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Using Jigsaw Learning Model to Improve Collaboration and Communication Skills of High School Students on Environmental Change

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Abstract: 21st century learning must be designed according to the 4C skills, namely critical thinking, communication, collaboration, and creativity. One that is needed in learning is communication. In addition to communication skills, collaboration skills are needed. One strategy that can be designed by teachers to be able to improve collaboration and communication skills is by implementing a jigsaw type of cooperative learning model. This study aims to improve students' collaboration and communication skills by applying the jigsaw learning model to environmental change material. The research method is descriptive quantitative. The true experimental design of the posttest-only control design was applied to this study. Analysis with t-test. The results of the average score obtained by the ability of collaboration in the experimental class 81 and the results of the average value of 89 communication skills are included in the very effective category. Based on the results of the study it can be concluded that the jigsaw type cooperative learning model can improve students' collaboration and communication skills on environmental change.

Keywords: jigsaw learning model, collaboration skills, communication skills.

Abstrak: *Pembelajaran abad 21 harus didesain sesuai dengan keterampilan 4C yaitu berpikir kritis, komunikasi, kolaborasi, dan kreatif. Salah satu yang dibutuhkan dalam pembelajaran yaitu komunikasi. Selain keterampilan komunikasi perlu adanya keterampilan kolaborasi. Salah satu strategi yang dapat dirancang guru untuk dapat meningkatkan kemampuan kolaborasi dan komunikasi yaitu dengan menerapkan model pembelajaran kooperatif tipe jigsaw. Penelitian ini bertujuan meningkatkan kemampuan kolaborasi dan komunikasi siswa dengan menerapkan model pembelajaran jigsaw pada materi perubahan lingkungan. Metode penelitian adalah deskriptif kuantitatif. Desain true eksperimen jenis posttest-only control design diterapkan pada penelitian ini. Analisis dengan uji t-test. Hasil nilai rata-rata yang diperoleh kemampuan kolaborasi pada kelas eksperimen 81 dan hasil nilai rata-rata kemampuan komunikasi 89 termasuk kategori sangat efektif. Berdasarkan hasil penelitian dapat disimpulkan bahwa model pembelajaran kooperatif tipe jigsaw dapat meningkatkan kemampuan kolaborasi dan komunikasi siswa pada materi perubahan lingkungan.*

Kata kunci: *model pembelajaran jigsaw, kemampuan kolaborasi, kemampuan komunikasi.*

▪ INTRODUCTION

21st century learning is learning that integrates literacy skills, knowledge skills, skills and attitudes as well as mastery of technology. 21st century learning has characteristics and uniqueness, namely learning conducted in educational institutions focuses on 21st century learning skills. Learning must be designed according to the 4C skills, namely communication thinking, critical thinking, collaboration, creativity (Rosnaeni, 2021). One that is needed in the learning process is communication skills to achieve learning success. According to Ahmad (2016) Communication is a skill that

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involves the process of speaking, listening and understanding systematically and continuously. Student communication skills are a students' ability to express their thoughts, ideas, knowledge, or new information in the form of verbal and non-verbal in the learning process (Wilhalminah, 2017). Verbal communication skills can be improved through class presentations, starting with easier assignments and moving on to more complex assignments. challenging (Halimah & Sukmayadi, 2019). Non-verbal behavior plays an important role in the development of the teacher-student relationship (Wubbels & Brekelmans, 2012). Communication skills also encourage an active learning atmosphere where students have the freedom and confidence to express ideas. In addition to communication skills, other skills are needed to support communication skills in the development of the 21st century, namely collaboration skills.

The foundation of 21st century education is a call to encourage collaboration among students (Little, 2013). Collaboration is an interaction between members in a group that give each other a positive role and work together to be able to solve a problem or achieve a goal. The existence of these goals must be accompanied by shared responsibility (Qisthi, 2021). Collaboration and communication skills are important to develop in schools. Teachers as facilitators in the learning process are expected to be able to design learning strategies that are in line with the demands of 21st century learning such as students being able to communicate and collaborate.

