Improving Student Ability in Collaborative Problem Solving (CPS) Using the Power of Two (TPOT) Model

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Improving Student Ability in Collaborative Problem Solving (CPS) Using the Power of Two (TPOT) Model

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ABSTRACT

The purpose of this study was to find whether the Power of Two (TPOT) strategy was effective or not to improve the ability of students in solving a problem collaboratively. The research uses action research within a pre-experimental design. The study involved an experimental group consisting of 36 students in grade VIII of Junior High School in Gorontalo District, Gorontalo Province, Indonesia. This study employed a collaborative classroom action study method conducted in two cycles using instruments in the form of observation sheets and questionnaires on the ability of students to collaborate in solving a problem by applying the TPOT model. The results of this study reveal that the observation of students' ability to solve problems collaboratively increased from the first cycle to 74.58% and in the second cycle to 84.45%. The application of the TPOT model was able to improve the ability of students from the initial assessment in the first cycle 69 % to the second cycle 86 % and the questionnaire on students' ability to collaborate to solve problems greater than before Cycle I, 75.56 % and Cycle II 88.89 %. The research concluded that the TPOT model can improve students' ability in Collaborative Problem Solving (CPS). Research recommendations necessitate using the TPOT model as one of the strategies to improve students' ability to collaborate in problem solving.

Keywords: Assessment, collaborative, problem solving, student, TPOT model

Introduction

Social Sciences or in Bahasa *Ilmu Pengetahuan Sosial* is one of the subjects in the national education curriculum devoted to examining events, facts, concepts, and generalizations among humans. These subjects are designed to develop knowledge, understanding, and analytical skills on the social conditions of a dynamic society (Omiyefa & Lijadu, 2014; Sunal, 2005). The purpose of social science subjects is to direct students to become democratic and responsible Indonesian citizens that love peace and justice (Shiveley & ve Misco, 2009; Yamin & Bansu, 2012).

Indonesia still experiences numerous problems in implementing Social Sciences learning, such as the preparation of Lesson Plans (RPP) not oriented to the situation, factual conditions, and students' needs (Wiryohandoyo, 1998). Social Sciences are sometimes misunderstood as a rote lesson, which leads to learning that emphasizes more on verbalism. The learning process associated with these subjects is teacher-centered, with less emphasis on student activities (Henderson., 2010; Thobroni & Mustofa, 2013). Teacher-centered learning is less varied and conventional, making them bored and less motivated during the learning process (Daldjoini, 2000; Suprijono, 2009), because it requires students to sit, be quiet, take notes, listen, and memorize. Teachers pay less attention to students' differences in the learning process due to minimal media, which only relies on school textbooks.

Generally, students feel bored and pay less attention when they convey the subject matter alone with their contribution. Intelligent students seem to master the learning material faster, while those that are less intelligent are left behind. This passive behavior is certainly a problem for teachers because this fact greatly affects students learning outcomes (Fathurrohman, 2015; Lie, 2004).

Where the Power of Two (TPOT) cooperative model is a method used to bring students into a comfortable and pleasant situation hence, they can play an active role in the learning process (Annisa & Yerizon, 2018; Rusman, 2012), hence, to improve the learning quality, teachers need to use varied methods, such as these active learning methods.

Literature Review

According to Zain and Kholis (2015), TPOT is a cooperative learning model where students are grouped into small groups of two to learn about a concept or topic in a pleasant atmosphere. In these groups, students are expected to develop critical thinking when providing answers to questions given by the teacher (Hidayat, 2009; Nofriansyah et al., 2018).

TPOT is a learning model used to motivate students to express their opinions in small group discussions (Agustina et al., 2016). The TPOT emphasizes active learning processes, creative thinking, and working together to improve student achievement. With each member expected to give their opinion, which is further discussed together to determine the appropriate answer, each student is asked to discuss and provide these answers to problems given to them, answers that are expected to be mutually agreed upon in the group (Agustina et al., 2016; Ariyawan, 2014). The TPOT type of cooperative learning model emphasizes the importance of carrying out activities together, defined as it is as an activity carried out by two people that work together to increase their capacity. The situation of students working together with others enables their ability to overcome individual strengths and weaknesses and solve problems (Hamruni, 2012, Rohana, 2011), encouraging an atmosphere of openness.

The benefit of the cooperative learning model using TPOT is that students become more confident in expressing their opinions, exchanging ideas, and determining the best answers to given tasks (Leksono et al., 2018; Suprijono, 2009; Vhalery & Nofriansyah, 2018). Paired discussions enhance collaborative learning and minimize gaps between students and peers (Webb et al., 2002; Yazid, 2012) wherein, by discussing thoughts, they can minimize failure or misunderstanding of the material being studied.

