Measuring for enhancing high school students’ cooperative attitude and responsibilities in learning closed electrical circuits through STEM approach

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Abstract. This study conducted by the finding of the lack of students’ cooperative attitude that gained 35.29% and the students’ responsibility 29.41%. It also looks at the preliminary study that conducted by the observation group obtained the students’ cooperative attitude (34%) and student's responsibility (30%). The purpose of this study to determine students’ cooperative attitude and responsibility at the time of learning a closed electrical circuit through STEM approach. This research method is the descriptive study with the pre-experimental design and the paradigm of one shot case study. The population of this study is the tenth-grade high school students with a sample size of 40 students that consist of 24 female and 16 male. The data collection techniques that utilized is the attitude rubric and the attitude measurement format. The result of this study showed that the percentage of students’ cooperative attitude in the first and second meeting is 83% and 81% with very high criteria. Meanwhile, the attitude of responsibility answerable for the first and second meeting was 81% and 79% with very high and high criteria. This indicates that the STEM approach can improve students’ cooperative attitude and responsibility.

1. Introduction
Today the demands competencies required of students not only cognitive, but as stated in the syllabus of the national curriculum, students in Indonesia must have the abilities 1) the skills to learn and innovate that include critical thinking and ability to solve problems, creative and innovative, and able to communicate and collaborate; 2) skilled to use the media, technology, information and communication technologies (ICTs); 3) the ability to live a life and career, including adaptability, flexibility, initiative, able to develop self-esteem, social skills and cultural, productive, reliable, have a spirit of leadership, and responsibility, Syllabus National Curriculum [1].

One of the abilities that must possess by the students is the cooperative attitude and responsibility. The research that has been done in one of the junior high schools showed the level of cooperative in the lower categories, namely 35.29% visible only some students who are actively involved and participated and responsibility in a group that is 29.41%. This is in line with a preliminary study carried out in one high school in Bandung, which shows the students’ cooperative attitude and responsibility still low at 32% and 30%.

Thus the required learning process can train students’ cooperative attitude and responsibility. One of the current learning approaches that teach 21st-century skills one attitude of cooperative and responsibility are learning approach STEM (Science, Technology, Engineering and Mathematics).
The STEM approach is one way to unite science and engineering as well as a combination of strategy, implementation of the formation of the concept and application of the idea of learning science [2]. In this case, the students to unite the four disciplines in the lessons, and also because the using of STEM learning students often grouped for completing the project given by the teacher. So expect the use of STEM learning can train the students’ cooperative attitude and responsibility.

The STEM education does not mean only the strengthening of the educational praxis in STEM professions as separate, but to develop an educational approach that integrates science, technology, engineering and mathematics, with a focus on the educational process in solving the real problems in daily life or professional life [1]. The STEM can prepare the students who have the competence to deal with the world of work, one of the characters needed in the working world that is the cooperative attitude and responsibility. Thus, the purpose of the study to determine the increase the students’ cooperative attitude and responsibility after learning a closed electrical circuit through STEM approach.

2. Methods
The method that utilized in this study is the descriptive method with the Pre-experimental design and the paradigm of the research is One Shot Case Study [3]. The research sample is the high school students of class X with the total number 40 students that consist of 24 female and 16 male.

The data collection techniques using the rubric of the students’ cooperative attitude and responsibility, as well as a questionnaire to evaluate the response of the students after learning in the classroom. The technique of data analysis using the equation according to Ali [4] as follows in the equation (1):

\[ X = \frac{n}{N} \times 100 \]  

Notes:
- \( n \) = Scores obtained by respondents
- \( N \) = the maximum score
- \( X \) = the percentage of students' cooperation attitude and responsibility

Once the percentage of students’ cooperative attitude and responsibility were then analyzed interpreted in Table 1.

| No. | Interval Score (%) | Criteria          |
|-----|--------------------|-------------------|
| 1.  | 81-100             | Very High         |
| 2.  | 61-80              | High              |
| 3.  | 41-60              | Intermediate      |
| 4.  | 21-40              | Low               |
| 5.  | 0-20               | Very Low          |

3. Results and Discussion
The research was conducted on the eleventh-grade high school students that divided into two, namely the students’ cooperative attitude and students’ responsibility.

3.1. Cooperative Attitude: Profile of Student Cooperative Attitude.
Data collection was performed by observing the students’ attitude during the learning takes place, it is in line with the research method used is the descriptive method. The students’ cooperative attitude at the first meeting reached the percentage of 83% and at a second meeting to reach 81% of the results achieved percentage students’ cooperative attitude including very high criteria. The learning process at the first meeting of designing tools. While in the second meeting, before the students do make teachers tool provides early knowledge of the components that will be used to make tools. This is done in order to
increase student cooperative attitude. But the results of research decreased the percentage of students working attitude from the first meeting to the second meeting indicated the student's motivation in doing the task performance when learning takes place is reduced due concepts students need to have when the first and second meeting increasingly diverse. So that despite efforts to improve cooperative students are yet to get the maximum results.

Table 2. Profile of Students’ Cooperative Attitude in Two Meetings

| No | Meeting | Cooperative Attitude |
|----|---------|----------------------|
| 1  | I       | 83%                  |
| 2  | II      | 81%                  |

Figure 1. Graph Percentage of Students’ Cooperative Attitude based on the Learning Meetings

In addition, factors that lead to the percentage of students’ collaboration decrease is students’ understanding the concept that still lacking and there are two groups in which some group member odds with each other so that when learning takes cooperative between the two groups is less. To overcome these problems before the students perform project STEM teachers are expected to give the material a closed electrical circuit through the model inquiry or discovery. Thus, students understand the material in depth.

3.2. Responsibility: Profile of Students’ Responsibility

Table 3. Table of Students’ Cooperative Attitude in the Two Meetings

| No | Meeting | Responsibility |
|----|---------|----------------|
| 1  | I       | 81%            |
| 2  | II      | 79%            |
The students’ responsibility to 81% of the first meeting and the second meeting is 79% with the criteria for the two meetings in a row is very high and high. As for the above criteria in accordance with the table set forth by Riduwan [5]. The factors that led to a decrease in students' responsibilities include the coordination of the team leaders in the division of tasks that have not been up caused there are some members of the group who is not doing his job properly. To overcome these conditions, the teacher should assign tasks to each group leader to coordinate the tasks of each member of the group.

4. Conclusion
The students’ cooperative attitude for two meetings is very high, although there was a decline when the first meeting to the second meeting despite efforts to improve student collaboration is already done when learning takes place.
Profile stance of students’ responsibility to the two meetings is very high and high. Although there was a decrease in the attitude of the student's responsibility because the head of the group did not coordinate its members to the maximum, subsequent to efforts to improve the attitude of responsibility in students.

5. References
[1] ACT 2014 The national condition of STEM 2014 http://act.org.
[2] Bybee R B 2013 The case for STEM education: Challenges and Opportunities (City: NSTA Press)
[3] Sugiyono 2014 Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D (Bandung: Alfabeta)
[4] Ali M 2013 Prosedur dan Strategi Penelitian Pendidikan (Bandung: Angkasa)
[5] Riduwan 2012 Belajar Mudah Penelitian (Bandung: Alfabeta)