One strategy that can be designed by the teacher is by applying the cooperative learning model. Learning Model is one of the ways that teachers use to achieve learning goals (Rokhmah & Subroto, 2019). Cooperative learning is a learning model in which the system learns and works in small groups consisting of 4-6 people collaboratively so that it can stimulate students to be more enthusiastic about learning (Telaumbanua, 2022). The application of the cooperative learning model in groups for two times can train students to exchange thoughts and opinions with peers (Subiyantari, Muslim, & Rahmadyanti, 2019). Students do much better in a collaborative learning environment (Burns, Pierson, & Reddy, 2014).

Cooperative learning model emphasizes collaboration between students in groups (Silalahi & Hutauruk, 2020). The cooperative learning model has several types, one of the most common types of cooperative models is the jigsaw (Saputra, Joyoatmojo, Wardani, & Sangka, 2019). The use of the jigsaw cooperative learning model is not only able to develop students' cognitive abilities but can also develop students' affective abilities. such as cooperation, tolerance, responsibility and students' courage in expressing opinions, these characteristics are useful for establishing a relationship between students (Purwanty, Fredy, & Yampap, 2020). Jigsaw cooperative type is an activity carried out to instill self-confidence in students, carry out relevant activities, arouse students' interest/attention, foster a sense of respect for students and instill a sense of shared responsibility in groups (Nurjanah, Daulay, & Ansari, 2020). Jigsaw learning model can be applied to biology learning, one of which is environmental change material. Environmental change material presents various problems that have an impact on life. The Jigsaw method, students usually help each other in solving the problems discussed (Rohmat, Hakim, & Sakti, 2019).

Based on observations made at SMAN 1 Telaga Biru, the teacher's learning process uses a conventional model, teacher-centered learning and learning task given

per groups. Students interview revealed that only few students work and finish the group learning tasks, some groups did not do the task.

▪ METHOD

Participants

A total of 31 students in the experimental group (grade X IPA 3) and 30 students in the control group (class X IPA 4) were selected randomly as the sample of this study. Each student stated that he was willing to be involved in this research without any coercion.

Research Design and Procedures

True experimental designs with posttest-only control design was applied in this research. In this design there is a posttest for the experimental and control groups. Two groups were chosen randomly (R). The first group was given treatment and the control group was not given treatment. The group that was given the treatment was called the experimental group and the group that was not treated was called the control group (Sugiyono, 2018).

The research was conducted for two weeks. The experimental class in this study was class X IPA 3 which applied the jigsaw cooperative learning model. During the learning process there were 2 people who observed student activities, while the activities observed were students' collaboration and communication abilities. The control class in this study was class X IPA 4 which applied the conventional model. During the learning process there were 2 people who observed student activities, while the activities observed were students' collaboration and communication abilities. At the end of the learning meeting, students in the experimental class and control class were given a test in the form of 12 number essay questions.

Instruments

The instruments used in this study were questions and observation sheets for collaboration and communication skills. Problem description with a total of 12 numbers given to students after the learning process. Questions given about Theory environmental change which includes environmental pollution, waste and environmental preservation.

Observation sheets are used during the learning process to observe students' collaboration and communication abilities during the learning process. There were two observers in this study, namely researchers and students. The indicators of the observation sheet for collaboration abilities are student responsibility and productivity, namely being responsible for doing the assignments given and completing the assignments in a timely manner, student responsiveness during the learning process, namely listening, paying attention and taking the initiative to respond to friends who ask questions, and contributing, namely students in group discussions often give ideas and able to lead the discussion.

Indicators of the communication aspect are being involved in discussions, namely being involved in discussions and in accordance with the topics that should be and showing respect for the opinions of other students during discussions, communicating in groups, namely being able to express opinions with group members and accept these differences positively, conveying material, namely being enthusiastic in the delivery and

volume of the voice can be heard, not in a hurry in the delivery so that it can be understood when delivering the discussion results.

