

Need assessment of STEM education based based on local wisdom in junior high school

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Abstract. The aim of this study was to determine the various needs for the implementation of STEM learning based on local wisdom in junior high schools. This research was a qualitative descriptive study. The subject of the study were 17 natural science teachers in Lampung and 32 second graders in Junior High School 1 Seputih Raman. The teachers was chosen by random sampling technique while students were selected using cluster random sampling technique. The data collection was carried out by a questionnaire and descriptive qualitative is used to analyse the data. With regard to various needs in STEM learning implementation based on local wisdom, the results of this study showed; (1) the need for innovation in the learning approach (2) the need for knowledge about various approaches including the STEM approach, and (3) the integration of learning material with local wisdom.

Keywords: local wisdom, science learning and STEM approach

1. Introduction

These days, many countries need to be ready to face a rapid change in this digital era. The formation of human resources with qualified skills is one solution that must be considered through a formal education or school. One of the efforts made by Indonesia to continuously improve the quality of education is to regenerate Indonesia's education curriculum. The improvement of this curriculum was carried out by changing the Indonesian education curriculum from Curriculum Education Unit (namely, KTSP) to the 2013 curriculum. In the 2013 curriculum, learning planning is carried out by preparing a learning implementation plan that is developed from a material that refers to the syllabus and also the curriculum content standard. Furthermore, learning is done with a scientific approach, and assessment of learning outcomes by authentic assessment using test and non-test techniques, performance and attitude assessment [1]. Learning that refers to the 2013 curriculum is also required to be a student-centered activity, so that students have the opportunity to explore their abilities. One of the subject that can facilitate the development of students' abilities in junior high is natural science subjects.

Science learning can equip students with scientific skills and ways of scientific thinking. Realizing scientific learning requires learning that involves students in learning so that they can develop their potential and construct knowledge through discovery. Students who have the opportunity to be directly involved in their learning can have the potential to develop skills such as communication skills, high-level thinking, and collaboration [2].

The involvement of students in learning cannot be separated from the teacher's role as a facilitator. The teacher has a role to guide and direct students about how to solve existing problems and how to connect their experiences with the solutions that are being sought. Through this activity, students will understand that communication is one way to solve problems [3],[4]. Furthermore, the way teachers



manage learning can also influence the involvement of students in learning. Teachers who use teaching methods by paying attention to the background knowledge and behavior of students will be more able to involve students in science learning compared to teachers who assume all students' abilities are the same [5].

In managing learning the teacher must be able to choose a method, model, or learning approach that appropriate to the teaching material so that it can be optimally accepted by students. One of learning approach that can be used to develop students' potential in terms of cognitive, psychomotor, and affective is the STEM approach. STEM is a learning approach that integrates science, technology, engineering, and mathematics so it can develop students' skills through the process of solving problems in daily. The STEM approach is believed to be used as an answer to the challenges of the 21st century by preparing a generation that is equipped with 21st century skills [6]. In addition, people who support STEM education have an opinion that STEM has the potential to contribute to learning in schools that will later be applied to real life and will have an effect on the global economy of a country. This is supported by a study which suggests that students who take part in learning with the STEM approach can be motivated to learn and have a better perception of science [8].

In general, STEM learning is doing by assigning students to project activity in the group. Projects assignments in learning have several advantages, one of which is during the realization its students will have scientific satisfaction because it can arouse students' motivation when controlling, evaluating, and operating their projects so as to arouse students' satisfaction in learning [9]. Students' satisfaction will appear in an expression, gestures when their project is successful or better than other groups. In addition, project assignments will be able to bring up bold attitudes in expressing opinions, accepting opinions from others, willing to admit mistakes, and accepting the presence of others as group members when they collaborate or cooperate in groups during project creation [10].

However, the STEM approach is still rarely used because several obstacles were found in implementing learning with the STEM approach. The obstacles encountered in STEM education consist of intrinsic, extrinsic and institutional obstacles. Intrinsic barriers focus on the personalities of teachers and students; extrinsic barriers focus on the tools or media of learning that are absent or imprecise, while institutional barriers include curriculum issues, educational policies and others [11]. Based on existing obstacles, STEM approach can be maximized by combining this approach with other learning methods, such as integrating it with learning resources that involve material in daily. This learning resource can be realized as local wisdom of the local area that is already known by students, so that it allows learning to be more easily accepted by students compared to using matter from learning resources that they do not know. Science learning based on local wisdom is one of the efforts to preserve the local wisdom of an area so that it becomes an important capital in learning so that learning will become more meaningful [12]. Science learning that is integrated with local wisdom can increase the creativity and learning outcomes of students [13]. In addition, local wisdom-based learning is proven to be able to improve positive character in students in the form of honest, disciplined, thorough, diligent, careful, responsible, and environmentally caring characters significantly [14]. Previous studies have shown that STEM learning can develop 21st-century skills [15], whereas if STEM learning is integrated with local wisdom it can improve students' creative thinking skills [16]. Therefore the STEM approach integrated with local wisdom is a learning innovation that is recommended for use in science learning, because there was research about STEAM Education (integrate from STEM with Art) based on local wisdom of coffee plantation in jember to improve the competitiveness at 21st century with results could improved performance and student's motivation to learn [17]. Therefore this article aims to analyze the various needs of teachers and students so that it is necessary to carry out STEM learning based on local wisdom in junior high schools

2. Research method

This research used a descriptive-analytic method with a qualitative approach. The subjects of this study consisted of 17 natural science teachers in Lampung and 32 second graders in Junior High School 1 Seputih Raman. The teacher subject in this study was selected using a random sampling technique while students were selected using a cluster random sampling technique by considering that the class division of the school was carried out heterogeneously. Data collection techniques used in this study were using a questionnaire. The questionnaire used consisted of a student questionnaire that was a closed questionnaire and a teacher's questionnaire which was a combination of an open and closed questionnaire because there were several questions with alternative answers and also a column of reasons to be filled in manually. The questions in open questionnaires are used to strengthen the data obtained from the teacher. The collected data were analysed using qualitative analysis methods with a narrative study of the research results.

