JPII 4 (1) (2015) 86-89

Jurnal Pendidikan IPA Indonesia
Indonesian Journal of Science Education

http://journal.unnes.ac.id/nju/index.php/jpii

THE PROFILE OF ARGUMENTATION SKILL USING "*TOULMIN ARGUMENTATION PATTERN*" ANALYSIS IN THE ARCHIMEDES PRINCIPAL ON THE STUDENTS OF SMA KOTA BANDAR LAMPUNG

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DOI: 10.15294/jpii.v4i1.3506

Accepted: 15 January 2015. Approved: 3 April 2015. Published: April 2015

ABSTRACT

This research aims to indentify student's argumentation skill which is seen from argumentation discourse and then it is analyzed using *TAP (Toulmin Argumentation Pattern)* which consists of some components such as data, claim, warrant, backing and rebuttal on the topic of Archimedes Principle. The method used in this research is descriptive method. The result of this research shows based on the written assignment, the student's scientific argumentation skill is not good. The student often do not use an appropriate argumentation, do not use adequate evidence, or try to straighten their own option or try to apply their own argument.

Keywords: Argumentation Skill; Toulmin Argumentation Pattern "TAP"; Archimedes Principle.

INTRODUCTION

Physics is a mean to foster a useful thinking ability which can be used to solve an everyday life problems and it also a mean to equip a student with knowledge, understanding, and other skills required to enter a higher educational level also a mean to develop science and technology. It also cannot be separated from an activity to examine a nature phenomenon and then to interpret the research result and finally to communicate the final result. Therefore, it is a teacher's priority to excavate the student understanding based on some scientific ideas, to develop the student ability in making an excuse, to examine the excuse, to approve of a conviction, and to develop the student skill as a team work.

Unfortunately, many physics lesson are dominated conceptually. This thing is happened not only because of the teacher's option but of the educational system which prioritized the *ontology* rather than the *epistemology.* In addition, the education institution such as junior high school, senior high school, and vocational high school has not trained their students yet in order to have an argumentation skill. The insufficient skill in arguing is an effect of the teacher's mind set that the student is an empty bottle who is ready to fill with many concepts. This is an example of a learning environment that holds the student to increase his argumentation skill.

The argumentation skill becomes a mean to recover the physics educational aims. In science (Physics), Kuhn (1993) states that argumentation has a central role in the scientific thinking because it is a scientific way to communicate an empirical and causal explanation. The education experts believe that the point of the way to think scientifically is how they are able to present evidence as a basic argumentation skill. In education, argumentation is used often to inform,, to persuade, and to strengthen something to other people. Argumentation is a logic strategy appearing in a domain of informal and critical logical thinking. It is a *prominent* field in the science edu-

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cation community (Jiménez-Aleixandre & Erduran, 2008).

Eemeren, Houtlosser, dan Henkemans (2007) identify four characteristics of argumentation. (1) Argumentation is a verbal activity normally built by the local language. (2) Argumentation is a social activity which principally directs other people. (3) Argumentation is a logical activity which indicates some consideration about an object. (4) Argumentation relates to the opinion or *standpoint* about a specific object. The scientific explanation in argumentation is a skill which the student must have because it is an important skill in order to become a professional scientist. The need to educate the student and the society on how to figure out and why we have believe on the need which focus on (1) how the evidence used in science can build a scientific explanation (2) which characteristic used in science is used to evaluate the selection of an evidence and to make an argument (Duschl & Osborne, 2002). The argumentation activity is rarely found in a science class even though the research in this case is developed.

The Archimedes Principle is one of the Fluids material discussing about varies of the things condition in a stay Fluids (floating, sinking, and drifting) emphasizing on the nature phenomenon and its measurement with the wider abstract concept. The problem of floating, sinking, and drifting often is seen as the case on how to use an equation formula without knowing that the formula appears because of the investigation of the phenomenon happened in fluids. So, this thing only focuses on the mathematic calculation and ignores the characteristic of fluids material itself and the scientific explanation activity. According to the syllabus, this material is integrated with laboratory work and supported with a discussion of the requirements of floating, sinking, and drifting by applying the buoyed energy. Then, it is continued with the discussion of Archimedes Law implemented in the daily life such as ship, submarine, shipyard, hydrometer, and air balloon.

