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STEAM Education Based On Local Wisdom Of Coffee Plantation In Jember To Improve The Competitiveness at 21st Century

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ABSTRACT

In the 21st century, the educational institution needs to consider coverage graduates that success is not confined to academic ability, but more to the abilities and skills that will help graduates to compete in a global and digital world today. An important skill to have in the digital age, such as critical thinking skills, problem-solving, creativity, ability to communicate and collaborate as well as having the ability in information technology.This study conducted to describe the learning outcome and response of students with the use of science teaching material that integrated STEAM education and based on Jember's local wisdom. The design of development by using a model of ADDIE (Analysis, Design, Develop, Implement and Evaluate). This research has done in MTs. Bustanul Ulum, Jember in class VII A with 25 sample. The results of the validation average of 4.31 by experts 1, and 4.09 by experts 2. The results of students' cognitive and psychomotor are 73.84 and 91.8. The average score of student's response is 0.91. It means the teaching materials that developed is very valid, the value of the cognitive is good enough, the psychomotor is very high and the given of response is very positive, so the teaching materials are feasible to implement and this teaching materials can improved performance and student's motivation to learn.

INTRODUCTION

In the 21st century, the swift globalization began to have an impact on all aspects of human life ranging from political, economic, cultural and technological (Ocampo, 2010;

Akram et al, 2011). Economic problems, increasing human population and the increasing number of unemployed have been a challenge for some countries, especially developing countries (Goryakin et al, 2015). The influence of globalization also affects to the education sector. The problems are so complex requiring sophisticated problem-solving skills, and innovative solutions. Students are required to have 21st-century skills in order to compete in the global competition and the global problems. The 21 st century skills are a set of abilities that student needs to develop and success in their career. 21st-century skills include critical and creative thinking, collaborating, communication, information literacy, media literacy, technology literacy, flexibility, initiative, social skills, productivity and leadership (Thoughtful learning, 2016). So it takes some innovation and renewal in the learning process.

Education in Indonesia began to change in the direction of contextual learning in accordance with the region's potential. This is in accordance with the Law of the Republic of Indonesia Number 20 The year 2003 about National Education System, the curriculum at all levels and types of education developed on the principle of diversification in accordance with the educational unit, the potential of the area, and the learners. So in the learning process in the school must always base and raised on the potential, culture, and wealth of the area have. Contextual education with local wisdom surrounding area can generate good learning outcomes (Kurniawati et al, 2017). This is because the topic of the lesson is very close to the daily life of students (Khusniati, 2012). Local knowledge is influenced a lot by the cross-cultural influences and the process of globalization (Sartini, 2004). Local knowledge has many positive values that have the potential to build identity and national character (Alfian, 2013). Those values such as mutual cooperation, discipline culture, democracy, mutual respect, and tolerance. But the facts on the schools, the majority of schools in Indonesia are still not linking potential regional or local knowledge into the area of learning.

Jember is one of the districts in Indonesia that is famous for its natural wealth in the plantation sector. The most abundant plantation in Jember is coffee. This is supported by the presence of Indonesian coffee and cocoa research centers in Jember District. Large productivity in this coffee commodity is used for self-consumption and exports to other regions. Coffee has helped the economy of the people of Jember. The regions producing coffee commodities in Jember district are Ledokombo, Sumberjambe, Jelbuk, Rambipuji, Panti, Tanggul and Sumberbarusubdistricts (Haryanti, 2008). In addition to coffee potency, KabupatenJember also has potential in other fields such as tobacco, cocoa and cultural diversity of the community. All aspects of wealth owned by the community become a local wisdom of the local community. Local wisdom can be understood as local ideas that are wise, full of wisdom, good value, which is embedded and followed by members of the community.

