The prospective of STEM education: students' perceptions about the role of interest growth in science literacy

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Abstract: This study aimed to describe students' perception about the role of STEM in growth interest in scientific literacy. The study was conducted in Lampung province of Indonesia, involving 221 junior high school students and interview with 5 science teachers. The method used in the research is a mixed method with Sequential Explanatory Design. Data were taken using Questioner, interview and Observation. Data were analyzed using descriptive analysis. The survey results show that students have a positive perception of the STEM approach. The results of the analysis of the STEM Approach most teachers have not utilized the STEM approach to provide an understanding of science. STEM approach not only provides an understanding of student science but also mathematical skills and conceptual understanding in science so STEM learning can support 2013 curriculum learning.

1. Introduction
The 21st century is a century of globalization marked by advances in science and technology, the application of science and technology has shown revolutionary changes in many countries [1]. To stay in global competition, everyone is required to have superior competence and skills. Some countries have established scientific literacy as a goal of science education [2]. Science literacy in the modern era is currently very much influenced by technology so it requires an understanding of science and mastery of technological issues [3]. The role of science and technology is needed in the era of globalization to improve the competitiveness and prosperity of the nation. Every country needs the readiness to face the era of globalization in various fields, especially education [1]. The field of education at the forefront of a country [3]. Education needs to provide the best facilities so that the learning process is following the standard Teacher process [4].

Indonesia currently uses a revised 2013 curriculum that directs students to support 21st-century abilities, namely Communication, Collaborative, Critical Thinking, and Creativity [5]. 21st Century learning requires teachers to direct students to have creativity in dealing with problems of everyday life [6], [7]. One of the methods used to support student creativity is by applying Science, Technology, Engineering, and Mathematics (STEM) [8]. The approach of the four aspects of Science, Technology, Engineering, and Mathematics (STEM) is a matching pair between problems that occur in the real world and also problem-based learning [9], [10]. STEM education is built on the theory of curriculum
integration in two perspectives, one of perspective is that STEM education enables teachers to integrate correlated subjects without ignoring unique characteristics and depth [11].

The results of observations in a preliminary study conducted on junior high school students in Lampung showed that 80% of students did not yet know STEM, 91% of students had difficulty understanding science lessons, 63% of teachers did not invite students to observe and collect facts, 97% of students liked learning associated with daily life, Even so, students may have limited knowledge about STEM, but they believe that the STEM learning approach will bring many changes in understanding science lessons. Therefore researchers need to apply the STEM approach so that students are not difficult to understand science lessons.

The STEM approach can create a cohesive learning system and active learning because all four aspects are needed simultaneously to solve problems [12], [13]. The implementation of these four aspects students can do work following the skills and can reduce the unemployment rate. STEM education has become a worldwide trend [8], [10], [12], [14]. STEM education involves science, technology, engineering, and mathematics as well as other fields of study through project-based learning experiences that require the application of knowledge to solve authentic problems in the real world in a collaborative environment for students' needs [15]. Through STEM learning, students know about scientific and technological literacy that appears from reading, writing. Observing, and doing science in the environment [16].

This study aims to describe students' perceptions about the role of STEM in fostering students' interest in scientific literacy.

2. Research Method

This type of research is mixed-method research. The mixed-method strategy used by Sequential Explanatory Design that combines data collection and data analysis qualitatively and quantitatively is adapted from Creswell [17]. The study was conducted at SMP / MTs in Lampung Indonesia, the research subjects of the SMP and MTs classes consisted of 221 students (Ages 14 ± 0.5 Years) and 5 science teachers. Data collection uses observation, questioners, and interviews. Questioners were given to 221 students to find out students' perceptions about the STEM used during the learning process.

Questioner results with a Likert scale were analyzed by making a percentage of responses from each item submitted. The choices proposed are strongly agreed, agree, less agree and disagree. The questionnaire consisted of 10 items which included 3 categories namely learning difficulties, liking science learning and the use of laboratory facilities. Results Questioners were analyzed quantitatively, observations and interviews were analyzed descriptively qualitatively.

| Interval % | Favorable       | Unfavorable |
|------------|-----------------|-------------|
| 75 < x ≤ 100 | Strongly Agree | Disagree    |
| 50 < x ≤ 75  | Agree           | Less Agree  |
| 25 < x ≤ 50  | Less Agree      | Agree       |
| 0 < x ≤ 25   | Disagree        | Strongly Agree |

Questioners were given to 221 students, this was done to find out more detailed information about students' perceptions of STEM. Interviews were conducted on 5 science teachers to find out the approaches that are often used in learning. The following teacher code interviewed by researchers.

3. Result and Discussion

Results and discussion of the data obtained in the form of Questionare. Results Student Perceptions towards STEM in Science Literacy Interests, The data can be seen in Table 2.
Table 2. Results of Questionnaire Student Perceptions towards STEM in Interest in Science Literacy (n = 221)

| No. | Question                                                                 | Percentage (%) | Category       |
|-----|---------------------------------------------------------------------------|----------------|----------------|
| 1   | IPA has learning difficulties because many mathematical formulas          | 50             | Agree          |
| 2   | I have difficulty understanding science with lab.                         | 46             | Less Agree     |
|     | **Average number of students’ learning difficulties**                     | **48**         | **Agree**      |
| 3   | I prefer books ipa are many examples of the application of technology    | 62             | Agree          |
| 4   | I love science lessons because teachers often encourage students to be creative with the products of the engineering science | 53             | Strongly agree |
| 5   | I am interested to learn science if teachers ipa associate with in my everyday life | 52             | Strongly agree |
|     | **Average number of students Liking IPA**                                 | **56**         | **Agree**      |
| 6   | Teachers deliver material science with stimulation or animation           | 57             | Agree          |
| 7   | Teachers deliver material science with demonstrations                     | 57             | Agree          |
| 8   | With my practicum understand better learn science                         | 50             | Agree          |
| 9   | Teachers deliver material science with a lab.                             | 58             | Agree          |
| 10  | I do not use virtual lab on the learning process                          | 41             | Less Agree     |
|     | **Average number of laboratory facilities use**                           | **53**         | **Agree**      |

