CHAPTER V

CONCLUSION AND RECOMMENDATION

A. Conclusion

Research of CmapTools utilization under five stage conceptual change teaching model that is adopted from Driver & Odham (1986 in Lin et. al., 2010) has been conducted systematically, based on the research result it is acquired some conclusions as follows:

1. Secondary students' conceptual change that is analyzed based on comparison of preliminary and post concept map construction shows significance of 50.92 % differences that is elaborated into concept map element based on Novak and Gowin criteria such as prepositions and hierarchical level in high category, cross links in medium category and example in low category.
2. Secondary students' cognitive learning outcomes after experiencing *CmapTools* utilization shows high category improvement based on normalized gain <g> as 0.86 that under four leveled of cognitive taxonomy; from C1 until C4.
3. The implementation of five-stage conceptual change model by utilizing *CmapTools* as prototyped media in helping students to construct concept map is capable to improve secondary students' cognitive learning outcomes based on statistical calculation result that indicates strong correlation as value of correlation coefficient (r_{xy}) is 0.78.
4. Secondary students' response towards *CmapTools* utilization is positive in all indicators; impression of improvement in learning Physics, interest and motivation towards Physics lesson, improvement of behavior aspect towards Physics lesson, and cognition towards the benefits of *CmapTools* feature.

B. Recommendation

Based on the findings of the research that has been conducted and concluded, there are several recommendations that necessary to be conveyed by the researchers as follow:

1. It is recommended for the other researcher to make a research about mapping conceptual change by utilizing *CmapTools* to analyze cognitive learning outcomes in others topics with higher level of cognitive level at evaluating (C5) and creating (C6) aspect by integrating it into project based learning.
2. Time allocation should be well-arranged in developing the conceptual teaching model so that efficient time with better result can be obtained.
3. Before designing or adapting a learning model, teacher should be able to adapt with new characteristics of students based on their learning style.
4. Teacher has to concern with every students' need in conducting treatment therefore they will be not feel being pressured and learning atmosphere can be more enjoyable.
5. In conducting introduction of concept map that describes its elements such as propositions, hierarchical levels, cross links and examples, it is highly recommended to directly train students how to build concept map by using concept bank in order to stimulate students to classify and organize their prior conception. Concept bank can be made by using small papers that attached on the whiteboard.
6. For the researchers, it is suggested to build good communication with related subject teacher at school in order to overcome and minimize obstacles such as providing equipment for experiment and demonstration using local resources materials if school does not provide it.
7. For further researchers, it is suggested to distinguish characteristics between concept map and content diagram based on the inclusion of linking words and cross links.