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AN ANALYSIS OF STUDENTS' SKILL IN APPLYING THE PROBLEM SOLVING STRATEGY TO THE PHYSICS PROBLEM SETTLEMENT IN FACING AEC AS GLOBAL COMPETITION

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ABSTRACT

The results of previous studies show that students of Physics Education (S1 and S2), FKIP Syiah Kuala University more than 50% do not understand the programs and roadmap of Pilar ASEAN Socio-Cultural Community as a part of the ASEAN Economic Community (AEC). The inference of those results to the implementation of learning physics and science education system needs to be implemented through a link and match learning model that can improve the ability to think critically and creatively, and students need to be trained to be problem solvers, not the problem makers.Based on these problems, through this research has been applied physics learning by using Problem Solving strategies on 25 students of Master of Physical Education and Science. At the end of the implementation study measured the ability of students to apply problem-solving strategies in accordance with Answer Sections of Problem Solving adopted from previous research. The results showed that the majority of students (78%) are able to implement the stage I (Focus on Problem) with a complete, almost all respondents (91%) was only able to implement the stage II (Describe the Physics) of about 40%, almost all respondents (91%) can apply for the stage III (Plan The Solution) approximately 80% of all respondents have been able to implement the stage IV (Excute the Plan) perfectly, and all respondents have been able to apply the stage V (Evaluate the Answer) completely. It is expected that all staff of teaching Science materials (Physics), they are recommended strongly to implement Problem Solving as an alternative strategy for preparing students to face global competition in the ASEAN Economic Community (AEC).

Keywords: ASEAN Economic Problem Solving, Physics Education, Science Lesson

INTRODUCTION

The Society of Southeast Asian countries formed an organization in Bangkok on August 8, 1967, known as ASEAN. The main objective of thisinstitution is to create and maintain the security and peace in the region of Malaysia, Indonesia, Thailand, Singapore, and the Philippines. After 30 years later, or rather the establishment of ASEAN in 1997 goalsincerased to the economic sectors and social life, so in the end they come to an agreement to establish the ASEAN Economic Community (Hakim, 2013). The members of ASEAN Economic Community or shortened by the AECin 2003 in Bali, Indonesia had built the three main pillars, namely (i) the AEC (ASEAN Economic Community), (ii) the ASEAN Security Community and (iii) the ASEAN Socio-cultural Community (Arifin, 2007; 2008).

Roadmad pillar of Socio-Cultural Community (SCC) included in the educational, social and religious. Supposedly every learner, whether at low, medium and higher education levels must understand well what are Roadmad of the pillars of the ASEAN Socio-cultural Community (Halim et al., 2015). The main objective of the

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pillars are forming Human Resources (HR) in the ASEAN region to compete in the Southeast Asian region and also within the scope of International broadly. Therefore, for the success of the SCC ASEAN pillars implementation, at the higher level education learning model to adopt the link system and match through the learning model based on the ability to think critically and creatively, and students need to be trained to be problem solvers, not to be problem makers (Zamrozi, 2000; Wangke, 2014).

Problem Solving is one of the strategies to not only filled with a load of knowledge (Cognitive Load) (Sweller, 1988), but also regarding the technical or procedural (Bagno, 1997), and has a strong correlation with the leraners' structure of knowledge (Toth, 2009). In other words, learning activities Problem Solving strategies include cognitive and psychomotor domains (Frederiksen, 1984), as well as the realm of attitudes (Caballero et al, 2011). Some research indicates that through the implementation of strategies Troubleshooting formed two models of problem solving, the model expert (expert performance) and a model beginner (novice performance) (Larkin et al, 1980, 1980a; Schoenfeld, 1982; Kook, 1991). Besides, some of the results also showed that the implementation of Resolution Issues strategy is better done in a group than individuals (Heller et al, 1991),It needs cognitive skills, metacognitive skills, and motivational skills (Mayer, 1998), and can be developed representative metal (Savelsbergh, 1998). However, in the implementation of the Problem Solving strategy the solver intuitive are still affect both at the strategy starters stage (diSessa, 1993), or at the strategy undertaken stage done by experts (Sherin, 2005).