3. Results and Discussion

3.1. Teacher Needs Analysis

The results of the analysis of teacher needs based on aspects and indicators are presented in table 1.

Table 1. Results of questionnaire analysis of teacher needs (n = 17).

| Aspect and Indicators | Percentage (%) |
|--|----------------|
| Learning Activity | |
| Use of the 2013 curriculum | 100 |
| The difficulty of teachers in using the 2013 curriculum | 52.9 |
| The difficulty of students in using the 2013 curriculum | 17.6 |
| Use of learning methods/models | 88.2 |
| Learning resources | |
| Integrate learning material with potential or local wisdom | 64.7 |
| Use learning resources other than textbooks | 94 |
| Use of students worksheet | 100 |
| STEM Approach | |
| Knowing STEM approach | 58.8 |
| Applying STEM approach | 47.1 |
| Learning Output | |
| Output planning after learning | 82.4 |
| Involve students in learning | 100 |
| Doing learning to construct the skills | 82.4 |
| Doing learning to construct the scientific thinking | 82.4 |

In the aspect of learning activities, the data shows the results that science learning has fully used the 2013 curriculum. Some teachers, namely 52.9%, stated that the implementation of the 2013 curriculum in science learning was still relatively difficult. This is because there are several obstacles encountered. Some of the obstacles mentioned by the teachers are school infrastructure that is not supporting to doing learning in the 2013 curriculum, the basic abilities of children who are not accustomed to learning in the 2013 curriculum and assessments in the 2013 curriculum are considered difficult to implement. However, from the constraints in the implementation of the 2013 curriculum, most of the teachers (82.4%) stated that students could participate in learning to use the 2013 curriculum well. Some teachers (64.7%) have tried to make learning not monotonous by using various models, methods, or learning approaches when implementing learning activities in the classroom. The

use of learning methods, models or approaches need to pay attention to the characteristics of the material and the learning objectives taught, because not all learning objectives can be achieved with the same approach [18].

One of the learning approaches that can be used in science learning is the STEM approach. Some teachers (41.2%) claimed that they did not know what is the STEM approach, and some teachers who claimed to know what the STEM approach was still rare (47.1%) used this approach in learning science. Lack of knowledge and application of the STEM approach is something that needs to be improved because learning using the STEM approach can facilitate students in exploring their potential. Previous research showed the STEM approach can improve learning outcomes significantly, both from cognitive, psychomotor, and affective aspects [19]. Each teacher has a different opinion about the output in a learning. Some teachers (82.4%) think that learning output is important to plan before learning, but of 82.4% teachers only a few teachers who think that cognitive, affective, and psychomotor aspects are equally important outputs that must be owned by students, the others still argue that only the cognitive aspect is an important output for students to have after learning.

The selection of learning resources is also an important thing for the teacher to pay attention in learning. Although few, but there are still teachers (11.7%) who claim to only use textbooks as learning resources, others (88.3%) claimed to use other learning resources besides textbooks like internet. Furthermore, the use of learning resources that are integrated with local potential or local wisdom of the local area is still rarely done. Though this can help students in learning because learning from things that are commonly found in their daily.

3.2. Student Needs Analysis

The results of the analysis of students' needs based on aspects and indicators are presented in table 2.

Table 2. Results of student needs analysis questionnaire (n = 32).

| Aspect and Indicators | Percentage (%) |
|--|----------------|
| Students' perception | |
| Regarding learning science is difficult | 93.8 |
| Interesting with Science Learning | 15.6 |
| Feel invited by the teacher to be active in learning | 75 |
| Active in Science Learning | 18.8 |
| Learning Activity | |
| Monotonous learning | 9.37 |
| Student involvement | 90.6 |
| Likes the practicum activities | 87.5 |
| Likes the discussion activities | 81.3 |
| Learning Resources | |
| Use of student worksheets | 15.6 |
| Interesting with learning resources other than textbooks | 100 |
| The relation of matter with daily life | 100 |
| Understanding of material related to daily life | 12.5 |

Based on the data of student needs in table 2, aspects of students' perceptions indicate that science learning becomes a scary thing because most students (84.38%) claim to dislike science learning. This is possible because most (93.8%) of students consider science learning to be difficult to understand and also the majority (81.25%) of students claim not to be active in learning science even though most of them claim that the teacher has invited them to be active in learning.

Furthermore, the aspects of learning activities show that students are excited when learning science is filled with practical activities and discussions. This shows students like learning that involves it in doing something, whether it's arguing or even making something. Students will feel interesting about learning science if the teacher makes learning innovations both from the selection of methods, models, or approaches learning and the selection of learning resources. This is supported by the opinion of all students (100%) which states that learning science is not enough if only using textbooks. Science learning that has been carried out with activities in the laboratory still needs to be supplemented by learning science that refers to the real world, such as local wisdom of the local area. This needs to be done to create learning that is more motivating for students so can improve science process skills, and scientific attitudes of students [20], [21].

4. Conclusions

Based on the results of the study, it can be concluded that the needs of STEM based on local wisdom in junior high school are (1) the need for learning innovations to interesting the attention of students so as to increase motivation in learning science, this innovation can be in the form of a selection of appropriate learning approaches and can increase the involvement of students in science learning, (2) the need for knowledge of new learning approaches, one of which is STEM, and (3) learning resources that need innovation with integrating learning with local wisdom.

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