CHAPTER V
CONCLUSION, IMPLICATION, AND RECOMMENDATION

5.1 Conclusion

The research was completed in May 2024 on grade 8 Junior High School students by implementing electrical circuit projects through STEM-based learning of human circulatory system topics. The class consists of 34 students. The learning activity on using an electrical circuit project to learn about the human circulatory system was conducted within five meetings. Each meeting consists of 1 x 60 minutes. At the first meeting, the pre-test was conducted with 28 questions, followed by an introduction to the topic. Students work in groups in all learning activities. Students related the human circulatory system to the electrical circuit project at the second meeting. At the third meeting, students made their project based on their concept mastery and creativity. At the fourth meeting, students showed and tested their project. The last meeting, the review and post-test were taken. The learning activities are completed by worksheets that students did in groups. Based on the description of each STEM stage, an improvement in students' creativity and students' concept mastery was found through experiments done on the electrical circuit project.

The study results indicate that implementing STEM-based learning was highly successful, with each session achieving 100% success. Table 4.2 shows that the average improvement in students' concept mastery scores was 44.77, increasing from 32.38 to 77.15. Based on the calculation, this research found a N-gain of 0.63, which is categorized as medium (Hake, 1998) the value of sig. The pre-test and post-test are typically distributed (sig. >0.05) and analyzed using a parametric test, which Shapiro Wilk examined. The result means that there is a significant difference between the pre-test and post-test scores. There are still need improvement to make students think critically for the significant result improvement in STEM stages applied especially formulating the problem and thinking the ideas to determine the next stages such as making the project, designing the project, testing the project and solving the problem.

The creativity was also measured by the project students made from their concept mastery of the topic. Table 4.11 shows the results of students' projects for each group. The average score is 77%, categorized as high (Sugiyanto,2018). The results are in line with the hypothesis H_1. There are significant differences in students' concept mastery and creativity before and after the implementation of electrical circuit projects on the human circulatory system topics through STEM-based learning. The research demonstrates that the method can improve students' learning activity on science topics in the educational curriculum.

The dependent variables show significant value when compared before and after learning activities. However, there is just one dependent variable that gives considerable effect by implementing STEM learning: creativity. There are six stages in STEM learning activities. Based on the analyzed data, a designing stage improves students' creativity on the human circulatory system topic. The data shows 0.000 for the significant value for students' creativity, which is very substantial. The researcher analyses that there is no correlation between the two dependent variables, shown in Table 4.21; the critical value is 0.373, which means no considerable correlation makes just one that significantly improves students' creativity. The reason was that the method had never been used in the school learning process, especially in science subjects on blood circulation. Therefore, one group and the others exchange ideas for the worksheet. However, in the aspect of designing, students simulate the correct electrical circuit with their creativity through the web *Phet Colorado,* whose work depends on the skills and ideas of each group at different times.

5.2 Implication

According to the results of this research, electrical circuits serve as an effective tool for generating interest and mastery of concepts in science among students. The study found that students became more engaged and motivated to find solutions when they realized that the electrical tool did not work because of a misconnected circuit. In addition, the students showed togetherness in group discussions for all activities. Students find it confusing to start projects because they have never built a circuit before. Therefore, the researcher must explain the essential

tools that must be used and how to start building a circuit. Students ask many questions about tools and materials that can be used until it takes more time to answer and discuss these questions. To solve the problems found, the researcher presented the project by introducing the tools used and their relationship to the topic studied. In making the project, the researcher visited group by group so that students focused on paying attention to the methods or answers explained by the researcher to the questions that students asked. This activity was boisterous and chaotic because some students tested some tools, such as buzzers, which made the class uncomfortable. Therefore, the researcher ruled that groups that had finished assembling their projects were allowed to end the class early. So that all students can re-focus and complete their respective projects.

The electrical circuit project, which demonstrates the human circulatory system project and engages students' conceptual understanding and creativity, requires continuous use in science learning activities. This is because the electric circuit project can help students increase their concept mastery and interest in science, especially in schools that never conduct laboratory activities in science subjects.

5.3 Recommendation

After completing the study, the researchers draw conclusions and write a list of recommendations that need to be discussed. These recommendations include suggestions for improvement and areas that need attention. The following recommendations should be followed to achieve the desired results.

The achievement of students' concept mastery and creativity is measured through objective tests and electrical circuit projects, which are expected as primary information for the students to consider how to summarize the material to get a high score for academic achievement. As the result of this research, students should know about electricity, specially making circuits and be given more time to think about the idea of making something creative.

The analysis of the use of an electrical circuit project in learning the human circulatory system topic can be a reference and essential information for the teachers to assess students' concept mastery and creativity. Teachers must complete

the project before applying the activity to student learning if they want to use the electrical circuit project in a science learning activity. Thus, when the students find the problems, the teacher will have the answers and the correct solutions.

Objective tests and electrical circuit projects measure students' concept mastery and creativity. Due to the innovation in improving the same variable, both variables should have the correlation to achieve the objective research for the significant result. This study can be used as a reference for relevant research. The validation of the test items and the creative rubric should also be considered. Pay more attention to the preparation of the stages on stem learning if it will use the worksheet to ensuring students got the significant difference before and after implementing the STEM based learning. Another dependent variable can be observed for further research or even analogize another subject by using this electrical circuit model. Another suggestion can make modifications to the project that will be made for the learning process by adding blood circulation modeling.