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THINK-PAIR-SQUARE LEARNING: IMPROVING STUDENT'S COLLABORATIVE SKILLS AND COGNITIVE LEARNING OUTCOME ON ANIMAL DIVERSITY COURSE

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ABSTRACT

Empowering collaborative skills and optimizing learning outcomes are essential goals in every course. The aim of this study was to determine the effect of Think-Pair-Square (TPS) learning model on student collaborative skills and their cognitive learning outcomes. This study was Lesson-Study-based Classroom Action Research (CAR) carried out in two cycles. The subjects of this study consisted of 32 students who took Animal Diversity course. The CAR consisted of four phases i.e. planning, action, observation, and reflection. At the action phase, LS was conducted and consist of Plan, Do, and See. The instruments used were LS observation sheet, collaborative observation sheet, and cognitive test. The observation and test results of the both cycles were calculated and compared each other. There were improvements in the both student's collaborative skills and cognitive learning outcome as high as 14% and 7.56, respectively. Therefore, TPS model can strengthen the student's collaborative skills and cognitive learning outcome.

***Keywords**: cognitive learning outcome; collaborative skills; Think-Pair-Square*

INTRODUCTION

Education is a process that facilitates a person or group of people to gain knowledge, skills, and attitudes. Education can be managed in formal or informal setting. Formal education is divided into several levels, namely early childhood education and kindergarten, elementary school, secondary school, and higher education. Some levels of formal education can be experienced in various educational institutions, both public and private.

The purpose of various educational institutions in carrying out the process of education is to develop the nation intellectual life. By achieving the goal, the community can build a nation with good moral through education. To meet these objectives, not only does the learning process need to emphasize the concept understanding which is reflected in learning outcomes (Fauzi, 2013; Sukmawati, Ramadani, Fauzi, & Corebima, 2015), but it also should ensure the empowerment of skills needed in 21st century era, such as metacognition (Ramadani, Fauzi, Sukmawati, & Corebima, 2015), critical thinking skills, and collaborative skills (Ladd et al., 2014).

Collaboration is one of social interaction form in society. Thus, the skills needed in the interaction must be possessed by students as they graduated (Huang et al., 2010; Ouellet, Sabbagh, Bergeron, Mayer, & St-Onge, 2016). Consequently, the efforts in empowering collaborative skills is essential. One of the learning conditions support the efforts is by setting the students to face some communal problems.

However, based on the observation results toward B class students in 2016 academic year of the State University of Malang on animal biodiversity course on September 30, 2017, the ability of students during working in their teamwork was relatively limited. Yet the students solved the problem given without any discussion. This evidence indicated that the students' collaborative skills were not empowered yet. These skills belong to social behavior for students in which important to be developed in their social life. Thus, it is necessary to design the learning which develop

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the skills through observing and improving the learning process itself.

Problems that arise in the learning process, including problem in empowering some important skills, is a condition that must be solved by educators. The effort to overcome this kind of learning problem is aimed to increase the learning process. In overcoming various problems that arise, various ways can be used as solutions to solving the problem. Various solutions have been reported could solve learning problem in biology learning, such as through the development of learning media or learning source (Fauzi, 2017; Widiansyah, Indriwati, Munzil, & Fauzi, 2018), the use of model organisms (Fauzi & Corebima, 2016c, 2016a, 2016b), the application of research activities in the learning process (Fauzi, Corebima, & Zubaidah, 2016; Fauzi & Ramadani, 2017), as well as the application of cooperative learning (Fauzi, 2013; Ramadani et al., 2015).

Cooperative learning is learning model that classifies students with the aim of creating a learning condition that effectively facilitate the improvement of social skills (Lavasani, Afzali, & Afzali, 2011; Lie, 2005; Strebe, 2013; Suprijono, 2009). The advantages of implementing cooperative learning are to give opportunities to students to express and discuss the learning material. The cooperative learning is a learning form that covering all types of group learning. Through cooperative learning, the teacher assigns tasks and questions and provides materials and design information to help students to solve the problem.

Think-Pair-Square (TPS) learning model is the modification of Think Pair Share model that developed by Spencer Kagan (Fisher & Frey, 2014; Lapp & Moss, 2012; Strebe, 2013). TPS provides students the opportunity to work on their own and work with the others. The syntax of TPS is basically similar as Think Pair Share. First, the students think for themselves. Second, the students discuss with their partner. Finally, the students make a group that consists of four members to solve the existing problems. Due to the possibility of conduct problem solving activities during learning process, TPS probably can facilitate the improvement of students' collabarotaive skills. Some previous studies used this cooperative learning as the alternative solution to solve the problem in the learning process (Erra, Portnova, & Scanniello, 2010; Erra & Scanniello, 2011; Karyawati, Murda, & Widiana, 2014; Magsino, 2014; Scanniello & Erra, 2014; Tahueyo, Martawijaya, & Azis, 2013)

Beside collaborative skills, learning outcomes are one of the goals to be achieved in the learning process (Buku, Mite, Fauzi, Widiansyah, & Anugerah, 2015; Fauzi, 2013; Ramadani et al., 2015). The results achieved by the students give an information about the position of their academic success compared to others. Learning outcomes can be measured through tests that are often known as learning result tests. Moreover, the result of the test can reveal the quality of the learning.