Several steps need to be taken by the teacher to apply TPOT learning models, namely, (1) provision of information, materials, and questions as a knowledge base for students; (2) formation of a small study group consisting of two students; (3) asking questions, and the students providing individual or group answers, (4) each pair carrying out discussions to determine new answers to the first question within a limited time, (5) after the discussion phase, the teacher asking each pair to compare the answers, (6) each group being guided to present their discussions, and (7) the teacher clarifying the answers of each group, summarizing and drawing conclusions (Isjoni, 2010; Suprijono, 2010).

Material and Methods

This study employed a collaborative classroom action study conducted in two cycles, with each consisting of two meetings comprising planning, implementation, observation, and reflection (Sanjaya, 2014; Sugiyono, 2010). This study subjects were 36 students of class VIII Junior High School Gorontalo. Data were obtained from teachers, students, colleagues, and documents through tests, observations, interviews, and documentation. The indicators measured in this study were eight learning activities, namely (1) enthusiasm in learning, (2) student interaction, (3) group cooperation, (4) group activities, (5) cooperative attitude, (6) exploration, (7) associations and (8)

communicating the results of the collaboration. In each cycle, the results of student learning completeness are also measured with data validated using data triangulation techniques. Furthermore, the data collected were analyzed using quantitative and qualitative descriptive methods. Quantitative data analysis was conducted to determine student learning outcomes tests before and after using the TPOT learning model were analyzed by comparing the initial and final scores (Hutagaol, 2018; Septin, 2011).

Results and Discussion
Results

This collaborative classroom action research was carried out to improve learning outcomes by using the TPOT type cooperative model in social studies subjects for class VIII students at State Junior High School Gorontalo. This study was conducted in two cycles, with each consisting of two meetings carried out in two hours (2 x 35 minutes). Data on student learning outcomes are assessed in every cycle, with the results shown in Table 1.

Table 1. Percentage of achievement student learning activities in each cycle

Indicator	Cycle I		Average	Cycle II		Average
	Meeting I	Meeting I	age	Meeting I	Meeting II	age
Enthusiasm in learning	48,23	49,52	72,99	51,72	59,74	81,59
Interaction	47,05	48,94	71,52	53,28	58,67	82,62
Group cooperation	51,43	52,68	77,77	55,14	61,81	86,05
Group activities	50,27	51,47	76,01	54,31	59,87	84,25
Attitude in cooperation	49,71	51,86	75,64	53,47	60,69	83,82
Exploration	47,28	49,79	72,18	53,17	60,17	83,26
Association	48,10	50,52	73,34	55,76	61,49	86,51
Communicating the collaboration results	50,82	52,64	77,14	56,49	61,97	87,46
	392,89	407,42	596,59	433,34	484,41	675,56

Based on Table 1, several indicators of student learning activities vary in results, starting from the lowest percentage value to the highest. In Cycle I, the lowest and highest percentage indicators in the first meeting were student interaction activity and learning activities with values of 47.05% and 50.82%. At the second meeting of Cycle I, the lowest score was student interaction activity, which was 48.94%, while the group cooperation indicator had the highest score at 52.68%.

In the first meeting in Cycle II, the highest and lowest indicator of 56.49% and 51.72% were obtained in learning cooperation and enthusiasm. For the second meeting in this cycle, the lowest value in the interaction activity obtained was 58.67%.

The results showed that the average difference in the achievement value of learning activity indicators in Cycles I and II was 78.97%. The difference between the activity indicators of the first meeting of Cycles I and II is 40.45%. For the second meeting of each cycle, the value of the difference in the indicators of learning activities is 76.99%.
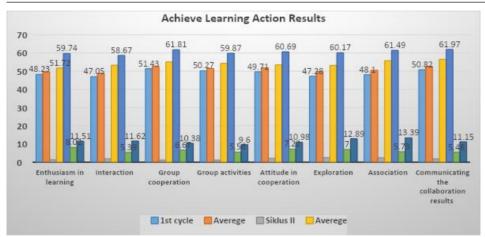
Figure 1. Achieve learning action results

The student achievements results for the Minimum Completeness Criteria (KKM) are shown in Table 2.

Table 2. The Minimum Completeness Criteria (KKM) of students

Indicator	Cycle I		Cycle II	
	Total students	%	Total students	%
Complete	25	69	31	86
Not Complete	11	31	5	14
	36	100	36	100

Table 2 shows that student learning completeness scores were obtained after the teacher gave the posttest in Cycles I and II. In Cycle I, the Minimum Completeness Criteria (KKM) is 69%, while the KKM value in Cycle II is 86% hence, the percentage of KKM in both cycles was 77.50%. Assessment of students working on the questions given by the teacher is an activity to determine the completeness of student learning in achieving KKM.