Now, the company starting to look for graduates (students) who are able to think outside the box, in collaboration with people who have diverse skills, as well as have an approach is convergent and divergent problems. The diverse and complex problems can only be solved with complex knowledge anyway. Traditional learning only provides strong fundamentals of science facts, but less teaching about the application of science. So it takes a multidisciplinary science and learning with diverse references. The multidisciplinary learning approach that began to develop in the 21st century is the approach to STEM (Science, Technology, Engineering, and Mathematics). STEM combines four essential aspects of fundamental needed for the development of students. STEM potential to help students learn in more depth, fun, and provide access to his

future career (Moore & Smith, 2014). Teachers have the task to design a study that can motivate students to continue to actively engage in the learning process. Student motivation and involvement can improve student learning outcomes (Saeed & Zyngier, 2012) and achieve learning objectives (Rehman & Haider, 2013). The learning objectives are now starting to be associated with the career they would like (Badri et al, 2016). One of the most important aspects and needs in the 21st century than the ability of STEM is an element of creativity. Creative thinking is useful to form students who are able to think a solution to overcome the problems that developed in the environment (Daskolia et al, 2012). To increase creativity in the student learning must be integrated with the design of science and art. By applying all the science and art will make the student as a scientist who is creative and able to develop an innovative solution to solve serious global problems (Madden et al, 2013). Art is also one window that opened up a detour, difference, equality and pluralism in the world. integration of art and science in addition to increasing the element of beauty can also improve processes, and communicative in terms of student reflection and in deep thought (Hatice, 2009). Jacobson et al (2016) combines science, art, and design (Art) in the discussion of climate change and is proven to increase the level of creativity and problem-solving thinking students. Creative thinking will shape students' imaginative and have a creative action to solve problems in everyday life (Williamson, 2011). So that to further improve the quality of human resources, elements of design and art included into STEM learning become STEAM education. STEAM is an educational framework that brings reality into the classroom. It connects the different subjects together in the way that they would relate to the business world and to each other. So it's science and technology Interpreted through engineering and the arts all based in the language of mathematics.

The Natural Science Learning

Natural science is a branch of science concerned with the description, prediction and also understansdingof natural phenomena, based on observational and empirical evidence. Natural science can be divided into two subjects; life science (biological science) and physical science. Science has three essential characteristics in improving the productivity of learning experiences, 1) improving students' attitudes and character,

2) improving thinking ability and motor skills, and 3) increasing knowledge of the surrounding environment (Martin et al, 2009). Science is a collection of knowledge and ways to acquire and use that knowledge. Science Learning is a system designed to find information about phenomena that occur in nature (Dahlan, 2016).

STEAM (Science, Technology, Engineering, Art and Mathematics) Education

Knowledge of science, technology, engineering and mathematics or otherwise known as STEM has become a major focal point in schools today. STEM (Science, Technology, Engineering and Mathematics) education began to emerge due to the rapid development of technology. Because of the rapid development of technology, demands a change in an instructional objective and the basic capabilities that learners must possess (Ostler, 2012). As time passes, related parties begin proposing art added to the mix to create STEAM. STEAM began to emerge as a result of concerns that current employees lack the skills and talents necessary to succeed in 21st century economic competition. STEAM's learning seeks to leverage the artistic talents of students to generate creative thinking (Cox, 2016).STEAM lessons were designed to correct student

misconceptions and clarify concepts students had struggled with. Physical science was targeted first because this was the discipline in which students had experienced the greatest trouble envisioning phenomena explored in their science kits (Graham, 2016). Numerous projects and curriculum initiatives have launched in recent years toward the end of expanding the role of the arts in STEM education. The specific goals of these efforts range widely, but at the core they all focus on the role of creativity, the benefits of interdisciplinary learning, the interconnectivity between disciplinary concepts, the role that knowledge from one discipline might have in learning in the other, and the benefits of a metadiscipline. The STEAM movement is the latest suggested addition to STEM education (Daugherty, 2013).

Local Wisdom of Coffe Plantation in Jember

Exploration and cultural richness in local wisdom should be continuously preserved through the implementation of education. The educational activities undertaken are the integration of local wisdom in learning materials, the development of questions or evaluation tools, the development of teaching materials, and the development of learning models (RuRambipujiwati et al, 2015). To showing the ability of critical thinking and reasoning, the design of instructional must give students opportunity for develop their thinking and reasoning process. Teachers can design instructional material that can provide students to bring the values of local wisdom in each region as a source of learning process. Local wisdom is something that is related to a particular culture (local culture) and reflects the way of life of a particular community (local community) (Kurniawatiet al., 2017). The values of local wisdom are a value around the neighborhood of students who are integrated in the learning. The learning process will be begins with problem real with students real life and the things that existed in their mind. By using this approach in learning process, we can find some value of learners that can be implanted. There arecooperation, responsibility and discipline. It is visible when students are given the opportunity to contribute in solving problems through discussion activities and presenting the problem (Laurens et al., 2014). Jember Regency is an area in East Java that has the potential to produce coffee. The area of coffee plantation in Jember reaches 16,882 ha where 5,601,31 ha of them are smallholder coffee plantations. Coffee has become the main commodity of jember society which is very influential to macro economy (prayuginingsih et al, 2012). In the process of coffee processing and the habit of the community in the coffee plantation becomes a local wisdom that becomes a wealth of an area (prayuginingsih et al, 2012).

