



THE JOURNAL OF IJETZ

(International Journal of Education and Teaching Zone)

P-ISSN: 2963-7899 | E-ISSN: 2830-7925

jurnal.yayasannurulyakin.sch.id/index.php/ijetz

The Effect of the STAD Type Cooperative Learning Model With The Help of Crossword Worksheet on Biology Learning Outcomes, Especially The Cognitive Domain

Aminah Zb^{1*}, Rizki Ananda², Bismark Mensah³

¹Faculty of Tarbiyah and Teacher Training, UIN Sulthan Thaha Saifuddin Jambi, Jambi, Indonesia

²Faculty of Science Education, Universitas Pahlawan Tuanku Tambusai, Riau, Indonesia

³Faculty of Social Sains Education, University Of Ghana, Accra, Ghana

Article History:

Received: September 04, 2022

Revised: September 15, 2022

Accepted: September 25, 2022

Published: October 08, 2022

Keywords:

Cognitive Domain, Cooperative Learning Model, Crossword Puzzle Worksheets, STAD

***Correspondence Author:**

aminahzb@uinjambi.ac.id

Abstract: This study aims to determine the effect of the STAD-type cooperative model with the help of Crossword Puzzles on students' biology learning outcomes, especially on Development and Growth material in terms of Cognitive aspects. The population in this study amounted to 5 classes, and a sample of 2 classes was taken randomly. The study was conducted in two classes which were grouped as experimental class and control class. In the experimental class, learning is carried out using a STAD-type cooperative model with the help of crossword puzzle worksheets, while in the control class, learning is carried out using a conventional model research data obtained from the test of learning outcomes for cognitive aspects. Student learning outcomes on cognitive aspects were analyzed by t-test. The results of data analysis show that the learning outcomes of cognitive domain biology students whose learning uses the STAD-type cooperative model with the help of crossword puzzle worksheets are higher than students whose learning uses the conventional model.

INTRODUCTION

The development pattern of science and technology is taking place very drastically (Defrianti & Iskandar, 2022). Changes in education patterns occur along with the development of science and technology, where every country is required and required to be able to create quality human resources (Zb, Novalian, Ananda, et al., 2021; Zb, Novalian, Rozal, et al., 2021), namely humans who are not only able to carry out activities as usual but also have mental readiness and also expertise commonly called the ability to participate in developing science and technology so that they can automatically improve the quality of human resources in a nation and own country (Cummings, 1974; Mattu & Sullivan, 2020). Improvements in various aspects of education have been carried out with various educational reform efforts that have been carried out including changes to the curriculum or improvement of the learning curriculum (Sulman et al., 2021), improvement of teaching systems such as school processes in carrying out learning processes, and preparations, improving the quality of teachers' abilities by providing training in both the use of learning models and the development of teaching

media and so on. The process of developing and improving learning systems cannot be separated from the actual learning improvement efforts, and it is an effort toward improving the best quality of learning in accordance with the changing times (Sulman et al., 2022; Zb, Setiawan, et al., 2021).

The process of improving teaching and learning in schools certainly requires educators to do various things that can affect maximum learning changes (Akman et al., 2020; Honey et al., 2014). Many things can be done to achieve these goals, one of which is how to create a good learning atmosphere that can be a supporter in achieving the learning goals that have been determined at school, knowing the habits and pleasures of student learning so that students are passionate and develop fully during the learning process. Take place so that they can go hand in hand according to the needs of the times (Zb et al., 2020; Zb, Setiawan, et al., 2021). As an educator, a teacher should be able and able to find good ways so that students are interested and happy with the material being taught, and teachers should be able to find information about conditions that can improve learning in schools so that the learning carried out can optimize students' abilities, especially in the field of education. Cognitive. Cognitive ability is a classical benchmark for a child to be considered to master a learning material, so teachers who are one component of education must be able to optimize the learning outcomes of their students, primarily in the cognitive domain (Colorado et al., 2021; Gray, 2011). The process of improving students' cognitive domains can be achieved by applying various approaches and learning models that can increase students' activities, interests, and creativity in a pleasant atmosphere and under various conditions.

