Challenging student to play the ladder snake game “finish your mean” to improve students’ communication and collaboration

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Abstract. Challenging student to do the exercises with speed and focus through the game is a fun lesson. This study aimed to improve the communication and collaboration of students in learning mathematics using Problem-based learning with the help of ladder snake game “finish your mean” to replace daily exercise. The subject in this study is eight grade in public school in the village, precisely in Bantul, Indonesia. The number of students is 29 students in the school year 2018/2019 and have an age range of 13 to 14 years. This study was conducted with a quantitative methodology. Data collection techniques used in this study were questionnaire and observation sheet. Data analysis was obtained from questionnaire with t-test and observation sheet with percentage of learning implementation This study conclude that the ladder snake game helped student to improve students’ communication and collaboration through Problem-based learning.

1. Introduction

Mathematics exercise are important in understanding the subject of the material being learned, but daily exercise is very boring to do [1]. The problem that arises were not particularly interesting or boring because of text filled with full of exercises, also restrict the freedom of students to find their own answers [1]. Therefore, with the help of a game in mathematics, challenging students to contribute in a fun learning to learn [1]. Games in mathematics supporting and facilitating students to develop not only cognitive abilities but also social skills [1,2]. The game does not require special skills to get an answer from the given problem [3], but the participation of the learner [1]. Students require teamwork and communication among members of the group were good, so that they enjoy the activity in the game and find that it is meant to develop their cognitive abilities and social skills [1,4].

This study integration of traditional games in the middle school. Several studies discuss about traditional game in mathematics focused on elementary school, and the aspect in motivation [5-7]. Their results have a positive impact on student motivation. But students need to learn appropriate social skills, so that the behavior is to encourage positive interaction with others and the environment [8,9]. It is important to students to have a positive rather than a negative self-concept [10]. Positive or negative emotions of students in the learning process is social related to interaction with classmates instead of
Social skills such as participation in group activities, helpfulness, and communicating with others [8,13]. Each student is a team worker in their group who supports and builds on other people’s strength and underpins their weaknesses. Students tends to be skilled at actively listening to each other [14,15], active listening is one of indicator of communication aspect define by paying close attention to what is being said asking the others to explain exactly what he or she means, and requesting that ambiguous ideas or statements are repeated [16,17]. Students also tends to be skilled at facilitating communications within the group and dealing with difficult interpersonal situations [14], the terms social skills and interpersonal skills are often used interchangeable [18]. Interpersonal skills capacity for 21st century skills were work creatively with others, communicate clearly, and collaborate with others [16,17]. Collaboration among peer and communicate student-student and student-teacher including students’ ability to develop their social skills.

Improve students’ communication and collaboration requires the suitable of learning process, so that students continue what their team work did to play the ladder snake game. Teachers needed to act as a facilitator in the learning process, so that students work in groups to solve the problem that given by teacher, and responsibility to solve the problem with their group [19,20]. This characteristic leads to a learning process that will improve communication and collaboration provides students with a problem to the students. Problem-based learning works well with all students, making its strategies ideal for heterogeneous classrooms where students with mixed abilities can pool their talents collaboratively to invent a solution [21]. It is clear that in one class have different abilities, so that they can communicate and collaborate to exchange ideas in the learning process. Problem-based learning is a student-centered approach in which students, in a collaborative environment, generate various solutions to what are often perceived as real-life problems using their existing knowledge and new information acquired through surveying different resources [22]. In other hand, Problem-based learning as an instructional approach by which students learn by tackling challenging and open-ended problems or issues in the teaching and learning process in mathematics [23,24]. The stage of problem-based learning used in this study were orient the problem, problem analysis, discovery and reporting, presentation and evaluation [21,25].

Considering how important mathematics exercise [2] and the purpose of the education system that discusses social capabilities from various countries states that social skills are important from all ability standards and various levels of education [26], problem-based learning creates an active learning environment where students can develop and improve communication and collaboration with games as a replace daily exercise. Then several studies that provide positive results that learning with games are well-accepted and appreciate by student [27,28], also games using application in iPad, mobile phone, and computer has been studies by Katmada et al., Chang et al., and Pedersen et al [4,27,28]. Not all school in the village have that facility because the school only have computer rooms which are used interchangeably with other classes and the numbers are limited.

Based on descriptive above, this study aimed to improve the communication and collaboration of students in learning mathematics using problem-based learning with the help of ladder snake game to do the exercises and complete the learning. That matter means to replace daily exercise of mathematics to fun exercise. The ladder snake game is a traditional game that is presented in the form of sticking on the blackboard. So that, the students can see even from a distance.

2. Experimental method

The subject in this study is eight grade in public school in the village, precisely in Bantul, Indonesia. The number of students is 29 students in the school year 2018/2019 consisted 13 males and 16 females. The student has an age range of 13 to 14 years. The time used in this study is 200 minutes. This study was conducted with a one group quasi experimental with pretest-posttest design. Data collection techniques used in this study were non-test instrument by questionnaire and observation sheet. Non-test instrument by questionnaire interpersonal skills have two aspects were communication and collaboration. There were five answer option in questionnaire and every statement consisted positive
and negative expression with Likert scale items, namely always, often, sometimes, rarely, and never. Observation sheet using two scale to checklist 1 if suitable with the stage of lesson plan and 0 if it is not suitable with the stage of lesson plan.