Data Analysis

The data analysis technique in this study was the student activity sheet instrument. Data on students' communication and collaboration skills were analyzed descriptively by looking at the percentage of student observation sheets. The criteria for the percentage of students' communication and collaboration abilities are the percentages obtained 81% -100% very effective category, 61% -80% effective category, 41% -60% quite effective category, 21% -40% less effective category, and 1% -20% ineffective category (Riduwan, 2018). The normality test aims to see whether sample data is normally distributed or not. The normality test is to test whether or not the distribution of the analyzed data is normal (Sugiyono, 2018). The normality test in this study was carried out using the Kolmogorov Sminov and Shapiro Wilk test in the SPSS version 26 program. Homogeneity test aims to see whether the two data are homogeneous or not. The homogeneous test that will be used in this study is the F test. The hypothesis testing in this research was carried out by the Independent Samples Test t-test.

▪ RESULT AND DISSCUSSION

Prerequisite testing consists of a normality test and homogeneity test. To find out whether the research results are normal or not, a normality test is carried out and to find out if the data has the same variance (homogeneous) or a homogeneity test is not carried out. The normality test in this study used the Kolmogorov Smirnov Shapiro Wilk test with the help of SPSS software version 26. The normality test results were said to be normal if > 0.05. The normality test in this study uses data from the calculation of posttest scores for both the experimental class and the control class. The results obtained from the normality test have a Sig value of more than 0.05. In the experimental class 0.047 and in the control class 0.072 so that the data in this study can be said to be normally distributed.

Homogeneity test to find out the similarity of data variants. The homogeneity of the data can be seen from the significance value of the homogeneity test results. The results obtained from the homogeneity test between the posttest experimental class and the control class are more than 0.05, namely 0.011 so that the data in this study can be said to have a homogeneous variance. After the data is normally distributed and has a homogeneous variance, the hypothesis testing is continued using the Paired Samples Test on SPSS version 26. The results of the hypothesis testing are the Sig. (2-tailed) on the posttest data of 0.000 where the value is less than 0.05 so it can be concluded that H_0 is rejected and H_1 is accepted.

Description of student collaboration and communication skills

Observation of students' collaboration and communication skills during the learning process consists of three aspects of collaboration indicators namely responsibility and productivity, responsiveness and contribution and aspects of communication indicators namely engaging in group discussions, communicating in groups and presentations. The achievement of students' collaboration and communication skills was observed during the learning process in class using

observation sheets. The results of the assessment were analyzed according to the observation sheet of students' collaboration and communication skills.

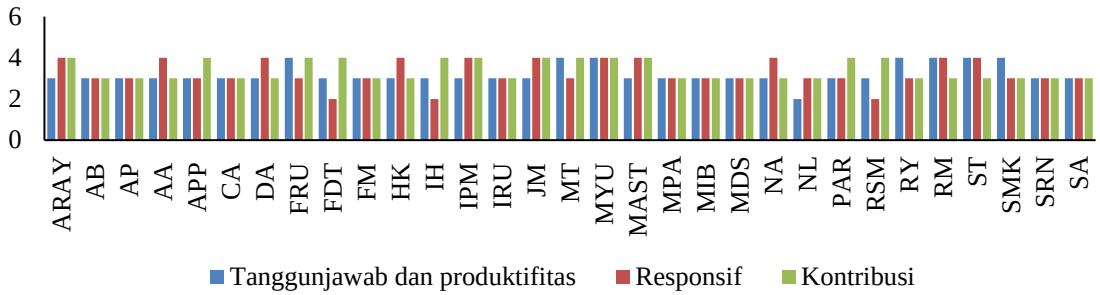

Figure 1. Student collaboration skills in the experimental class for each indicator.

