill distribution of the students seen from nominal, conceptual, functional and multidimensional levels and what factors affect scientific literacy skills of the students?. The purpose of the research is to find out the distribution of the students seen from nominal, functional, conceptual and multidimensional levels as well as to investigate and describe affective factors on the primary educational students' scientific literacy skills.

METHOD

The study was conducted on even semester. The subjects are the 4th semester of primary educational students of Universitas Muria Kudus. The samples take are done through Slovin calculation formula and is gained 77 sample of number the students in science application course. Samples are taken to represent all the students who have earned a course concept of science (in the previous semesters) with a sampling distribution in Table 1.

Table 1. The distribution and the Number of the Research Sample

Number	Criteria	Number of the students
1.	The A – score gaining students	17 students
2.	The AB – score gaining students	25 students
3.	The B – score gaining students	25 students
4.	The $\leq$ BC – score gaining students.	10 studnets
	Total	77 students

In the research, the researcher uses descriptive quantitative method. It is a quantitative since the approach used in this proposal, process, hypothesis, action field, data analysis and data conclusion until its report use measurement, calculation, formula, and numerical absolute data aspects (Ginting, 2008). On this research, the researcher does not do any special treatment toward sample used so no control group is needed nor experimental group.

The instruments used to gain the data covers; questionnaire and questionnaire test to measure the student's attitude toward science and to find out its learning strategy of learning and teaching science appropriately. The questionnaire has three options, such as agree (S), doubt (R) and disagree (TS) then is converted into Likert scale. Meanwhile questionnaire test has 40 multiple choices and is attached with reasons encompass scientific content, scientific competency and scientific context aspects.

After taking the data, the test toward the data is conducted. The data gained is quantitative in the form of score of scientific literacy mastery, students' attitudes and the expected teaching and learning in science to support scientific literacy. The quantitative and qualitative data will be analyzed descriptively to find out the data intention or the findings will be used to draw conclusion. And this correlative testing is used to find out the correlation between scientific literacy with response questionnaire filled by the students. To calculate it is used correlative product formula moment from Karl Pearson.

RESULTS AND DISCUSSION

1. Analysis Capabilities Literacy Science Students

The ability of scientific literacy of students from of primary educational teacher department is measured by the test instrument and the non-test. The test instrument includes 40 questions objectively accompanied by arguments about the concepts of physics and biology concepts that are used to measure aspects of scientific knowledge, scientific competence and scientific context. Score test results for scientific literacy abilities of students in Table 2.

Table 2. Recapitulation of scientific literacy score of the students

High Score	54
Low Score	21
Average score	36
Scientific Literacy Level	66.2% students are in nominal level 33.8% students are in functional level

Table 3. Recapitulation of the measurement results based on indicators of competence of science

Indicators	Number of Task	Average
1. Identifying scientific issues	1.4. 7. 9.13.17.21.2 3.24.30. 33.37.38	39.8
2. Explaining phenomena scientifically	2.5.10.14.16 .19.20.22.25 .27. 34.35.39.40	34.4
3. Utilizing scientific evidence	3.6.8.11.12. 15.18.26.28. 29.31. 32. 36	35.5

Table 4. Measurement recapitulation based on scientific context indicators

Indicators	Number of Task	Average
1. Health	1. 9. 12. 13.18.22. 30.32.37	38.4
2. Natural resources	4.7.19. 24. 25. 27. 36	32.3
3. Environment	2.8.5.11.23.3 1.33.34	28.2
4. Disasters	10.14. 16. 20. 28. 35. 38.39	42. 0
5. Science and technology	3.6.15.17.21. 26.29.40	38.3

This it is gained that 66.2% students are in nominal level while 33.8% of them are in functional level. Based on this data – known that basically the students have obtained concept to relate science with other discipline; they are able to write a scientific term but still have misconceptions or mistake on the concept, meanwhile 33.8% of the students remember the theory and explain the concept correctly, but they have limited understanding and difficulties to relate the concept into their personal answers.

