Indonesian Journal of Biology Education
Vol. 2, No. 2, 2019, pp: 26-32
pISSN: 2654-5950, eISSN: 2654-9190
Email: ijobe@untidar.ac.id
Website: jurnal.untidar.ac.id/index.php/ijobe

Integration of STAD with Mind mapping to Enhanced Student Cognitive Through Classroom Action Research

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Article History

Received :02 – 08 – 2019
Revised :05 – 10 – 2019
Accepted : 27 – 10 – 2019

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Keywords:
STAD, Mind mapping, Student, cognitive.

Abstract

The problem of learning biology is always dynamic in accordance with the learning ecology that is developing. In line with this problem, the learning activities that occur in class X-MIPA 3 SMAN 4 Magelang are also found, based on observations and discussions with the class teacher, the concl
usion of the problem is the learning outcomes that are not in accordance with the minimum completeness value and the learning variation is not much as well as more directed towards teacher-centered learning. Based on the results during August to October, classroom action research was carried out using an integrated STAD learning model and Mind mappping. The study was planned in 2 cycles, each cycle consisting of 3 meetings on class X with biodiversity material in Indonesia. The results showed that the application of the STAD Cooperative Learning Model and mind mapping in general can improve the learning outcomes of class X MIPA-3 students of SMAN 4 Magelang. Increasing the percentage of mastery learning from cycle I amounted to 73.52% to cycle II amounted to 85.29% with a difference of increase of 11.77%. While the average score of test results in the first cycle was 72.11 while in the second cycle was 75.50.

1. INTRODUCTION

Cognitive learning outcomes are learning outcomes that are usually very easy and most often to be learned and done by a teacher. This is caused by this because it can be known by using tests about what material has been learned by students. According to Joesmani (1988), this cognitive domain can be divided into six categories, starting from the simplest to the most complex. This domain fully supports him with intelligence, thinking skills, and problem solving skills.

In accordance with the results of observations that have been made through direct observation in the learning process and interviews with teachers of SMAN 4 Magelang in August 2019, understanding how the educational process that occurs in schools that cannot maximize the ability of capable students. This can be seen from the learning ¬ which is still centered on the teacher so that students can accept what is delivered by the teacher, then it becomes a single source that will be an example for students. Another example is test assistance in the form of tests that do not require students to facilitate the needs of students who will complete the test in the manner delivered by the teacher without understanding other ways that might result in the same thing shown by what is different. Can refute as an example that challenges rigidity in thought and gentleness in discussing an issue.

Learning activities carried out by the teacher cannot be separated from the learning model undertaken. One of the cooperative learning models undertaken is the STAD (Student Team Achievement Divisions), this learning model can be simply translated into four main steps, namely the provision of motivation and initial material by the teacher, heterogeneous grouping of students for joint learning, evaluation and awarding. Through the application of STAD cooperative learning, teachers can condition students actively building their own knowledge. The next knowledge is built by students by working together with friends in a group. Each student is required to cooperate with each other and practice student skills so that students' creativity grows. There are at least two benefits that can be obtained in cooperative learning, namely academic benefits and social benefits. Academically students increase

creativity and understanding of the material, socially students learn to live in society.

One learning technique that can develop one's creativity is the Mind Mapping technique or mind map. This technique was introduced by Tony Buzan in the 1960s. This technique is a technique for recording information using keywords, images, symbols, and colors that will form a structured collection of information. This technique can develop creativity because it allows a person to plan and take notes according to their desires and abilities, which of course are adjusted / limited by predetermined concepts. The application of this technique can be integrated in learning where students can create a mind map of the concepts they are learning. One student's mind map will certainly be different from other students so the teacher will have to limit the concepts included in the mind map. In essence, the teacher only gives a general concept then students develop it in accordance with their respective creativity by using Mind Mapping techniques.

The results of Sutarni's (2011) study revealed that through Mind Mapping, it can improve students' ability to read readings thoroughly and enjoy reading which currently students are less interested in reading. So that students understand and work on problems with enthusiasm and the result is the ability to work on students' problems has increased from 62.5% in the first cycle to 87.5% in the second cycle. Similar results were also found by Nurjanah (2011) who stated that the cognitive learning outcomes of students experienced an increase from 58.34% in the first cycle to 94.29% at the end of the third cycle for biology subjects the concept of the circulatory system in humans.