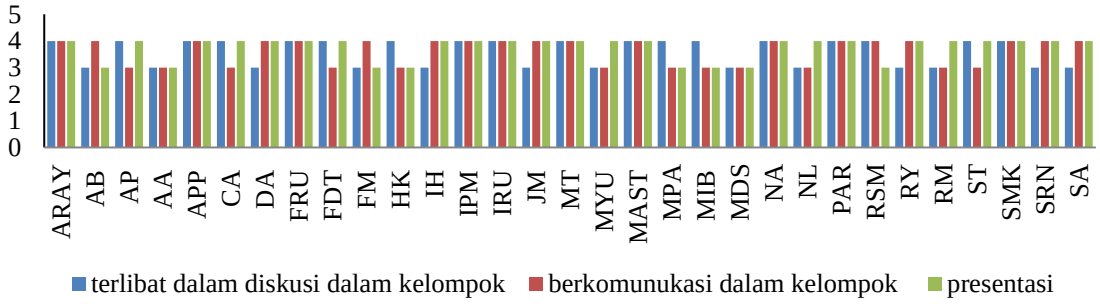

Figure 2. Students' communication skills in the experimental class for each indicator.

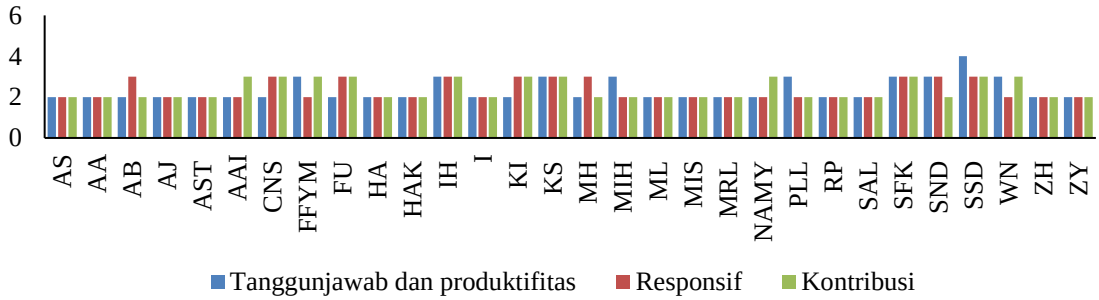

Figure 3. Student collaboration skills in the control class for each indicator.

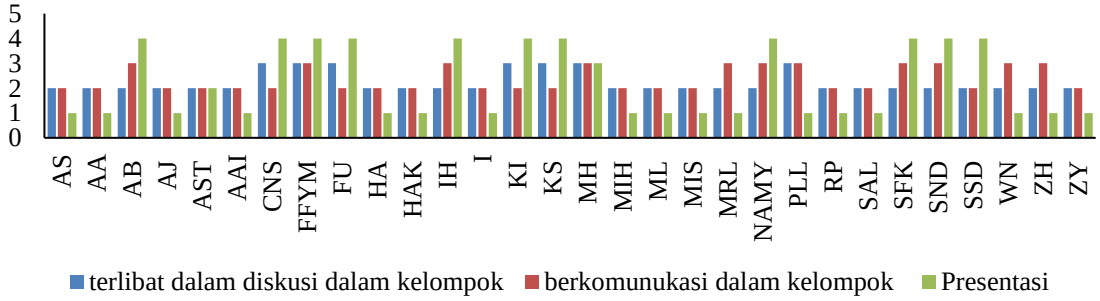

Figure 4. Students' communication skills in the control class for each indicator.

The importance of activities in the process of teaching and learning activities to be able to achieve learning objectives. According to Mulyono as cited in Agustin (2021) Learning activities are activities or behaviors that occur during the teaching and learning process, namely activities that lead to the learning process such as asking questions, submitting opinions, doing assignments, being able to answer teacher questions and being able to work with other students, and being responsible for the assigned task. Learning is said to be successful through various kinds of activities. In this study, the learning activities observed were students' collaboration and communication skills in the learning process.