The process of forming maximum learning outcomes is, of course, appropriate and related to what is stated in the Minister of National Education Regulation No. 41 of 2007 concerning process standards, where the function of a teacher is actually as the primary source in providing knowledge references, motivators and at the same time being able to become a facilitator in the learning process (Zb, Novalian, Rozal, et al., 2021) given especially in biology learning. The fact occurred in class VIII of SMP Negeri 4 Kerinci, which the researchers observed on January 15 to February 16, 2013, where the biology learning process was still not running as expected. From the results of the observations of exceptional researchers on learning biology for class VIII SMP Negeri 4 Kerinci, it appears that the learning process is still dominated and centered on teachers in the field of study only; learning is only carried out by transferring knowledge to students regardless of whether the knowledge conveyed can be understood by students or not. Teachers are too domineering using conventional methods, and the learning media used are straightforward, so the learning atmosphere becomes monotonous. Teachers have not been creative enough to create a learning atmosphere that can enable students to be directly involved in learning.

The observation process that the researcher did and based on the theoretical study that has been described, the researcher wants to provide a solution to learning, namely one of the efforts that can be made to increase the interest, activity, and understanding of students in learning biology, primarily the cognitive domain of students on growth and development material is to use cooperative learning model of student team-achievement

divisions (STAD) type with the help of crossword puzzle worksheets. Learning with the help of crossword worksheets is intended so that in the process of applying the STAD type cooperative learning model, students can be facilitated with the crossword worksheets so that in addition to helping and facilitating students in learning, it is also able to add interest to learning biology so that the learning objectives can be achieved effectively and efficiently, especially in the cognitive domain. The learning process with this crossword worksheet combines play activities with learning activities so that learning will be more fun. In the learning process, students are believed to be no longer bored and bored because they do not just sit and listen to stories from the teacher, but they will be more active because they are involved in an educational game. An increase in learning activities also occurs, which will impact increasing student learning outcomes, especially in the cognitive domain.

The process of learning biology on developmental and growth materials by carrying out a STAD-type collaborative learning process equipped with the help of crossword worksheets can be expected and believed to create a pleasant learning atmosphere because all students in their respective groups will work together in solving the problems that are given to them. Given the teacher in the cognitive domain, the interaction between intelligent students and students who are moderate or less will occur to help students with moderate and low abilities understand the material. In addition, the STAD-type cooperative learning model will also be able to increase students' confidence in terms of asking, answering, or presenting their work because of the cooperative spirit built in each group member, all of which are intended to improve learning outcomes in the cognitive domain on developmental and growth materials.

METHOD

The pattern used in this study is to use research with a quasi-experimental research pattern (quasi-experiment). Quasi-experimental research pattern is a part of experimental research that is not true, which means that in the research process, the researcher cannot or can fully or entirely control the variables that can be factors that can affect research both physically and in procedures for checking research conducted. The pattern of quasi-experimental research is carried out in research that is indirectly carried out to obtain information which is an estimate of the information obtained by the actual experiment. The pattern of semu experiment research In experimental research, it can be simplified where the researcher is in a situation that does not allow control of the variables studied adequately and cannot control the research situation from threats that might damage the research results. In this study, the sample was taken using the purposive sampling technique, with the research design used can be seen in table 1.

Table 1. Research Design Patterns

Number	Class	Treatment	test
1	Experiment (A1)	X	T
2	Control (A2)	-	T

The research process described in table 1 is intended by the researcher to provide a simple view of the research to be analyzed, which only relies on cognitive domain tests that are carried out after the learning is carried out, where the test results both in the experimental class and in the control class will be compared to draw conclusions. a conclusion. The treatment was only carried out in the experimental class, namely using the STAD type cooperative learning model, while the experimental class used the learning usually used by the teacher in the learning process.

RESULT AND DISCUSSION

The learning process uses the STAD type cooperative learning model with crossword puzzle worksheets in biology lessons with developmental and growth materials where the cognitive aspects of biology learning outcomes for experimental class and control class students can be seen as shown in table 2.

Table 2. the results of the calculation of the test data on the cognitive aspects of the experimental class and the control class

Description of values	Experiment class	Control class
N	27	27
Xmaks	100	85
Xmin	65	42,5
	82,037	64,352
	9,533	12,298

The facts obtained in table 2 believe that the table of the results of the calculation of the learning test data for the cognitive aspects of the experimental class and control class where the difference in the average value is quite high which can be used as a reference as well as a real measure that the biology learning value of students whose learning uses the cooperative learning model type STAD is higher than students who use conventional learning.