METHODS

Participants of the Study

Participants in this study were 25 students of seventh grade junior high school (MTs Bustanul Ulum), Panti sub-direct, Jember, Indonesia. This school was chosen because it is close with the coffee plantation (Plantation Area Companies Gunung Pasak, Jember). Participants was randomly selected to assume that all participants are homogeneous.

Reserch Design and Methods

This type of research is the development of research by using ADDIE (Analysis, Design, Development, Implement, Evaluate) model (Aldoobie, 2015). The purpose of this research is to produce a new product from development process. The product of this reseacrh and development is science teaching materials integrated with STEAM

education and based on local wisdom of coffee plantation of jember. The aspects that studied in this research are validation of developing science teaching materials, responses after used the teaching material and also the accomplishment result of students lesson. The Validation is done by giving quasioner to the evaluator. Students respond is known by giving quasioner which is given in the end of learning process. The responds to be achieved in this research includes interest, attractiveness, motivation to learn, and the convenience in understanding the teaching materials. The achieved of student learning outcomes is measured from cognitive used post test score after learning used the developed teaching materials. Students achieved then compared with KKM of this school get is 65, if the students get is score (≥ 65), then declared thorought and development of leraning declared effective.

RESULTS AND DISCUSSION

Validation of Science Teaching Materials

Table 1. Result of the validation of science teaching material integrated STEAM and based on local wisdom of Jember

Valuing aspect	Score from first evaluator	Score from the second evaluator
Feasibility of content	4,21	4,21
Language	4,18	4,06
Presentation	4,53	4,00
Average	**4,31**	**4,09**

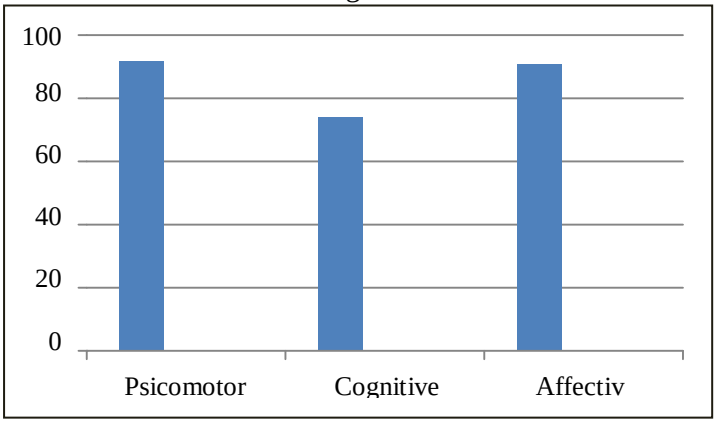
Note:
1. ≤ 2 not valid
2. ≤ 3 less valid
3. ≤ 4 valid
4. ≤ 5 very valid

Achievement of Student Learning Outcomes

Tabel 2. Result of Learning Outcome in Cognitive Domain

Aspect	Information
Number of Research Subjects	25 Students
Number of complete students	19 Students
Number of incomplete students	6 Students
The Average Value of Student Learning Outcomes	73,84

Graph 1. Values of Student Learning Outcomes in the three assessment areas



Results of Student Response

Table 3. Results of Student Response

Aspect of Assessment	Number of Respondents	Scores gained	Maximum Score	Student Response Value (P)
Response to the presentation of teaching materials	25 Students	97	100	0,97
Response to clarity of content		45	50	0.90
Response to achievement of goals		87	100	0.87
Average response rate				**0.91**

Discusion

Validation of Science Teaching Materials

After the science teaching materials integrated STEAM education and based on local wisdom prepared, first performed validation experts to determine the material aspect of feasibility of content, language, and form of presentation. Validation of these science teaching materials validated by 2 evaluators who are a lecturer at the University of Jember who have skills in the field of development science teaching materials. The result of validation shown in the following table 1

Conclusions should answer the objectives of research. Tells how your work advances the field from the present state of knowledge. Without clear Conclusions, reviewers and readers will find it difficult to judge the work, and whether or not it merits publication in the journal. Do not repeat the Abstract, or just list experimental results. Provide a clear scientific justification for your work, and indicate possible applications and extensions. You should also suggest future experiments and/or point out those that are underway.