The ability of collaboration has three aspect indicators that are observed, namely responsibility and productivity, responsiveness, contribution. Based on the results obtained by the experimental class that applied the jigsaw cooperative learning model, on the indicator of productivity responsibility, each student accepted responsibility by doing the assignments given and completing the assignments in a timely manner both in the expert group and in the home group. Each student in the expert group is responsible for explaining or teaching the topics that have been learned back to their original group members, so that each student does the assignments given and students are encouraged to learn about the assignments given. According to Maison et al. (2021) In the jigsaw type cooperative learning model, each group member is responsible for mastering part of the learning material and teaching that material to other group members.

The second indicator is responsiveness. Based on the results obtained, it can be seen that in the experimental class, students listened, paid attention to and responded to their friends who asked to provide feedback. Students in the expert group and in the home group, each group member listened and paid attention when one of the group members explained the topics discussed, and some students gave responses to their group mates who asked questions. In addition, each group member helps each other in understanding the topics discussed. According to Walad, Razak, Lufri, & Putri (2019) Jigsaw type cooperative learning can foster a sense of togetherness because listening to each other's explanations, accepting opinions and feeling responsible for others.

The third indicator is contribution. Based on the results obtained, students in the experimental class were able to participate in discussions by providing ideas, opinions or ideas. This was observed during discussions in expert groups and home groups, students actively gave opinions or ideas related to the topics discussed. According to Gusta, Christina, & Zakirman (2020) Jigsaw type cooperative learning can direct students to discuss with each other, communicate ideas and ideas as well as solve problems from the topics discussed in learning Communication skills there are three indicators observed, namely engaging in group discussions, communicating

in groups and presentations. The first indicator is being involved in the discussion. Based on the results obtained, it can be seen that the experimental class applied the jigsaw cooperative learning model, students were involved in discussions and showed mutual respect for the opinions of other students during discussions in expert groups and in the home group. According to Berlyana & Purwaningsih (2019) the Jigsaw type cooperative learning model, students are actively involved in the learning process which will have a positive impact on the quality of interaction and communication and can motivate students.

The second aspect is communicating in groups. Based on the results obtained from communicating in groups in the experimental class, students were able to express opinions with their group members and each student was able to accept differences positively during discussions with expert groups and home groups. According to (Hidayat, Suharno, & Indriayu, 2017) In the jigsaw type Cooperative learning model, each group member is given a different part of the material, then all students from the "home group" who have the same learning material gather with the "expert group" to discuss and communicate with each other until they master the material. Then, students return to their home groups to teach the material to other group members. This type of cooperative jigsaw emphasizes students working together in discussions and helping each other to understand learning material so that interactions arise between students.

The last aspect is presentation. Based on the results obtained by the experimental class when the presentation of students conveyed the material well, enthusiastic in delivering the material, the volume of sound could be heard, not in a hurry in delivery so that it could be understood by other students.

The material taught in this study is environmental change material. Environmental change material is one of the materials that discuss various problems that exist in the environment in everyday life. Environmental change material is raised because in this material there are various examples of authentic cases that exist in the environment around students. The sub-topic of environmental change material is environmental pollution, waste and environmental preservation. In this material students work together in solving problems, providing solutions, and sharing experiences gained by students in their surroundings. According to (Susanto & Dhony, 2014) The principle of the jigsaw type cooperative learning model prioritizes student experience and in practice students must share experiences or opinions with other students so that a sense of togetherness and cooperation arises between students in their group.

Research in the experimental class used the jigsaw cooperative learning model and the control class used the conventional model during the teaching and learning process. At the end of the meeting students were given a posttest to find out student learning outcomes while applying different learning models in the two classes. The following are the posttest results of the experimental class and the control class