In this study, the hypothesis testing proposed was carried out using the t test. Prior to statistical testing for the hypothesis, the requirements analysis test was carried out which included normality test using the Liliefors test and homogeneity test using the F test and Bartlett test. The research process was continued by conducting the Normality Test of Student Cognitive Aspect Biology Learning Outcomes, where this was done to see whether the experimental class and control class were normal or not, as one of the prerequisite tests used before using the t-test or difference test. The normality test data obtained in this study can be seen in table 3.

Table 3. Normality test with Liliefors experimental and control classes

	L-Count	L-table	Description
Control	0,0781	0,1680	Normal
Experiment	0,0918	0,1680	Normal

The data from table 3 shows that both the control and experimental classes are in normal conditions, so they meet the requirements for conducting the t-test. Before the

researchers used the t-test, the researchers also tried to see if the experimental class with the control class was homogeneous so that it could strengthen the basis for doing the t-test. The results of the homogeneity test of experimental and control class students can be seen in table 4.

Table 4. The results of the homogeneity test of the cognitive aspects of the experimental and control group

Component test	F-count	F-table	Description
Experimental and control classes	1.66	1.91	homogen

From Table 4 and Table 3, data is obtained that the research population is normal and homogen so that it can meet the research prerequisite test and continue with the Hypothesis Test, namely whether there is an effect of the STAS type cooperative learning model with the help of slang puzzle worksheets on biology student learning outcomes on the material development and growth. The study's t-test data (hypothesis test) can be seen in Table 5.

Table 5. t-hypothesis test results

Group	Experiment	Control
<i>N</i>	27	27
Average	82.037	64.352
<i>S</i> ²	90.88139	151.2462
t-count	5.9108	
t-table	2.006	

The facts obtained are shown in table 5, where the value obtained based on the results of calculations using the t-test obtained t-count 5.9108 > t-table 2.006 at a significant level where $\alpha = 0,05$. These calculations can be a reason for making conclusions. Research hypotheses, in other words, the null hypothesis is rejected, and the working hypothesis is accepted. Thus, it can be stated that the learning outcomes of cognitive aspects of biology students on growth and development materials taught using the STAD type cooperative learning model with the help of crossword puzzle worksheets are better than students who use conventional learning on growth and development materials development.

In the teaching and learning process where the application of the STAD type cooperative learning model with the help of crossword puzzle worksheets, it has been proven to have a positive impact on the activities, interests and learning outcomes of students' biology on growth and development materials. The learning process carried out in class with a combination of the STAD type cooperative learning model and the provision of crossword puzzle worksheets as discussion material, provides a new and interesting learning pattern for students, which causes students to be enthusiastic and enthusiastic in learning, especially developmental material and growth. The learning process is assisted by good worksheets. In terms of answering the crossword puzzle worksheets, students are happy to find answers or solve them; almost all students are active and cooperate with each other in filling out the crossword puzzle worksheets so

that all members in the group can understand the material Development and growth. The learning process is effective and efficient in understanding development and growth material indirectly (Zubaidah, 2018). This showed that there is objective evidence that applying the STAD type cooperative learning model and assisted with the help of crossword puzzle worksheets as a material for student group discussions in understanding and focusing more on learning can positively impact Biology learning, especially on growth and development materials.

The learning process in schools focusing on using the STAD type cooperative learning model with the help of crossword puzzle worksheets can be a solution so that learning is more meaningful. The teaching and learning process is carried out by emphasizing various factors, for example, in the learning process after the process of giving awards to students who get the highest grades/scores, whether the grades/scores are obtained from group grades or individual student grades through quizzes given by the teacher on developmental material and growth. The learning process carried out from the observations of students felt very happy when given an award, and students became more active and more motivated to be able to work together in their groups (Gray, 2011; Rice et al., 2011). The process of awarding is critical because it is significant for students to obtain high scores, both individual scores and group scores. After all, each student feels responsible for the success of his group. Students in the learning process will feel responsible for the acquisition of value for the group to provide an understanding that they must make or provide the best answer so that each group member begins to interact positively by helping each other in understanding the subject matter to get the best results for the group, especially in the development and growth material.

The facts are presented in the data in Table 5. It clearly shows that the average learning outcomes of students' biology on developmental and growth materials after implementing STAD-type cooperative learning with the help of crossword puzzle worksheets in the experimental class are overall better than learning conventional learning because it can improve students' Biology learning outcomes, this is by several studies which state that the STAD type cooperative learning model can improve student learning outcomes and be able to develop students' thinking and creative abilities in the learning process.