Based on the results of the expert validation in the table above, it can be stated that the science teaching materials integrated STEAM education and based on the local wisdom of Jember have score of 4,31 from first evaluator and 4,09 from the second evaluator. From this score, the science teaching materials was development included in very valid category. Based on the score of validation from 2 evaluator, the science teaching materials can be used in the learning process and can be implemented.

Achievement of Student Learning Outcomes

Student learning outcomes in the 2013 curriculum are measured in three domains of affective, cognitive and psychomotor spheres.In this research, the achievement of student learning outcomes only viewed from the learning outcomes in the realm of cognitive or knowledge only.Students' learning outcomes are categorized completely if the value is above the minimum criterion value applicable in school, that is equal to 65. While the student is said not complete or not yet achieved if the value of learning result less than 65. The minimum criterion value is adjusted to student ability, material complexity and Supporting facilities and infrastructure in the school.The value of student learning outcomes is shown in Table 2.

The results using the integrated science teaching materials STEAM (Science, Technology, Engineering, Art, and Mathematics) based on local wisdom Jember plantation showed that 19 students or 76% of students successfully completed or achieved learning outcomes. In learning to use the materials integrated STEAM (Science, Technology, Engineering, Art, and Mathematics) and based on local wisdom muddy plantation is good enough because the number of students who completed more than 75% by value of the average student's cognitive is 73.84. Integrated learning STEAM is excellent for student learning because it combines several disciplines into a single unit so that students not only learn in a narrow scope but can view a natural event or phenomenon widely and complexly and studied with diverse sciences and perspectives. In the STEAM-based education of local wisdom students are led to be able to know the potential or the wealth that exist in the area around them. The potential and wealth of the area are brought into the learning as a topic so that students can learn the potential of the area they have. Local wisdom-based learning can improve student awareness of the environment and improve their social relations (Anwariet al, 2016). So that the students will have a caring nature of environmental sustainability and able to think creatively to increase the potential and wealth owned by the area.

On STEAM there is an element of learning technology and engineering so as to provide the latest knowledge (update) on the development of technology and information as well as engineering-engineering has been developed. One example in the teaching materials that developed there is a modern coffee processing machine that is very small and efficient. This is in accordance with the demands of ability in the 21st century is the ability to use technology and information, so that later students are able to have the ability of the 21st century and able to compete globally. The learning of STEAM requires the activeness of the students because in the learning process it is entirely centered on students and teachers only as a facilitator. The learning process provides free space for students to be able to express what students have. This can be seen from the psychomotor values of students taken during the lab and project and the affective value of students taken during the learning process shown in Graph 1.

The activity of student in learning is very high that average student gets value 91,8 in the psychomotor realm and 90,81 in affective area. The learning of the 21st century is no longer centered on cognitive values or knowledge alone but has shifted to other abilities such as psychomotor (skill) and attitude. In addition to the learning factors STEAM, student activeness is also supported by learning based on local wisdom. This is because what is taught is based on local wisdom that is very close to the daily life of the students. Contextual learning with everyday life can help students understand science and can increase science literacy (Rubini et al., 2014). The topics close to the students make the learning contextual and students feel more motivated to learn.

CONCLUSION

Science teaching materials integrated STEAM (Science, Technology, Engineering and Mathematics) education -based on local wisdom coffee plantations in Jember has a value of the average validity 4.31 by the first evaluator and the second evaluator gave average score 4.09, meaning that learning materials are developed very valid and deserves to be implemented into learning.

Cognitive learning results students quite well with the average rating value, whereas 73.84 liveliness or psychomotor students become very high with the average value of

91.8 learning so that STEAM can improve thinking ability and expertise so that students are able to have the capability of the 21st century such as creative, innovative, leadership, technological literacy, and critical thinking ability so that it can eventually compete in global competition. The value of the average response of students to learning materials that give a very positive value response of 0.91. Through the integration of STEAM and local wisdom in learning, students find it easier to understand the content of the material and students feel more excited and motivated in learning activities as well as in utilizing the local potential of an area.

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