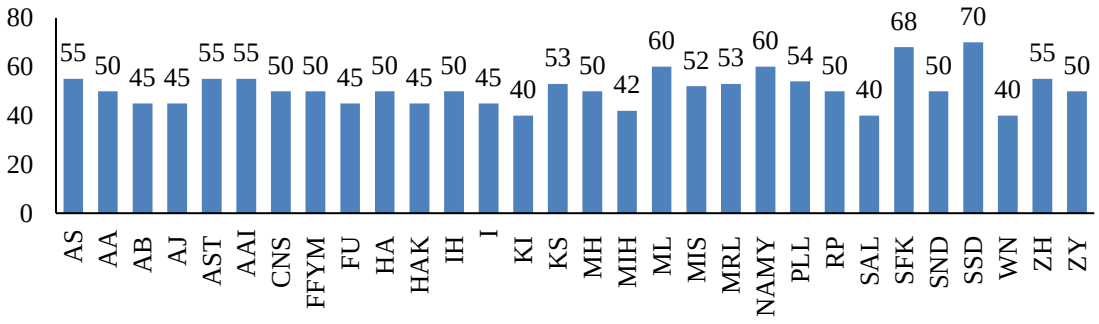

Figure 5. Posttest score of control class

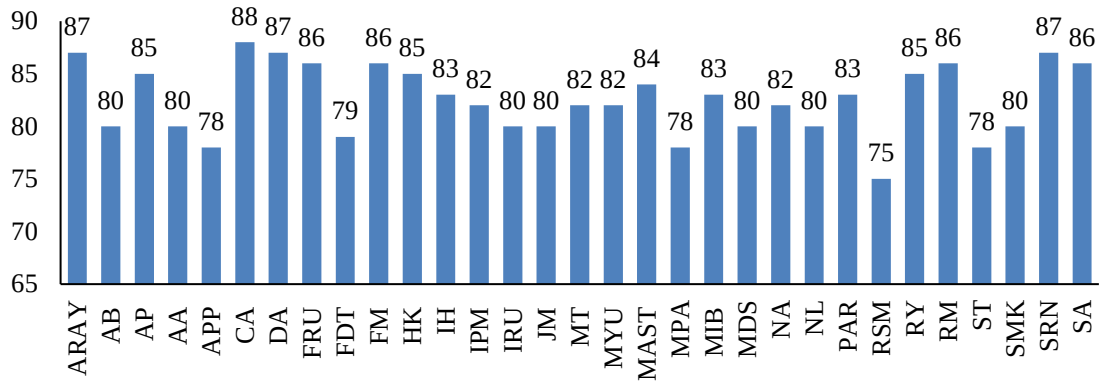

Figure 6. Posttest score of experimental class

Based on the percentage achievement indicators of collaboration and communication abilities, it shows that there is a difference between the experimental class that applies the jigsaw cooperative learning model and the control class that applies the conventional model. The experimental class can improve students' collaboration and communication skills. According to Affandi, Darmuki, & Hariyadi (2022) Jigsaw learning provides cooperative learning situations that can increase student activity. Active students in the learning process, then the learning outcomes achieved will be good. The experimental class learning outcomes obtained an average score of 83 while control class students obtained an average score of 51. Based on research conducted by Kahar, Anwar, & Murpi (2018) that the application of the jigsaw type cooperative learning model is able to have a real influence on learning activities students in class, so as to encourage increased learning outcomes. Students in the jigsaw group have higher achievement because they have more opportunities to help each other, exchange information and communicate effectively (tran, 2014)

▪ CONCLUSION

The application of the Jigsaw type cooperative learning model to environmental change material, it can be concluded that the jigsaw type cooperative learning model can improve students' collaboration and communication skills in environmental change material. The students' collaboration and communication abilities can be seen from the effectiveness of each student collaboration and communication indicator in the experimental class. This is because the jigsaw type cooperative learning model has two divisions of groups, namely the expert group and the home group. Home groups and student experts are required to be able to work together. In addition, students are required to be able to speak and express their opinions, starting from the expert group where each member has the same topic to discuss and the original group, each student in one group has different material. Students are required to explain to their group members about the material they have obtained from expert group.

The cooperative learning model can be applied by educators to train students' collaboration and communication skills. This research has been maximized but there are still factors that are difficult to control so that in this study there are still some limitations. These limitations include, the short research time.

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