According to Berland (2008), he states that science is the way to get knowledge by reviewing the nature phenomenon and then composing an interpretation of the research finding, after that presenting or communicating the result finding. Those coordination stages illustrate the result of empirical evidence of the nature phenomenon from the confronted theory.

In order to explain the scientific findings, the student must have the argumentation skill because it can improve or decrease the audiences and the readers' acceptability about the controversial *standpoint*. Based on the fact, it is known that the student's argumentation skill in learning physics has not developed well because they lack of encouragement in expressing their opinion and the teacher often dominates the discussion class. The awareness of education experts on how the scientific thinking is important increases when the conviction on how the student can explain the evidence as the basic argument or claim which is related to the facts through a premise also increases (Driver, Newton and Osborne, 2000; Emeeren, Houtlosser and Henkemans, 2007).

Realizing the argumentation skill on physics especially Fluids material is important so identification on the students' argumentation skill needs to be done in order to promote the three theoretical frameworks which underlie the research of argumentation in the science education. The first framework, the scientists involve the argumentation to develop and increase the knowledge (Lawson, 2003; Aufschnaiter *et al.*, 2007). The second framework, people must use argumentation to get involved in scientific argumentation (Simon *et al.,* 2003; Aufschnaiter *et al.*, 2007). The third framework, in the science learning process argumentation is needed (Osborn, Erduran & Simon, 2004; Aufschnaiter *et al.*, 2007). Erduran and Simon (2004) find that there are two frameworks which is used to the research of argumentation in the science learning, they are the frameworks which review the importance of discourse argumentation in a construction process of scientific knowledge and its consequences in education field.

According to the explanation above, a preliminary research was done in order to identify the students' argumentation skill reviewed from the argumentation discourse and analyzed it using *TAP (Toulmin Argumentation Pattern)* which consists of *data, claim, warrant, backing* and *rebuttal* in topic of the Archimedes Principal.

METHOD

The method used in this research is a descriptive method. It is used to identify the students' argumentation skill. A developed instrument in this research aims to identify the students' argumentation skill in the topic of Archimedes Principle of the students of SMA Bandarlampung. *Toulmin Argumentation Pattern (TAP)* including its components such as*, claim, warrant, backing* and *rebuttal* is used to analyze the argumentation skill. Driver, Newton and Osborne (2000) explain those components as follows: *Claim* is the values that

are maintained by people or what is exist; *Data* is the statement which is used as the evidence to support the *claim; Warrant* is the statement which is used to explain the relation between *data* and *claim; Backing* is the basic assumption, is often explained implicitly; *Rebuttal* (disclaimer): is the statement opposed to the data. Generally, TAP model is investigated as an informal measurement to analyze an everyday reasoning about the social issues, in this case is Archimedes Principle. The argumentation instrument was given to 30 students and the answer is analyzed by the TAP analysis.

RESULT AND DISCUSSION

The preliminary research in this research identified every argumentation skill that the students have by answering the instrument containing the quality components of the students' argumentation skill which classified based on argumentation *Level* modified from the argumentation analysis framework proposed by Erduran and Simon (2004), they are (1) *Level 0*, if the argumentation only contains *claim*; (2) *Level 1,* if the argument is a simple *claim* and opposed *claim;* (3) *Level 2,* if the argument is *claim* along with *data, counter claim* which has a data, assurance or endorsement but has no disclaimer; (4) *Level 3*, if the argument contains a series of *claim* or *counter* with a data, has an assurance or endorsement with a weak disclaimer occasionally; (5) *Level 4,* if the argument contains *claim* accompanied with one disclaimer which can be identified clearly and precisely, one argument can contain some *claims* or *counter claim;* (6) *Level 5*, if the argumentation is extensive (*extended,* but still relates to the learning material) with more than one precise and clear disclaimer.

