CHAPTER V
CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

This research examines how using STEM-PjBL combined with EDP influences students' awareness of renewable energy and their ability to think critically. The project activities focused on building a simple hydropower or water turbine. Students were encouraged to engage in collaborative activities, become aware of environmental problems, and develop problem-solving skills that lead to practical solutions. Based on this, it was expected not only to raise students' awareness about renewable energy but also to enhance their critical thinking.

Both the experimental and control classes demonstrated improvement in renewable energy awareness from the pre-test to the post-test. However, when comparing classes, there are differences that show the experimental class that implements STEM PjBL with EDP shows better results. While the N-Gain analysis did not show a statistically significant difference between the two groups, the higher post-test scores in the experimental class suggest that the integration of EDP positively contributed to enhancing students' renewable energy awareness.

In the context of critical thinking skills, the two classes started with similar abilities. After treatment, both classes showed improvement, but the experimental class showed greater improvement in both post-test and N-Gain results, with a large effect size. The result is supported by the fact that the experimental class achieved a higher score than the control class, both in overall results and across each indicator. This suggests that EDP played an important role in enhancing students' critical thinking skills.

Further comparison of students' performance in STEM-PjBL EDP in the experiment class with STEM PjBL in the control class presents a significant difference. Meanwhile, a comparison of the STEM-PjBL stages only (excluding the EDP stages in the experiment class) showed no significant difference between the two groups. This result indicates the improvement in the experimental class caused by the additional integration of EDP stages.

Lastly, correlation analysis showed no significant correlation between students' performance and renewable energy awareness in groups using STEM-PjBL with and without EDP, and also no significant correlation between students' performance and critical thinking in groups using STEM-PjBL with and without EDP. These results indicate that students' performance does not directly reflect their outcomes. In contrast, the relationship between learning stages is stronger. The STEM-PjBL with EDP showed a very strong correlation with STEM-PjBL stages and a strong correlation with EDP stages. Among all stages, 'Create schedule' had the strongest correlation with students' performance in STEM-PjBL, while 'Communicate the result' was the most influential across EDP stages.

In conclusion, integration of EDP into STEM-PjBL has been shown to meaningfully enhance students' renewable energy awareness and critical thinking skills in the renewable energy topic. These findings highlight the potential of combining EDP with STEM-PjBL as a learning model to create meaningful and impactful experiences. Not only promotes conceptual understanding, but it also encourages collaboration, responsibility, hands-on activity experience, and solving real-world problems.

5.2 Suggestions

Future research is advised to provide a longer period for carrying out the learning process. In this study, the learning process was limited to two weeks and interrupted by one week's school break. With more time, students would likely have more opportunities to explore their ideas, refine their designs, and engage more effectively with each stage of the project. Given that the Communicate the Result stage showed the highest correlation with student performance among all EDP stages, further research is encouraged to focus on communication-related skills. This includes how students organize ideas, present their work, and reflect on their learning.

For the teacher, it is suggested to guide students not only in building the final product but also in how they make decisions, solve problems, and explain their

thinking throughout the learning process. Providing a longer time for presentations and peer feedback is also suggested to support deeper learning.