Despite the problems faced by the students in social life and culture is more complex, real-time, and various, it turns out that the students who have been trained and familiar with the strategy Problems Solving for physics problems in open-ended and unstructured forms (ill-structured) can easily be solved (Ogive, 2009). Results of other studies also show that students who have been trained to solve the problem of non-routine forms by multi-solution method is better than the students who are trained in methods of single-solution (Lee et al, 2014; Bahar, 2015).Two of the latest research results as well as some previous research results give a strong recommendation that any problems that would be faced by the students in social and cultural life (Socio-culture Community), either in the form of close-ended (well-structured) or open-ended (ill- structured) will be resolved easily by the students who have been trained and are familiar with problem solving strategies.

There are some attempts have been made in the higher education to face the global competition in the ASEAN Economic Community (AEC). Among the efforts to prevent the collapse of the culture and language through the preservation of local literature in the form of teaching materials (Sultoni, 2015), setting up of IT human resources with Scientific approach (Sholikha, 2015), to prepare the students to be entrepreneurial through the development of learning materials based on Life Skill (Khoiri et.al ., 2011), to prepare the teachers who are able to compete and anti-corruption to include subjects of anti-Corruption in the syllabus LPTK (Murdani, 2014), and create a generation that mastered the technology through the provision of Basic Concepts of Science in Primary School students (Hidayah, 2014). As we know that we lack of data and informations how the efforts of higher education in preparing human resources who are able to compete globally in the AEC, through this study, it is possible to provide the students with the ability of accomplishing problems either closed-ended and open-ended.

METHOD

This research using Pre-Experimental Design approach in which the respondents were selected without going through random sampling and diagram for this design are shown in Table 1.

Table 1. Pre-Experimental Design

The One-Shot Case Study Design	
X	*O*
Treatment	Observation (Dependent variable)

Source: (Fraenkel *et.al.*, 2012).

The number of respondents involved in this study are 25 students of the Physical Education Master degree and Science. The treatments used at the first meeting is to stock the basic theory and practice to solve physics problems through Lecture and Discussion method (Kohl & Finkelstein, 2006). Respondents are also introduced and explained the rubric characteristics of physics problem solving assessment in the form of closed-ended or routine problems. While at the second meeting of the respondents were given two forms of assessment rubrics, they are; forms that have been filled (as a lecturer grip) and a blank form (for training the students).

For sections that have been filled, the res-

pondents were asked to give Grade on each item for each stage of the strategy to Troubleshooting. While for the blank rubric, the respondent was asked to be able to fill in the answers, according to the stages Troubleshooting strategy model (Heller et.al, 1991). The students' ability data to solve problems of physics are collected using a standard "Problem SolvingResponse Rubric" adopted from the research (Halim et al, 2010). Descriptive analysis of the answers are based on the completeness of student answers for every stage of Problem Solving strategies compared with standard stages which are carried out by an expert (the standart stages of Troubleshooting Strategy).

RESULTS AND DISCUSSION

Overall results of the study are shown in Figure 1. The figure shown in comparison of completeness of respondents between each stage of Troubleshootingstrategy. The results discussion are discussed based on the stages of Problem Solving strategy.

Stage I (*Focus on the Problem*).

Based on the bar chart in Figure 1.1 above, it can be seen that the stage I (Focus on the Problem), most respondents (78%) can complete this stage completely (100%), but there is also a small proportion of respondents (22%) was only able to complete this stage of approximately 50%. Some of the relevant research results indicate that this stage (Focus on the Problem) on the strategy undertaken by beginners (Novice strategy) is invisible and difficult given the score compared with the strategy undertaken by experts (Heuvelen, 1991; Cock, 2012; Docktor, et .al, 2015).

The results of interviews with respondents showed that most of them (90%) in the stages before, has never been revealed in the form of visual or words, but only in the minds of the respondents, it is often called the "unwritten customs" in the problem-solving physics(Montague, et.al., 2000). But after the respondents were given theoretical and practical physics problem resolving the standard has increased very well at this stage.

Stage II (*Describe the Problem*)

This stage or a stagethat explain the problem in physics, is found only in the strategy of Problem Solving Problems of physics, which was designed by Heller in Tuminaro & Redish (2007), while the model Polya, which is widely used in mathematics, has four stages, not including this stage II (Xin et al, 2005). Most respondents (90%) was only able to fill 40% of the full answer in this second stage.In other words, many respondents who did not fill the solution in the second stage. One reason is that the respondent is uncommon or rarely taught the solution in the second stage, either at college or at the high school level. This is consistent with the findings made by Ibrahim & Robello (2013) of 19 engineering students who take kinematics course, none of which showed a visual depiction of metal in the form or expression in words.