This low level of the literacy is affected by various factors, such as internal and external. One of the most affective factors is students' educational background before enrolling the university. Not all of the students of primary educational department are from science course major background. This input is from various majors, such as society, science, language, technique, economy, accountant and clothing, so their level to master the concept of science may vary. It is relevant to the research done by Ekohariadi (2009) states that one of the factors affecting scientific literacy is educational background. It also goes for educational background directly, experienced and educated parents will motivate and guide their children well. Plus,

one of the affecting natures to change is its reflection in the changing of opinion, perception, affection and action – that is intelligence factor (Baron & Byrne, 1991). Therefore, the students from science major background clearly have better scientific skills than the non-science majored students. But this can not be ignored in a sustainable manner. According Jufri et al' (2016) in his study explains that if the reason ability low student teacher, then of course it will be closely linked and their patterns of teaching if one day become a teacher is low, so it will be closely linked their patterns of teaching if one day become a teacher. Therefore, in order to develop students' ability to prospective teachers, teaching and learning process in the faculty should be directed to provide students to have the skills of scientific reasoning to support scientific literacy.

The scientific literacy score results can be analyzed on every aspect to analyze their skills in detail. The recapitulation of scientific competence aspect (table 3), known that the better average score is on identifying scientific issue, meanwhile its lowest score is in explaining phenomena scientifically. Based on the result, it is known that basically the students have fair theoretical ability or scientific concept, able to identify or determine a problem but still have difficulties to explain the phenomena or problems well. Based on the nominal and functional level, it is said that the students basically have theory but still have misconception and cannot relate between concept and their answers (Bybee, 2009). It can be seen during the learning. When they are given a problem, basically they are able to mention and identify its root of problem but still difficult to analyze complexly by relating various concepts or seen from other disciplines.

One of the most affective factors is lack access and literacy of the students, one of them is learning source. The students do not have science concept book. They only have *handout* from the lecturers although the lecturers have asked them to have books related to the materials for University level. However, some of them admit to have difficulties while learning the books because most science concept literacy provided in library are translation and some of them are still in English.

The recapitulation of scientific literacy skills of the students based on aspects of science, known that the indicators of health, natural resources and technology science have nearly equal average scores, but there is a gap on indicators of environment and disaster. The highest average score in the indicator of disaster is 42%, meanwhile it lowest average score is 28.2%. This low indicator of analyzing of environment and social issues is causing the low level scientific literacy's students. Marks & Ingo (2009) said that the factor can develop scientific literacy skills is sociocritical-oriented issues to identify, analyze and relate the issue of environment. Moreover, skill of scientific literacy can increase by making decision of science technology and environment issues (Yuenyong&Pattawan, 2009). Therefore, the students have not skills to analyze in solving the problems about environment, so the results of scientific literacy's score is not well.

The indicator of disaster has highest score due to the students are able to identify issue and explain various disaster covered scientific concept related to disaster, its affective factors, and its impacts. However, the students yet cannot analyze and relate the issue of environment into various concept and other disciplines. It is caused because issue of environment involves very complex concept and theory. Students can understand environments issues if the students interest to read any literature. But,

students uninterested to read any literature, except the books from the lecture. Students have homework to resume and analyze some problem and must be related from any literature. 68% students did not understand content of material that they wrote, moreover the literature in English language. Therefore, Jurecki & Matthew (2012) said that to improve the scientific literacy, students must have ability to review any literature critically and scientifically.

Basically the lecturers have applied cross theme learning that is relating among science, environment, technology and society. But, the students have been able to have integrated thought, but still fragmented in a problem. It is caused by many factors, one of them is intelligence. The students from science background averagely can answer well since they have the concept of science, meanwhile the students from other educational background have difficulties to explain the concept since they admit they have difficulties to keep up with the course in detail and the last learning time for them was in Senior High School in tenth grade. Based on Treacy & Melissa (2011) states that the communicative scientific improvement gained through reading, writing, and reviewing journal can improve scientific literacy. In other hand, its initial level of scientific literacy is affected by many factors, such as individual knowledge, speaking ability, economical status, educational level and history of the family (Heath *et al*, 2014). Scientifically and technically, the affective factors of an individual literacy is intellectual capacity, in this case the reasoning level, attitude, social nature and ability of relating multi disciplines (Holbrook & Rannikmae, 2009).

