CHAPTER V
CONCLUSION AND SUGGESTION

5.1 Conclusions

Based on the research that has been done, it can be concluded that:

1) Learning materials and Virtual-Based Learning Media have been developed with 4D model to support Project-Based Learning on the topic of Centrifuge Analysis, consisting of 3 sub-chapters, namely description of centrifuge analysis, types of centrifuges, factors that affect centrifuge. The media also provides videos and quizzes.
2) Project Based Learning has been developed with the topic Centrifuge Analysis which contains 5 projects, namely separation of components in wheat flour using the centrifugation method, separation by centrifugation method in cow's milk fat, the effect of centrifugation speed on the characteristics of aloe vera extract , separation of components in coconut milk by centrifugation method, separation of soy milk by centrifugation method.
3) Project standardization has been carried out on learning materials with the Centrifuge Analysis topic project. Respondents gave positive responses (3.51) and the components assessed were the average feasibility of content 3.78, the feasibility of language is 3.46, the feasibility of presentation is 3.50, the feasibility of graphics is 3.26 which means that the innovative learning media is valid and good to use.
4) Implementation of Virtual-Based Learning Media as a Support for Project-Based Learning has been carried out in the classroom in Centrifuge Analysis learning, and the results show that there is a significant difference between students' achievement obtained by innovative learning media with project-based learning compared to students that don't use innovative learning media, the students who

use innovative learning media give better results than the students who don't use innovative learning media in doing the project based learning. Moreover, it also happens a percentage increase in student learning outcomes of students who were taught by learning model project based learning with innovative learning media amounted to 72.11% greater than in control class amounted to 58.92%.

5) Virtual-based learning media as a support for project-based learning in centrifugal analysis learning significantly increases students' competence in Analytical Chemistry, where $t_{count} > t_{table}$, which is 4,398 > 1,674. So, based on the basis of decision making through a comparison of the calculated t_{count} with t_{table}, it can be concluded that H_0 is rejected and H_a is accepted. Which means, there is a difference in the average student learning outcomes between the control class and the experimental class or in other words the application of a project-based-learning model using innovative learning media and those who do not use innovative learning media will produce different learning outcomes.

5.2 Suggestions

The outcomes of this research recommend chemistry teachers to implement the kind of learning model due to its effectiveness and significances compared to direct instructions one on the teaching of centrifugation based on KKNI. The overall results of this study implications for future researchers who may be interested in studying the effectiveness of innovative learning media with project based learning.

Because this study limited the scope of research which is to chemistry students in a college with cognitive aspects C4-C6 only, so that, the future researchers could enlarge the scope of the research by examining this kind of learning model to elementary school, junior high schools or senior high schools, analyze other learning outcomes, achievement standard C1-C6 of Bloom’s taxonomy level, according to the sample that will be examine.

For perfection of this research, future research could include additional variables which may give contribution to students’ cognitive and affective aspects

such as examining the effectiveness in improving students' learning outcomes, and their character also. Furthermore, investigating the similar and different researchers about innovative learning media are really required to develop this own learning model, especially in science education quality in Indonesia globally.

Some of the obstacles encountered during the research, namely, the first is the difficulty in adjusting the time. It is expected that researchers will conduct research at least not a week before or after midterm and final exam. Because, during that time, students will be preoccupied with their assignments. Also in collecting assignments, it is hoped that researchers will always remind students, so they don't forget to do the assignments given by researchers.