The identification process in identifying the students' argumentation skill was done through several steps: (1) giving a problem to investigate "You are in a raft, stranded and floated in the middle of the ocean. Your stuffs are treasures full of gold founded before the ship is sinking, and your raft is about to sink. To make you floating higher, what should you do (a) left the treasure box above the raft, (b) tight the treasure box under the raft, (c) tight the treasure box with the rope connected to the raft? (Assume that you do not want to throw away the treasure box from the raft). This kind of problem is one of several given problem in order to identify the students' argumentation skill in Archimedes Principle.

This preliminary research was gathering the students' response in a written form to answer every problem presented in the Archimedes Principle topic material. The summary of the students' responses showed the level of the components of the argumentation skill was presented as follows: the information was presented to the students directly; it means that they do not have to code the problem so they can start to make physics description. Implementing the *Toulmin* category and the argumentation structure to the Archimedes Principle can get the whole solution to solve the problem by using pictures and explaining those pictures to support the solution. The students start identifying the three cases asked to be solved, such as (b) tight the treasure box under the raft, (c) tight the treasure box with the rope connected to the raft, in this case the treasure box was giving energy under the raft that made it went down to the ocean. It can be understood that, because the given problem is the part of identification process of argumentation skill to dig the preliminary knowledge and to encourage the students' desire in solving the problem.

Step 2: Reviewing and correcting the answer proposed in the first step. The students were collecting and analyzing the data through some book references, such as Physics module or handout, scientific journal or article relates to Archimedes Principle, the students were allowed to access other references taken from the internet. The data achieved from some references is used to answer the argumentative questions especially those that have not been answered well.

Step 3: Developing a temporary argument which determined based on the given assignment. The temporary argument was written in the students' worksheet. The developed argument relates to the main question "You are in a raft, stranded and floated in the middle of the ocean. Your stuffs are treasures full of gold founded before the ship is sinking, and your raft is about to sink. To make you floating higher, what should you do (a) left the treasure box above the raft, (b) tight the treasure box under the raft, (c) tight the treasure box with the rope connected to the raft? (Assume that you do not want to throw away the treasure box from the raft). Every argument proposed by the students is written to the worksheet. The argumentation session was ended by searching the additional data taken from simple laboratory work of the floating phenomenon individually. This additional data was used to answer which argumentation is correct and to investigate the reason why it is correct. Generally, the argumentation skill frequency appearing in every step is shown in the following Table 1.

Table 1. Frequency of Argumentation

Argumentation Components	*Data*	*Warrant*	*Backing*	*Rebuttal*	*Claim*
	55%	5%	0%	0%	40%

According to the table 1 above, the data component and claim that have higher frequency than the other three components such as *warrant, backing, rebuttal*, were written by the students to solve the given problem because they were not accustomed using their argument to solve the physics problem and were not having much knowledge about argumentation components. The students were accustomed to solve the physics problem mathematically so it is difficult for them to give the explanation based on the mathematic calculation. They have not realized that building a new skill is more important than using the skill that they already have

The result of this research relates to the research finding conducted by Manurung (2012) that is "the students often were not evaluating the validity or the acceptance explanation to the phenomenon precisely. The research showed that the students were not using consistence criteria based on the standardized scientific community to determine the idea of accepting, refusing, modifying (Hogan & Maglienti, 2001) and distorting, underestimating, or ignoring the evidence in order to restate the incorrect concept (Kuhn, 1993). On the contrary, Farida dan Gusniarti's argumentative research (2014) showed an excellent result. The quality of the students' written argumentative was spread from the first quality to the *level* 3 and was spread dominantly in the *level* 2. The students' verbal argumentative achievement was comparable that is dominantly in the *level* 2 and 5.

CONCLUSION

The students' in giving the scientific argumentation were not good, it can be seen from their written assignment. The data and claim component, written by the students to solve the problem, have higher frequency than the other three components such as *warrant, backing,* and *rebuttal.* This research shows that the students often were not giving an appropriate argumentation and sufficient evidence, or were trying to corroborate their own opinion or to straighten the evidence to their argumentation. Zohar & Nemet (2002) in Manurung (2012) states that the argumentation quality is depended on the assignment features, the students' personal interpretation, the way to present the assignment, and sometime it relates to the misconception, intuition, personal or general experience.

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