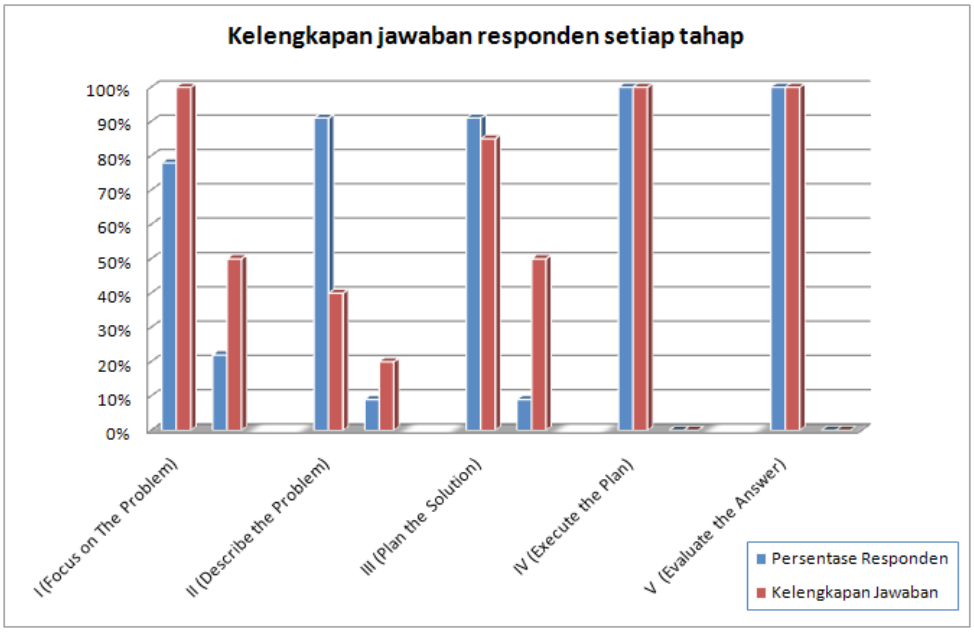

Figure 1. The Completeness of respondents Answer for each stage

Stage III (*Plan the Solution*)

The solutions activities in this stage, including measuring the ability of respondents to analyze the equation, compose what variables should be resolved first, checking the completeness of the information needed, whether it is necessary to form a new equation or not, and whether the units need to be converted or not. This kind of activity should be performed by the respondent. This fact is apparent from the results of the respondents in Figure 1. Approximately 90% of respondents were able to fill out a solution at this stage by about 80% complete. In the Problem Solving strategy practiced by beginners (Novice strategy) this stage can be completed perfectly (Schoenfeld, 1982).

Stage IV (*Execute the Plan*)

The capability of the respondents in this stage is good, where all respondents can fill the solutions at this stage perfectly. One reason is that this stage is the form of a solution that has been commonly done by the respondent to resolve the physics problems. The solution in this stage has no difference between the strategy undertaken by the beginners (Novice strategy) with the strategy undertaken by the Expert (Expert strategy) (Schoenfeld, 1982).

Stage V (*Evaluate the Answer*)

The ability of respondents at this stage is good, where all of the respondents can fill the solution at this stage perfectly. Although this stage is rarely done by the respondents formally, but after being given the concept and trained to solve the physics problems, the respondents could write the solution at this stage perfectly. The solution at this stage was not too difficult, the activity is just checking the numeric values, units and marks obtained (- or +).

CONCLUSION

The overall students (respondents) have been able to apply the right Problem Solving strategy, although the stage II (describe the problem) has not been done nicely. This is due to the respondents are not familiar with the contents of the requested solution in this stage. In the physics problem solving strategies, traditionally the respondents have never disclosed the solution as desired in stage II. The study results implications are expected to staff that administer the subjects of physics or science can develop an assessment rubric Problem Solving of a lecturer version and a student version. It certainly would make it easier to train students in implementing Problem Solvingstrategy as main ability to face global competition in the ASEAN Economic Community (AEC).

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