Figure 2. Student learning completeness value

Discussion

There are still a significant number of teachers that use conventional methods in teaching, thereby decreasing students' learning enthusiasm in class (Hamdayana, 2014; Istarani, 2011), however, to form superior students' abilities, teachers need to provide the best learning. Learning carried out in schools aims to achieve educational goals, namely to master the knowledge and develop personality and social skills (Jihad, 2010).

This study showed that before using the TPOT model in class VIII students of Gorontalo State Junior High School, some students failed to pay attention to the teacher during the lesson. Therefore, they had difficulty remembering and understanding the lessons. This led to low student learning outcomes with an average minimum completeness criterion (KKM) below 60%. However, Cycle I show that with the TPOT learning model, the KTM value increased to 69%. The absolute number of incompleteness 11 students (31%) out of 36 that are unable to achieve maximum learning outcomes. However, in the second cycle, the level of completeness reached 86%, with an increase of 17% due to the rise in students' participation in the eight learning activities carried out by the teacher.

Changes and improvements in the achievement of student learning activities in each cycle indicate that the intervention or collaborative action sought by the teacher through eight learning activities was successful.

The interaction aspect is a learning indicator with the highest level of change achievement were 47.05% and 58.67% in the first and second meetings in Cycles I and II. The value of the increase is equivalent to 11%. Meanwhile, the indicators of group activity are learning activities with changes in achievement improvement below 10% or approximately 9.6%.

Changes in the quality of learning activities are indicated in each meeting. In Cycle II, there was a significant change in the eight student learning activities. The average difference in the increase in learning outcomes from Cycle I to II for the first meeting was 5.01%, while for the second meeting, it increased to 9.62%. Where generally, in the second meeting of Cycle II, the average result of the student's learning activities increased compared to the first and second meetings in Cycle I, the average value of the change in learning outcomes from Cycle I to II was 4.57%.

Changes that occur in student learning activities, especially in Cycle II, are caused by learning that has been applied by the teacher a method that has been running in a conducive manner. The teacher explains the material and guides students in finding answers on question-and-answer cards. The occurrence of changes and increases in student learning activities due to the teacher's actions are obtained through the following steps (1) the teacher asks questions to the students; (2) students answer questions individually; (3) students are directed to pair up and share answers with their partners; (4) the teacher instructs each pair to make new answers; and (5) the teacher and all students discuss the answers.

Conclusion

The study indicates that cooperative learning strategies with the TPOT model tend to improve students learning activities in social science subjects. Students' problem-solving ability collaboratively increased in the first and second cycles to 74.58% and 84.45%, respectively. The application of the TPOT model was able to increase student's abilities from the initial assessment in cycle I by 69% to Cycle II by 86%, and their ability to collaborate in solving problems was greater than before in Cycles I and II by 75.56% and 88.89%, respectively.

TPOT model cooperative learning is used to determine students' strengths and weaknesses hence it encourages togetherness among students and exchanges information on their abilities. Paired discussions enhance collaborative learning and minimize gaps between students and peers, with the benefit of the cooperative learning model using TPOT being that students become more confident in expressing their opinions, exchanging ideas, and determining the best answers to the tasks given by teachers. The application of the TPOT type of cooperative learning model is

an effective learning approach used to direct students' activities in solving a problem in pairs, hence, they can easily understand the material and get more optimal learning outcomes.

Acknowledgment

References

Agustina, L., Sugiyarto, & Sarwanto. (2016). Penerapan model pembelajaran kooperatif Numbered Head Together (NHT) dan the power of two ditinjau dari motivasi belajar dan gaya belajar siswa, *Proceeding Biology Education Conference, 13*(1), 83-89.

Annisa, I., Rosha, M., & Yerizon. (2018). Meningkatkan kemampuan pemahaman konsep matematika siswa dengan menerapkan model pembelajaran kooperatif tipe the power of two. *Jurnal Pendidik Matematika*, 7, 84–8.

Ariyawan, I. P. E. P. (2014). Pengaruh strategi pembelajaran the power of two berbantuan media belajar manipulatif terhadap hasil belajar matematika. *E-Journal Mimbar PGSD Universitas Pendidikan Ganesha, (2)*1, 1-10.

Daldjoini, N. (2000). *Dasar-dasar ilmu pengetahuan sosial*. Bandung. Penerbit Alumni.

Fathurrohman, M. (2015). *Model-model pembelajaran inovatif alternatif desain pembelajaran yang menyenangkan*. Yogyakarta: Ar-Ruzz Media.

