CHAPTER V
CONCLUSION, IMPLICATION, AND RECOMMENDATION

5.1 Conclusions

The research on the effect of gender composition in grouping toward student collaboration, communication, and concept mastery in the implementation of STEM-Based Learning has been conducted systematically following the applicable stage of the mixed method. Based on the research result and analysis, it is acquired some conclusions as follows:

1. Gender composition in grouping actually gives the difference on students collaboration, communication, and concept mastery when it is implemented in STEM-Based Learning for the topic of pressure and the Pascal Law. The students in single gender group (experiment class) get the better result and increment in terms of their collaboration, communication, and concept mastery than the students in mixed gender group (control class).
2. In terms of collaboration skill measured in this research, three of five aspects has given the significant result, such as engagement in teamwork, relationship in teamwork, and team reporter performance. While, in terms of communication skill measured, four of six aspects that indicates the signifcant result are clarity of message, questioning and asnwering, arranging non verbal and voice, and giving introduction.
3. Those significant differences on collaboration and communication are affected by some factors, such as the characteristic between boy and girl students, like the level of confidence, the perspective toward science and mathematics, boys domination, the leadership skill of students, and even the environmental factors that affect the brain development of theirs. Boys have more confidence in scienca than girls because they do like problem yet girls don't. The boys dominance in laboratory investigations was particularly frustrating to a grade eight girl who commented that the two girls in her group were allowed only to collect things that were needed. In the single gender group, girl students are forced to accomplish the project by themselves

without any helps from boy students, meanwhile project based learning usually involving girl students on handling something unusual, like something that needs boys' touch. In the mixed gender group, the domination of boys students has not been avoided. It is caused by boys students take their role as leader automatically and girls students tend to put their believes on boys especially in handling something unusual for them. Besides that, all side factors related possibly make the difference to the process of collaboration and communication itself especially when girl students involve in project based learning. When faced with a difficult problem, girls are less likely than boys to persist. Girls are more likely to avoid tasks in which there is a likelihood of failure. Somehow, they don't believe in themselves, and they have not subjected themselves to the most challenging learning situations. In STEM Based learning with single gender group, the girls are forced to think and to do everything by themselves. Another reason is that boys consistently held more favorable attitudes toward science than girls, even though girls were more interested in school and school learning in general. Boys students indicate that science was easy rather than difficult to learn, whereas girl students were less positive about the ease of learning science. This thing also pushesgirl students to persist in a situation they might dislike. That is why the collaboration and communication in the single gender group is a bit different than in the mixed gender group in some aspects of both collaboration and communication.

5.2 Implication

As this research has given some conclusions, then the implication of this research is STEM-Based Learning can be implemented in the science class to evolve students collaboration, communication, and concept mastery. STEM-Based Learning which involve students in a teamwork and expect them to accomplish the project based on their scientific and critical analysis has successfully create a learning athmosphere in which students can have more collaboration and

communication among peers and it implicates to their achievement in concept mastery.

Besides, the main implication of this research is that the teacher also should consider how to construct students in group. Based on the result of this research in which there is significant different on collaboration, communication, and concept mastery between students in single gender group and mixed gender group, then teacher can consider this aspect when conducting STEM-Based Learning which involve project indeed. This is done to stimulate girl students to used to have similar experience as well as boys students.

5.3 Recommendation

Based on the findings of the research that has been conducted and concluded, so the consideration that this research need to be developed further is appear indeed. Following up this case, then this research give such recommendations not only for the future researcher but also the teacher who may implement STEM-Based Learning, some of them are:

5.3.1 For future researchers

1. Before having the research about STEM, the researcher should consider and make sure some factors, such as school curriculum, school environment, school facilities, students characteristics, and subject matter appropriateness, and the learning objectives as well. It all will help all of steps in STEM-Based Learning run smoothly. Moreover, if the research is going to be conducted in the school which implement STEM-Based Learning for the first time.
2. Conducting STEM-Based Learning includes the project based learning requires sufficient time, so the researcher and also the teacher in the school have to be thorough in determining the time allocation. It means that the researcher and also the teacher should have a good cooperation to create a good and effective STEM-Based Learning for students.
3. The research about collaboration and communication not only need some instruments to measure those aspects, but also the advantages of video

recorderand audio recorder is very helpful. The researcher should prepare for all equipment that support all recording process in each group during all steps of research. Make sure that each group has its own taperecorder and camera so it will record the whole activitie sof students during discussion. These things are used to strengthen the value of the research itself so that the result will be valid and acceptable. Besides, all the description will be clearly explained and it will ease every researcher to analyze what is actually being happened on discussion and resulting the precise result.

4. The researcher should pay more attention to the construction of worksheet as this part will have the crucial role toward the success of STEM-Based Learning itself. It will define whether students will be easier or not in having project.
5. To other researcher who also have the same interest about this research, it is most recommended to develop the research wider in term of research variable, subject matter, science, or mathematic concepts, and also the lesson plan.

5.3.2 For teacher

1. Handling students in STEM-Based Learning will be more challenging as so many preparations that should be managed first, so the teacher need to encourage her/himself when conducting STEM-Based Learning.
2. The teacher should be more skillfull in stimulating students in having discussion during the project. This is to make sure that the collaboration and communication among students in group is really happened. Besides, teacher also should stimulate students to finish all the steps of learning, like having designand fulfilling worksheet.
3. The teacher should be very clear in giving all instructions in all of steps in STEM-Based learning. This is very helpful to create the learning athmosphere more effective and all is done on the time of allocation.
4. Instead of the researcher, the teacher will be the one who knows everything about the students, so when the research about STEM-based learning is being conducted, it is important for teacher and researcher to discuss everything

related to the research and the current situation of his/her class. This is not only give the benefits for the researcher in terms of the successful research, but also the teacher and students in terms of having the meaningful learning in the science class.

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