From the observations made by the researchers during learning, it is known that students in the group given the needs of the experimental class have a higher enthusiasm for learning and are much better at discussing, paying attention to the material, and responding to learning compared to students in the control class that almost seem passive and lack interest study. However, this happens because of the demands of the implementation of the applied model. This indicates that students in the experimental class quite understand the material presented and enjoy the learning process. In terms of asking questions and group discussions, it can be seen that the level of activity and participation of students in the experimental class has high enthusiasm; in the discussion, students share opinions and work together in completing crossword puzzle worksheets, in line with this several other studies also shows that group learning provides a space and opportunity for other group members to be able to adapt and learn how to participate

effectively, learn to be a good and wise member, learn how to discuss and draw conclusions. Other individuals, so that students are taught to accept the thoughts or decisions of several individuals and at the same time trained to have good leadership and cooperation spirit in solving problems, especially on growth and development materials.

From the observations made by the researchers during learning, it is known that students in the group given the needs of the experimental class have a higher enthusiasm for learning and are much better at discussing, paying attention to the material, and responding to learning compared to students in the control class that almost seem passive and lack interest Study. Although this happens because of the demands of the implementation of the applied model. This indicates that students in the experimental class quite understand the material presented and enjoy the learning process (Reyza et al., 2022; Sulman et al., 2022). In terms of asking questions and group discussions, it can be seen that the level of activity and participation of students in the experimental class has high enthusiasm; in the discussion, students share opinions and work together in completing crossword puzzle worksheets, in line with this several other studies also shows that group learning provides a space and opportunity for other group members to be able to adapt and learn how to participate effectively, learn to be a good and wise member, learn how to discuss and draw conclusions. Other individuals, so that students are taught to be able to accept the thoughts or decisions of several individuals and at the same time trained to have a good leadership and cooperation spirit in solving problems, especially on growth and development materials.

The learning process encourages students to be enthusiastic about learning, especially in terms of filling out crossword puzzle worksheets that have been prepared and given to students during the learning process. The directed learning process makes students enthusiastic and serious about working on it. The student worksheets given by the teacher caused them to ask a lot of questions and want to fulfill their curiosity in completing the crossword puzzle worksheets. Likewise, with the second meeting, learning has begun to be directed even though there are still some parts or conditions of students who still do not understand. Some students ask about how they can do assignments, but overall, it can be seen that the average student can already enjoy learning well and maximally, doing crossword puzzles and quizzes well, discussion activities progress from the first meeting to the next, and all students were enthusiastic and cooperated in obtaining high scores. This is in line with several studies that state and show that student learning activities and outcomes have increased from cycle to cycle due to the application of the STAD-type cooperative learning model. Success in carrying out the teaching and learning process can, of course, be determined by how many good factors other than the applied learning model; of course, environmental or external factors can affect student learning outcomes. The effectiveness of the STAD-type cooperative learning model with the help of crossword worksheets can undoubtedly be seen and shown by the increasing number of children asking, answering questions, and responding to friends' questions on developmental and growth materials in the experimental class and inversely proportional to the control class.

The research process that has been carried out provides some essential data and facts. From the above explanation, it can be seen that learning by applying the STAD type of cooperative learning model with the help of crossword puzzle worksheets affects increasing learning outcomes in growth and development materials. The increase in student learning outcomes, especially in the cognitive domain, has proved that students in development and growth materials are greatly helped and motivated to learn and understand learning better and maximally.

CONCLUSION

From the research that has been done, it can be concluded that the cognitive aspects of biology learning outcomes of students who use the STAD-type cooperative learning model with the help of crossword puzzle worksheets are better than students who use conventional learning. Because this research was conducted in 2013, it is hoped that other researchers can try to modify it again so that it follows the times by preparing the eyes of all aspects that are considered to be able to influence or disrupt all learning processes to be maximized, for example becoming student worksheets in the online form, so that they can be used in various conditions.

ACKNOWLEDGMENT

Our gratitude goes to the thesis supervisor (S2), the teacher and the school where the researcher took data during the completion of the master's thesis at the Padang State University Postgraduate.

