CHAPTER V
CONCLUSION, IMPLICATION, AND RECOMMENDATION

In this chapter, the conclusion which is drawn from results and discussion in previous chapter is presented. Furthermore, the potential implications of findings in this study will be discussed and recommendation for further research is elaborated afterward.

5.1 Conclusion

The lesson unit of blood circulation system using engineering design project facilitate students with diverse learning style to demonstrate and develop particular skills, understanding and attitudes. This study incorporated engineering design process into project based learning as a strategy to help students with various learning style to develop their collaborative problem solving skills, conceptual understanding, and attitudes toward science and engineering career. The results showed that in general all students demonstrated active engagement throughout the lesson. Findings revealed that students with visual learning style had opportunity to reflect upon and gain deeper understanding through designing prototype. Meanwhile aural students could learn best from discussion session during collaborative work. Read and write students could write down their understanding and the process of problem solving in engineering journal. While kinaesthetic students can explore science concept through hands-on activities for instance during creating and testing. In other words, students with varied learning style were facilitated to learn in ways that correspond to their learning style. Consequently students were able to demonstrate better performance on collaboration and problem solving skills, showed better conceptual understanding about disease in blood circulation system as well as had more positive attitudes toward science and engineering career.

During collaborative work within engineering design project, students were able to demonstrate collaboration skills in varied level which include participation, perspective taking and social regulation skills. On the other hand, after the implementation of engineering design in blood circulation system project

students were able to demonstrate higher level of problem solving skills which include task regulation as well as knowledge building and learning skills. Moreover students' able to show better conceptual understanding which includes understanding (C2), applying (C3), analysing (C4) and evaluating (C5) concepts related to disease in blood circulation system. In addition students tend to have more positive attitudes toward science and engineering career, especially in biomedical engineering and biologist career preferences which correspond to the learning experience that students have throughout the lesson.

5.2 Implication

This study has implications for helping us understand how the integration of engineering design process into science lesson could accommodate students learning style diversity while at the same time facilitate students to foster one of essential 21st century skills, namely collaborative problem solving skills. Moreover, the lesson exposed students to particular career in science and engineering field that influenced their aspiration to pursue STEM career in the future. Therefore, it will be a good effort to develop and implement more science lesson unit using engineering design project. Different science topic can be used as the context for learning through engineering design project to make students become well informed about various careers in STEM fields.

5.3 Recommendation

The findings and issues raised by the current study indicate several considerations for teacher in designing a lesson with engineering design project. First, teacher should ensure that the instructions given during the lesson can be understood by all students with varied learning style. This could be done by providing multiple instructions including oral and written instructions. Second, teacher could show the real construction materials instead of providing pictures only, so that the students know exactly the characteristics of each material. This may help them to decide the best material to be used in create step and eventually students can construct the solution more effectively. Third, students' low performance in recording data and applying mathematical procedures found in

this study suggests that students should be given more opportunity to communicate and handle the data that they obtained during testing. Finally, if possible, additional session could be done to let the students construct and test the improved design. Thus students can experience the process of engineering design which is iterative.

Issues raised by the current study also indicate potential avenues for future research. The current study was limited to 14 students. An experiment study with larger size of participant would be able to verify reliability of teaching strategy implemented in this study. Moreover, implementing causal comparative study could be done to provide clearer picture on how different learning style engaged in such strategy and eventually contribute to different achievement. Lastly, the short duration of the current study (two weeks) only allow for slight changes in attitudes toward science and engineering career. Study with longer duration is preferable to help ascertain significant difference in this aspect.