Previous reports have reported the potency of implementing TPS in classroom learning. Several previous studies informed the implementation of TPS can improve student comprehension of learning material (Bennett, 2012; Hermiati, 2017). Several other reports have reported that the application of this learning model may improve critical thinking skills (Sumaryati & Sumarmo, 2013), creative thinking skills (Utami, 2014), communication skills (Talat & Chaudhry, 2014), and learning outcomes (Isharyadi, 2015; Januartini, Agustini, & Sindu, 2016; Karyawati et al., 2014; Tahueyo et al., 2013), beside also have impact on students' participation (Zainollah, 2014) and students' motivation (Januartini et al., 2016) during learning process. However, no reports have reported the application of TPS as a solution to improve learning outcomes as well as students' collaborative skills. In fact, the stages of the learning process in this model facilitate students to empower their collaborative skills.

Based on the problems found in the Animal Biodiversity Class and based on the potency of TPS model in empowering the learning outcomes and collaborative skills, classroom action research (CAR) would be conducted in the B class that followed Animal Biodiversity course. Moreover, Several recent CAR reports have informed that LS-based CAR implementation can provide the learning process more optimally (Buku et al., 2015; Mustofa et al., 2016). Therefore, in order to improve the learning process, lesson study would also be conducted on this CAR

METHOD

This study is a Lesson Study based-Classroom Action Research (LS-based CAR).

The research was conducted in the Department of Biology Education, the State University of Malang in Animal Biodiversity Course. The research subjects were B class students in 2016 academic year. This CAR consists of two cycles, the first cycle consists of three meetings, while the second cycle consists of four meetings. The course material taught in cycle 1 was "Low Cordata", while in cycle 2 was "Mammalia".

Each CAR cycle consists of four phases, namely planning, action, observation, and reflection. Meanwhile, LS was composed of three phases, namely plan, do, and see. In the planning phase, the lecturers collaborate with LS members to design the lecture plan and arrange the lecture plan at the next meeting. The lecture plan is focused on the student-centered learning process. Learning model that was planned in this research was TPS. Learning phase in this model was: 1) "Thinking", the lecturer asks a question or issue related to the lesson and asks the students to think independently to solve the issue; 2) "Pairing", the lecturer asks the students to pair up and discuss what they think. Interactions during this period can facilitate the students to share their answers to their teammate; 3) "Square", in this final step, the lecturer asks both of partners to meet again in a group of four. The students have the opportunity to share their work in a group of four.

In the do phase, there were two main activities, namely: (1) learning activities conducted by lecturers that practice the lesson plans that have been prepared together, and (2) observation activities conducted by other LS members. At the see phase, LS members review the lecture process that has been implemented and the proposed improvement of the next meeting.

The research instruments used include of; 1) observation sheets of LS activities; 2) collaboration skill observation sheet; and 3) cognitive tests. The second and third instruments were used as a means of collecting data on collaborative skills and student learning outcomes. Therefore, the collaborative skills data were obtained from observation result by the observer and cognitive learning outcomes data were obtained from the test result. Some of the indicators used in scoring collaborative skills, were 1) positive interdependence; 2) face-to-face promotive interaction; 3) individual accountability and personal responsibility; 4) interpersonal and small group skills; and 5) group processing. The results of the collaborative skill assessment observation were analyzed by using Formula 1 (Purwanto, 2014).

$$Np = (R/SM) \times 100\% \quad (1)$$

Information:
Np : percentage rate of achievement collaborative skills
R : the total score of all obtained points
SM : the maximum score of the total points

At the end of CAR cycle, both collaborative skill and cognitive learning outcomes were analyzed to know the improvement of those parameters from cycle 1 to cycle 2.

RESULTS AND DISCUSSION

The calculation of students' collaborative skill at Cycle 1 and Cycle 2 can be seen in Table 1 and Table 2.

Table 1. The average score of all the collaboration skills in cycle 1 and cycle 2

Cycles	Average (%)	Deviation	Conclusion
1	79	-	-
2	92	14	Increasing

Table 2. The calculation results of collaborative skill in cycles 1 and 2

Collaboration skill	Cycle 1 (%)	Cycle 2 (%)
Positif interdependence	80	87
Face-to-face promotive interaction	86	96
Individual accountability and personal responsibility	88	96
Interpersonal and small group skills	80	95
Group processing	61	88

Based on Table 1, student's collaborative skills scores increased by 14% from cycle 1 to cycle 2. Furthermore, based on Table 2, improvement of students' collaborative skills occurred in each indicator. Each indicator has increased more than 5% and the indicator "group processing" is an indicator that the greatest increase, from 61% to 88%.