The procedure of this study were followed by choosing the class to be tested, pretest by giving the questionnaire before treatment, dividing students in several groups, the process of Problem-based learning, do the exercise with play the ladder snake game with the same group, given posttest questionnaire after the learning was complete. The way to play ladder snake game like in general. The group that answers correctly from the given problem can throw the dice, the number that appears means the number of steps. If their group met stairs, it is means up and if their group met snake, it is means down. The first group to arrive at the finish line, win the game.

Data analysis was obtained from questionnaire with checking normality with Shapiro-Wilk and homogeneity with Lavene test. If the data was normal and homogeny, data analysis can be continued with t-test. Data analysis was obtained from observation sheet with percentage of learning implementation.

3. Result and discussion

Problem-based learning is a model of learning to create situation that student in the centered of learning [29], so that student will be learning by doing. Play the ladder snake game help the student to do the exercise involving cognitive abilities and social skills. The way to find that communication and collaboration of students in the learning process using problem-based learning with the help of game to change the daily exercise increases, by looking at what they know about themselves through a questionnaire after and before treatment. First, pretest and posttest data the test of normality and homogeneity, then used t-test to know the increasing of two aspect of social skills. The analysis of questionnaire results obtained in Table 1.

| Questionnaire | Mean   | Sig. Normality | Sig. Homogeneity | Sig. Difference of Two Mean |
|---------------|--------|----------------|------------------|----------------------------|
| Pretest       | 58.345 | 0.815          | 0.317            | 0.00                       |
| Posttest      | 66.551 | 0.342          |                  |                            |

Table 1 shows the results of data analysis that both of data are normal and homogen distribution. Assumption test is done, so that paired t-test can be implemented. Analysis data above given an explanation that after the treatment more promising to implemented than before the treatment.

| Meeting | Teacher Activity (%) | Student Activity (%) |
|---------|----------------------|----------------------|
| 1       | 84%                  | 84%                  |
| 2       | 92%                  | 90%                  |
| 3       | 80%                  | 88%                  |

Table 2 shows the percentage learning implementation in every meeting with 200 minutes. Learning implementation is stages of the process in problem-based learning. In general, the observation of active student engagement in learning better. This is evident from the enthusiastic students asking questions and doing worksheets. Student want to know more to complete student worksheet before teacher ask the student. The process of learning is done, so that the student do the exercise with play the game presented in Figure 1 and Figure 2.
Figure 1 shows that students do the exercise with speed and focus in play the ladder snake game. The students communicate each others to answers the question given by teacher. Figure 2 shows that after the group correctly answer the question, teacher give them dice to throw and do the step according the number that appears. Hence, student can stick the paper in ladder snake game.

Every students have a different thinking about what they want and not want to do. In the process of learning, students look very enthusiastic follow the game. A student tells that he likes learning with friends, so he can express ideas in understanding the material and doing exercises. Collaboration leads the student to share their ideas with other students [30]. In line with Chen et al. [31] their study results, student who doesn’t understand the problem will helped by the member group with give an opinions. Collaborative also allows the students to help each other and discuss difficulties when encountering problems [31]. Another students look very enthusiastic, but she tells that she more likes individual learning than learn with her friends. Working with teams in play the ladder snake game increases students’ awareness of the importance of communication and collaboration among group members. These results was also stated by Chen and Hwang with team games for competition improved students’ awareness of their collaboration and communication competences as well as their collective efficacy [32], so students can discuss well with the group and also compete well with other groups. Students feel the crowded environment of communication and collaboration with their team. The results of this study in line with other studies that emphasize the importance communication and collaboration in game to learning [31-33] and traditional games are still needed as a cultural practice instructional tool. [7,34,35].

In the end of learning, students discuss more about their answers in the game than ask when the class ends. This is why teacher need to teach the student how collaborate with other peers. Collaboration is also an important instructional strategy, especially when used in conjunction with project- or problem-based learning [11]. When teachers assist children to learn the social skills that are needed for success in their homes, schools, and communities, they are building a strong foundation for everyone for many years to come [8]. Students in 21th century should can develop their social skills, so that they can easily adapt, flexible with others, know when it is appropriate to listen and when to speak, responsible to others, and open mindly [14].

4. Conclusion
Based on data analysis in result and discussion, it answers the improvement of students’ social skills if their daily exercise replaced by the game. The main results of this study showed that students’ communication and collaboration can improve through problem-based learning with the help of game to replace daily exercise. The implication of this study, students more active to learn with their friends.
to improve not only cognitive abilities but also social skills. This study recommendation is play the game in mathematics learning can be used as an alternative to develop students’ social skills and replace boring daily exercise.

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