Hamdayana, J. (2014). *Model dan metode pembelajaran kreatif dan berkarakter*. Bogor: Ghalia Indonesi.

Hamruni. (2012). *Strategi pembelajaran*. Yogyakarta: Insan Madani.

Henderson. (2010). *Model pembelajaran menciptakan proses belajar mengajar yang kreatif dan efektif*. Jakarta: BumiAksara.

Hidayat, (2009). *Active learning*. Yogyakarta: Pustaka Insan Madani.

Hutagaol, K. (2018). Strategi multi representasi dengan kemampuan pemecahan masalah matematis siswa. *Jurnal Padegogik, 1*(1), 1-11. DOI: https://doi.org/10.35974/jpd.v1i1.636

Isjoni. (2010). *Cooperatif learning: Efektifitas Pembelajaran Kelompok*. Bandung: Alfabeta.

Istarani. (2011). *Model pembelajaran inovatif*. Medan: Media Persada. Jakarta:

Jihad, A. H. (2010). *Evaluasi pembelajaran*. Yogyakarta: Multi Pressindo.

Leksono, A. W., Vhalery R, & Maranatha S. (2018). Cooperative learning model: the power of two vs tea party. *International Journal of Research and Review, 5*(12), 80-88. Doi:10.4444/ijrr.1002/857

Lie, A. (2004). *Cooperative learning mempraktikkan cooperative learning di ruang-ruang kelas*, Jakarta: PT Grasindo.

Nofriansyah, Martiah, A, & Vhalery, R. (2018). The effect of learning model logan avenue problem solving heuristic to the student's learning activity. *International Journal of Scientific Research, 8*(10), 279-286. Doi:

Omiyefa, M. O. & lijadu, M. O. (2014). Utilizing concepts and generalizations in selecting and organizing social studies contents. *Historical Research, 10*, 27-32.

Rohana, (2011). *Pengaruh pembelajaran berbasis masalah terhadap pemahaman konsep mahasiswa FKIP Universitas PGRI*. Palembang: Prosiding PGRI

Rusman. (2012). *Model-model pembelajaran: Pengembangan profesionalisme guru*. Depok: Raja Grafindo Persada.

Sanjaya, W. (2011). *Penelitian tindakan kelas*. Jakarta: Kencana Prenada Media Group

Septin. (2011). Pengaruh model pembelajaran the power of two terhadap prestasi belajar matematika siswa. *Skripsi*. Indramayu: FKIP Universitas Wiralodra.

Shiveley, J. & ve Misco, T. (2009). Reclaiming generalizations in social studies education. *Social Studies Research and Practice, 4*(2), 73-78. https://doi.org/10.1108/SSRP-02-2009-B0006

Sugiyono. (2010). *Metode penelitian kuantitatif kualitatif & RND*. Bandung: Alfabeta.

Sunal, C. S. & ve Haas, M. E. (2005). *Social studies for the elementary and middle grades: A constructivist approach*. Boston: Pearson, Allyn & Bacon.

Suprijono, A. (2009). *Cooperatif learning*. Yogyakarta: Pustaka Pelajar.

Thobroni, M & Mustofa, A. (2013). *Belajar dan pembelajaran*. Jakarta: Ar-Ruzz Media Cetakan-II.

Vhalery, R, & Nofriansyah. (2018). Cooperative learning in the learning activity of students. *International Journal of Scientific Research, 8*, 62-72. DOI: https://doi.org/10.29322/ijsrp.8.9.2018.p8110

Webb, N., Farivar, S. & Mastergeorge, A. (2002). Productive helping in cooperative groups. *Theory into Practice 41*(1), 13–20. Doi: https://doi.org/10.1207/s15430421tip4101_3

Wiryohandoyo. (1998). *Pendidikan ilmu sosial*. FPIPS IKIP Semarang.

Yamin, M. & Bansu I. A. (2012). *Taktik mengembangkan kemampuan individual siswa*. Jakarta, Gaung Persada Press.

Yazid, A. (2012). Pengembangan perangkat pembelajaran matematika model kooperatif dengan strategi TTW (Think-Talk-Write) pada materi volume bangun ruang sisi datar. *Journal of Primary Educational, 1(*1), 31-37. Doi 10.15294/JPE.V1I1.52

Zain, M. R. & Kholis, N. (2015). Pengaruh strategi pembelajaran tipe the power of two dengan tipe question student have terhadap hasil belajar siswa pada mata pelajaran teknik elektronika di SMK Negeri 7 Surabaya. *Jurnal Pendidikan Teknik Elektro, 4*(2), 545-550.

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Madiun", Social Sciences, Humanities and Education Journal (SHE Journal), 2020
Publication

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