The results of this study are in line with some previous research reports that also used cooperative learning model (Ding et al., 2014; Talat & Chaudhry, 2014). The improvement of

collaborative skills through cooperative learning due to in this learning students are divided into small groups, whereas each group member has different abilities. Each member of the group is responsible not only for learning the material but also learning to help friends in one group.

Related to the implementation of TPS, the increasing of collaborative skills from cycle 1 to cycle 2 shows that the TPS learning model could empower the students' skills in the collaborating with each other. In collaborative skills, several skills related to the collaboration process among students is required. In connection with this, several previous reports reported that the application of TPS learning model is able to empower and improve students' communication skills (Talat & Chaudhry, 2014; Zainollah, 2014), students' social skills (Apriliyani, Wasis, & Supardi, 2015), as well as speaking skills (Lubis, 2014).

If TPS is analyzed in more depth, in this learning model, students' collaborative skills can be raised at every stage of the TPS learning model. The first stage, Think, is aimed to introduce the concept of matter in the presence of a given phenomenon. Moreover, at this stage, students will think individually about an existing problem since it can open self-awareness in solving a problem by working together. At the stage of Pair, students work in pair to solve problems, in which case a paired discussion will appear. In the last stage of the Square, 2 pairs of groups will merge into one group to discuss the existing problems so that the discussion will proceed actively (Fisher & Frey, 2014; Lapp & Moss, 2012; Strebe, 2013).

Furthermore, TPS learning model is a model of cooperative learning that requires students to work together in solving a problem. TPS learning model also gives students the opportunity to work on their own and work with others and optimize student participation. Moreover, The TPS model provides at least eight times more opportunities for each student to be recognized and show their participation to others. This explanation is in line with Anas, Atmoko, & Suyono, (2012) that explained the TPS learning model allows the students to work individually or in groups as well as optimize student participation. This condition is essential to empower collaborative skills. Moreover, this learning model has also given more opportunities to each student to be recognized and show their participation to others (Lie, 2005).

In the second parameter, students' cognitive learning outcomes were also improving from cycle 1 to cycle 2. The improvement of students' cognitive learning outcome as high as 7.56. The data on students' cognitive learning outcomes are presented in Table 3. The results of this study that indicate TPS could improve students' learning outcome are in line with some previous reports (Isharyadi, 2015; Januartini et al., 2016; Karyawati et al., 2014; Tahueyo et al., 2013).

Table. 3 The average result of cognitive learning in cycle 1 and cycle 2

Cycles	Avarage (%)	Deviation	Conclusion
1	77.94	-	-
2	87.50	7.56	Increasing

Learning experiences that occur in a learning process will affect the achievement of student learning outcomes (Sudjana, 2017). In this regard, the use of appropriate learning models will have a positive impact on student learning outcomes. These positive results are often caused by the selection of instructional models that lead students to be active during learning (Savitri & Wahyuni, 2013). Related to the statement, a previous study has informed the implementation of TPS could facilitate students to more active during the learning process in class (Zainollah, 2014). The reason, the implementation TPS learning model will give students the opportunity to discuss possible ideas and the solutions for a particular problem through discussions activities (Scanniello & Erra, 2014).

Related to its syntax, TPS learning model designed a paired group consisting of 2 students and each group will discuss and solve the given problem (Januartini et al., 2016). From this activity, the quality of learning will improve due to students will more engaged with learning process through interviews, discussion, as well as question and answer activity (Suyanto, 2008). Furthermore, through TPS learning model, it provides an advantage to students to discuss their ideas and provide an opportunity to understand problem solving in different ways. All of these activities will facilitate students to better understand the concepts being studied.

Collaborative skills and cognitive learning outcomes are two essential components and need to be empowered during learning. If students are not getting an optimal achievement on one or both of these parameters, it may be caused by a less precise learning process. Therefore, the selection of appropriate learning models is one key to success in facilitating students to achieve optimum competence. One of the appropriate learning models, in accordance with the results of this study, is TPS.

CONCLUSION

TPS is one of the learning models that potentially empowers collaborative skills and cognitive learning outcomes. Through this research, this potential was proven. Students' collaborative skills and cognitive learning outcomes of students have improved after class B students at Biology Department, State University of Malang followed Animal Biodiversity course which applying TPS learning. Based on these findings, it is recommended for Biology educators to apply the TPS learning model as one of the learning alternatives in their class.

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