2. The Students' Attitude Questionnaire Analysis

The questionnaire and its learning strategy upon 67 questions represent 4 indicators on aspect of attitude and 4 indicators of teaching and learning strategy aspect. The questionnaire consists of positive and negative statement. Then the score taken from the students are correlated into scientific literacy skill to find out its relationship between scientific literacy with the students' attitude toward science and its teaching and learning strategy. Its recapitulation and scientific literacy with the questionnaire score on Table 5.

Table 5. The Recapitulation of Scientific Literacy and Scientific Attitude Relationship

No	Indicator	Amount	Large correlation value
1	Questionnaire attitude	15515	0.37%
2	Students' attitudes towards science	4348	13.3%
3	Learning strategies and teaching science	9065	-8.2%
4	Supports scientific investigations	682	-0.52%
5	Confidence	1136	2.95%
6	Interest in science	1229	22.44%
7	Responsibility towards natural resources and the environment	1301	14.3%
8	Submission of materials	3617	-2.22%
9	Learning model	2428	8.46%
10	Participation	1816	-6.15%
11	Evaluation	1204	-13.92%

Based on the table 5, known that the students have interest on science. It is proved from responsive questionnaire states that its overall achievement average score is 86.68 or in the category of very good. The next is, responsive questionnaire score is correlated with scientific literacy skills of the students.

The analysis shows that the students have interest toward science. It is proved from the responsive questionnaire states that the overall average score of the students is 86.68 or is in very well. The questionnaire is correlated into scientific literacy skills, and gains score 0.37. The responsive questionnaire attitude consists of two variables that is student attitude toward science and its learning and teaching strategy. The average scores of the student's attitude variable toward science is 85.56. If the result is correlated with scientific literacy skills - the result is 0.1333. It means 13.3% of the ability is affected by students' attitudes towards science, meanwhile 86.7% affected by other factors and can be concluded that there is positive relationship between students' attitudes towards science with the skills. The reasonable action theory states that the attitude effect nature through process of carefully taking decision and reasonable (Ajzen & Fishbein, 1980 in Brhen, and Kassin, 1990). Attitudes consist of components of cognitive, affective and conative (Azwar, 2010). One of the most affective factor of low scientific literacy skills is the students' attitude toward science (Ekohariadi, 2009).

The second variable is teaching and learning strategy. Its average score is 87.23. If the result is correlated with score of scientific literacy skill achievement, the score is -0.082. The result means that a negative relationship is between teaching and learning strategy and the skills. Thus, teaching and learning strategy does not significantly affect the skills of the students.

The learning concept of science is not always done in the class through various learning strategy but the most important is learning to get skills, both from cognitive, affective or psychomotor.

The result of science concept scoring is affected by the learning model used by the lecturers. If the result is correlated with scientific literacy skill score, is gained 0.0846 so that the learning model affected the skills. Based on the result, 8.46% scientific literacy skills are affected by learning model used. Widiyanti et al' (2015) states that scientific literacy-based learning set can make students to be more active so they can improve their learning outcomes. And Gormally, et al (2009) investigated and gained result that shows students centered learning pattern will promote students' scientific literacy skills. Based on the questionnaire, the learning model demanded by students are experimental model, outdoor learning, cooperative learning, cross theme learning, and any other innovative learning model. Surpless, et al' study (2014) show that laboratory based learning can increase students' scientific literacy. Moreover, laboratory and inquiry based learning can promote scientific literacy (Gormally, et al, 2009; Forbes & Zint, 2011).

Moreover, the results of data analyzed show that self confidence is positive correlated with students' scientific literacy (2.95%) and interesting students in science correlate in scientific literacy (22.44%). It is caused students with science course have positive confidence in science and have self-confidence answer the questions. Holden (2012) said that self-confidence influence scientific literacy.