REFERENCES

- Akman, O., Eaton, C. D., Hrozencik, D., Jenkins, K. P., & Thompson, K. V. (2020). Building Community-Based Approaches to Systemic Reform in Mathematical Biology Education. *Bulletin of Mathematical Biology*, 82(8). <https://doi.org/10.1007/s11538-020-00781-4>
- Colorado, H. A., Mendoza, D. E., & Valencia, F. L. (2021). A Combined Strategy of Additive Manufacturing to Support Multidisciplinary Education in Arts, Biology, and Engineering. *Journal of Science Education and Technology*, 30(1), 58–73. <https://doi.org/10.1007/s10956-020-09873-1>
- Cummings, S. I. (1974). A methodology for environmental education. *Journal of Environmental Education*, 6(2), 16–20. <https://doi.org/10.1080/00958964.1974.10801853>
- Defrianti, D., & Iskandar, I. (2022). The Mastery of Teacher Emotional Intelligence Facing 21st Century Learning. *International Journal of Educational and Teaching Zone*, 1(1), 50–59.
- Gray, P. (2011). The Evolutionary Biology of Education: How Our Hunter-Gatherer Educative Instincts Could Form the Basis for Education Today. *Evolution: Education and Outreach*, 4(1), 28–40. <https://doi.org/10.1007/s12052-010-0306-1>
- Honey, M., Pearson, G., & Schweingruber, H. (2014). STEM Integration in K-12 Education. In *STEM Integration in K-12 Education*. <https://doi.org/10.17226/18612>

- Mattu, J., & Sullivan, J. A. (2020). Classification, kinds, taxonomic stability and conceptual change. *Aggression and Violent Behavior*, May, 101477. <https://doi.org/10.1016/j.avb.2020.101477>
- Reyza, M., Taqwa, A., Sulman, F., & Faizah, R. (2022). College Students ' Conceptual Understanding of Force and Motion : Research Focus on Resource Theory College Students ' Conceptual Understanding of Force and Motion : Research Focus on Resource Theory. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/2309/1/012073>
- Rice, J. W., Olson, J. K., & Colbert, J. T. (2011). University Evolution Education: The Effect of Evolution Instruction on Biology Majors' Content Knowledge, Attitude Toward Evolution, and Theistic Position. *Evolution: Education and Outreach*, 4(1), 137–144. <https://doi.org/10.1007/s12052-010-0289-y>
- Sulman, F., Sutopo, S., & Kusairi, S. (2021). FMCE-PHQ-9 Assessment with Rasch Model in Detecting Concept Understanding , Cheating , and Depression amid the Covid-19 Pandemic. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 6(2), 297–309. <https://doi.org/10.24042/tadris.v6i2.9273>
- Sulman, F., Yuliati, L., Kusairi, S., & Hidayat, A. (2022). Hybrid Learning Model : Its Impact on Mastery of Concepts and Self- Regulation in Newton ' s Second Law Material. *Kasuari: Physics Education Journal*, 5(1), 65–74. <https://doi.org/https://doi.org/10.37891/kpej.v5i1.273>
- Zb, A., Novalian, D., Ananda, R., Habibi, M., & Sulman, F. (2021). *DISTANCE LEARNING WITH STEAM APPROACHES: Is Effect On The Cognitive Domain?* 6(2), 129–140.
- Zb, A., Novalian, D., Rozal, E., Sulman, F., & Habibi, M. (2021). STEM Approach in Online Lectures: How Does it Contribute to Cognitive Aspects? *Indonesian Journal of Science and Education*, 5(2), 88–97. <https://doi.org/10.31002/ijose.v5i2.4365>
- Zb, A., Setiawan, M. E., Rozal, E., & Sulman, F. (2021). Investigating Hybrid Learning Strategies: Does it Affect Creativity? *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, 7(4), 868–875. <https://doi.org/10.33394/jk.v7i4.4063>
- Zb, A., Setiawan, M. E., & Sulman, F. (2020). Pengaruh E-Learning Berbasis Schoology Berbantuan WhatsApp Group terhadap Hasil Belajar Ditengah Pandemi Covid-19. *Al-Khidmah*, 3(2), 55–60. <https://doi.org/10.29406/al-khidmah.v3i2.2282>
- Zubaidah, S. (2018). *Disampaikan pada Kuliah Tamu di Pendidikan Biologi FKIP Universitas Islam Riau, 28 April 2018 I. April*, 1–8.