The results showed that students have difficulty learning science, especially in the mathematical mathematics and science books used for student learning are less interesting and applicable so students are difficult to understand science lessons, students prefer science lessons because in science books are presented interesting drawings and many examples of the application of technology and with science engineering products, students prefer learning to use the laboratory because students are more familiar with there concrete examples so students are stimulated in science lessons.

Table 2 reinforced student interviews, there were a number of questions asked by the moderator namely researchers, based on the results of the interview that students did not know about STEM, did not understand the calculations in science lessons because the teacher delivered the material using only the lecture method not using the lesson learning approach Science, students' interest in learning science when it is related to daily life, and students do not like material related to technology, they prefer explanation of material related to daily life.

STEM learning suitability analysis was obtained from interviews of teachers from each school in the Lima district of Lampung province science subjects teachers are presented in Table 3.
Table 3. Statement and Response Teacher

| No. | Statement response Teacher |
|-----|---------------------------|
| 1   | The approach used in the study Conceptual and scientific |
| 2   | Difficulty understanding science lessons Lack of student interest |
| 3   | STEM approach to foster interest in science literacy STEM approach needs to be applied in science learning that growing scientific literacy in students. |

Questionnaire results of students is also strengthened by the teacher's interview with the interview questions in table 3. The teacher uses a conceptual, factual and practical approach, (IS), contextual (RA) Scientific (IB) CTL (IN) contextual and following the material (M). However, current learning is not maximized due to limited facilities and infrastructure so that teachers cannot integrate science and technology (IN, RA), and sometimes the tools cannot be represented to implement STEM, the hope is that there are animations or media that can represent to implement STEM (STEM) RA). Some students find it difficult to understand students because of the factors namely students are not eager to learn (IS), Environment, motivation (AR, IN) and students are difficult to understand because they are not focused on one subject (M). Not maximizing learning with the STEM approach (AR, IS), by using the STEM approach students are more understanding and interested in learning science (M, IB, IN). As for the obstacles of teachers to implement STEM, the limited ability of teachers and the limited tools available at school (AR, M, IS, IN, IB), lack of interest in student learning and quality of teacher ability so that students' scientific literacy abilities do not grow to the maximum (AR, IN, IB, M, IS).

In the learning process, the teacher has not fully applied the learning of Science, Technology, Engineering, and Mathematics (STEM), not all material has been applied because it requires extensive skills in the teacher to apply STEM. This shows the lack of readiness of the teacher to plan for application in learning. STEM education trains students to improve their competencies to solve problems in several situations [19]. STEM can be developed if it is connected with the environment. Students not only memorize concepts but also understand scientific concepts and their relationships in everyday life. Therefore, the STEM approach is used in science learning, student learning approaches are trained for designs made related to the environment by utilizing technology [18]. In learning the need for a teaching Scaffolding strategy used to provide a form of support to students so that they can gain knowledge [20]. The importance of giving Scaffolding to students in optimizing the integration of STEM as one of the innovative physics learning strategies [15], [22].

In this study, analyzing students' perceptions about the role of STEM in the growing interest in scientific literacy. Based on interviews, observations and Questioners covering (1) the approach used in the form of a contextual, scientific, conceptual, factual approach to teachers has not been integrated with STEM. (2) STEM approach consisting of four aspects is a matching pair between problems that occur in the real world and also problem-based learning (3) solutions provided show that students are able to unite abstract concepts from each aspect (4) The challenge of a teacher is to provide an education system that creates opportunities for students to connect knowledge and skills has not become familiar to every student so students cannot integrate science with technology, students are more dominant by memorizing concepts than connecting concepts with everyday life.

Based on students' perceptions and teacher expectations, then with a hypothetical model, the principles of science learning with the STEM approach such as the 21st century can be described as shown in Figure 1.
Decreased ability of scientific literacy is due to the lack of students reading, students' habits of getting knowledge only from the teacher and students have never conducted experiments in the class [23-24]. Furthermore, in-class the teacher guides students to various experiments and makes projects with the STEM approach. The STEM approach makes students able to solve problems better, innovators, inventors, independent, logical thinkers, and technological literacy [23]. In learning the teacher guides students to follow the learning procedures. In line with the results of the study show that learning activities that are integrated with STEM can be an alternative solution to serve all the skills needed in the 21st century [25]. In this regard, learning science with the STEM approach requires the help of media or multimedia that can help teachers provide guidance or scaffolding to students so that they grow into critical and creative students [26-27].

4. Conclusion
The survey results show that students have a positive perception of the STEM approach. The results of the analysis of the STEM Approach most teachers have not utilized the STEM approach to provide an understanding of science. STEM approach not only provides an understanding of student science but also mathematical skills and conceptual understanding in science so STEM learning can support 2013 curriculum learning. Science learning with the STEM approach has the potential for the development of learning oriented to the provision of students’ higher order thinking skills, thus the classroom climate must be able to actively involve students in the learning process.

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