CONCLUSION

Based on the results showed that science literacy skills 66.2% of the student of Primary Educational Faculty of

Universitas Muria Kudus at the level of nominal and 33.8% of students at the level of functional. It shows that 66.2% of students already have a concept for connecting science with other disciplines, can write a scientific term, but students still have misconceptions or misconceptions, while 33.8% of students considering the theory and explain concepts correctly, but has a limited understanding and difficult to connect between the concept of his own opinion. The attitudes of the students toward science has positive correlation towards scientific literacy skills, while teaching and learning strategy negatively correlates toward the skills. 13.3% of the skills is affected by the attitudes of the students, while 86.7% is affected by other factors.
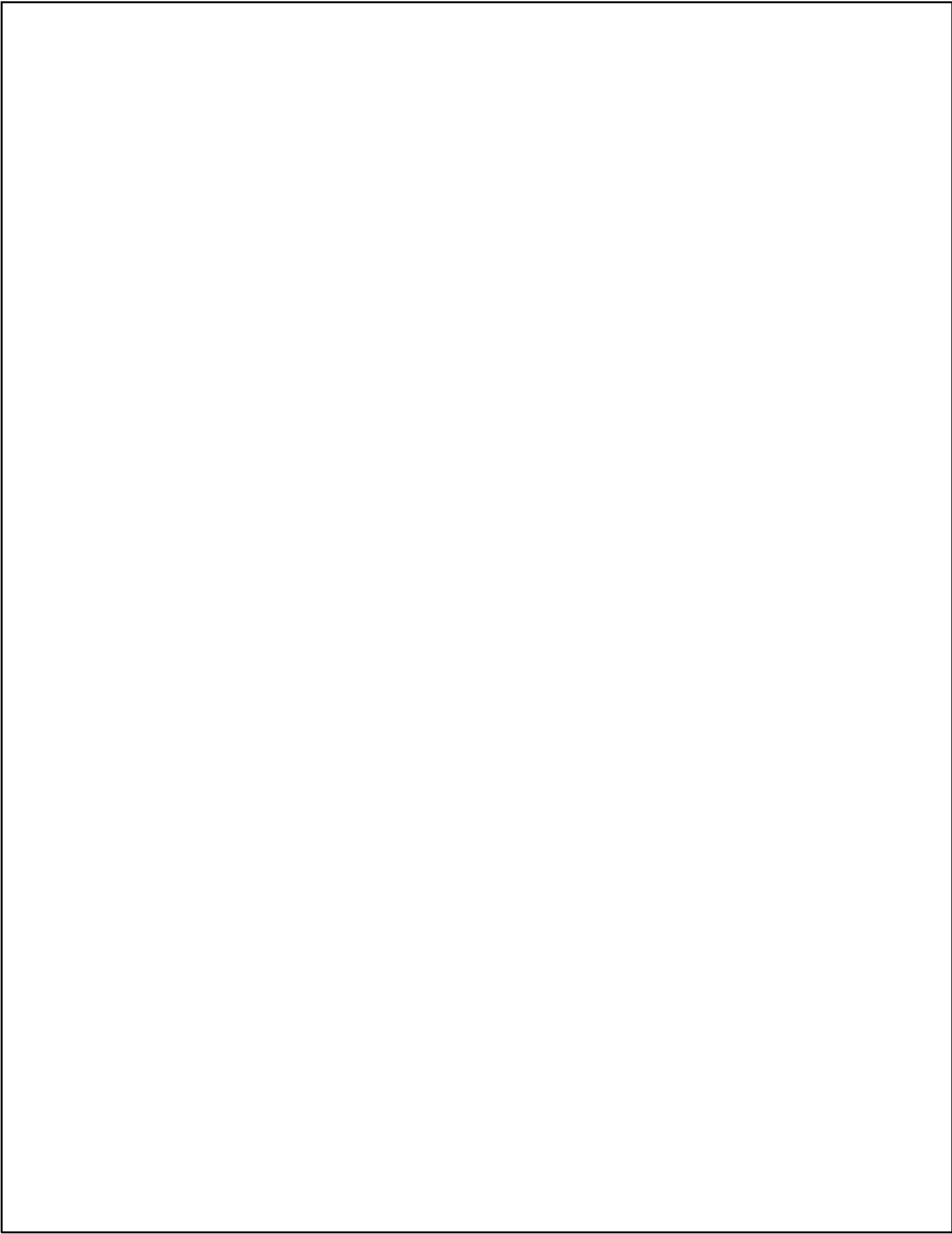
Based on the discussions and findings of the lecturer should provide instructional materials science concepts that can develop the skills of students and conducting scientific literacy learning skills of students can explore both aspects of cognitive, affective and psychomotor. While students are able to access various sources of literature and information, not only from lecturer and students must practice explore a higher order thinking skills.

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