Mind Mapping is a note taking technique that combines the two regions of the brain. For example, notes of subject matter that students have can be poured through pictures, symbols and colors. Mind Mapping embodies students 'hope for long-term memory (Sugiri, 2011). Mind Mapping technique, which is the easiest way to enter information into the brain and to retrieve information from the brain. Thought map is the best technique to help the brain think process regularly because it uses graphical techniques derived from human thought that are useful for providing universal keys so as to unlock the potential of the brain (Buzan, 2009).

Interviews with several biology teachers in August 2011 showed that the respiration system and excretion system material was included in the material that they considered quite complicated. The complexity of the material as well as the various processes that are difficult to describe / describe directly are the reasons so that the teacher is sometimes difficult to teach students. The most difficult material to teach, based on the results of the interview is material about the nervous system, endocrine, and immune system, but because the three systems are material taught at the end of the semester so it is difficult to insert with research activities because at the end of the semester usually schools the school will focus on preparing for the semester exam. Based on these reasons, the material respiration system and excretion system become the material of choice in the research conducted.

The various things and problems that were found indicate that it is necessary to conduct classroom action research on STAD type cooperative learning with Mind Mapping techniques in Magelang. Based on the description of various theories and data that have been submitted previously, then a study was proposed with the title "Integration of STAD with Mind Mapping to Enhanced Student Cognitive Through Classroom Action Research"

2. RESEARCH METHODS

This type of research is Classroom Action Research (CAR) that uses a qualitative approach. This research was conducted in two cycles. Each cycle consists of action planning, action implementation, observation, and reflection. The Classroom Action Research Procedure consists of two cycles of action. Each cycle of action is carried out in accordance with the changes to be achieved. Each cycle of action consists of one sub concept that is learned and implemented in 3 times face to face, each 5 hours of learning. Every cycle in this class action research, including the initial observation stage, is carried out through the stages of planning, implementation, observation, and reflection.

The subjects in this study were students of class X MIPA-3 SMAN 4 Magelang in semester 2 of the 2019-2020 school year. The number of students is 34, with 22 female students and 12 male students. The research instrument used in this study consisted of observation sheets, tests, questionnaires, student worksheets and field notes. The instrument is used to measure students' process skills, motivation and learning outcomes. The data obtained in this study are quantitative and qualitative data.

The process of qualitative data analysis begins by examining all available data from various sources, namely observation, interviews, field notes, questionnaires. The data in this study will be analyzed qualitatively, including three channels, namely data reduction, data presentation and drawing conclusions. Data obtained through the data collection tool will be analyzed and then systematically reduced based on data groups, this reduced data will be presented in an organized manner to draw conclusions.

Quantitative data on student learning outcomes are based on quiz scores given after each cycle. Mastery learning students seen based on:

a. Individually (individually); students are considered to have "finished learning" when the absorption reaches 75%.

b. As a group (classical); considered to have been "complete learning" if it reached 75% of the number of students who achieved a minimum absorption of 65%, using the formula:

$$\text{TB} = \sum \frac{student\ with\ score\ above\ 75\%}{all\ student} \text{X } 100\%$$

Table 3.1 Percentage of success rate of actions

Percentage success	Level Success	Value with Alphabet
0 – 25	Low	D
26 – 50	Enough	C
51 – 75	Good	B
76 – 100	Very Good	A
76 – 100	Sangat baik	A

Source: Syarofatin (2007)

Indicators of the success of actions towards improving student learning outcomes seen from the results of the test at the end of each cycle, by comparing the level of success of learning outcomes from cycle I to cycle II

3. RESULTS AND DISCUSSION

Learning outcomes data were obtained from quiz scores conducted at the end of each cycle. The summary of the data on the completeness of students learning cycle I is shown in Table 4.3

Table 4.3 The number of students completeness learning cycle I

Mastery Learning Students	Total students
Students Complete Learning	25
Students Not Completely Studying	9

The percentage of completeness of Student Learning cycle I is

$$\text{TB} = \sum \frac{student\ with\ score\ above\ 75\%}{all\ student} \text{X } 100\%$$

$$\text{TB} = \sum \frac{30}{42} \text{X } 100\% = 73{,}52\%$$

Reflection of Cycle I Actions, based on observations during learning activities in cycle I the excess of teachers during learning activities that must be maintained in cycle II is good class mastery, the teacher can give a good correction of student answers. The enthusiasm of students during the learning process that is at the group learning stage must be maintained in the second cycle. The results of observations during the implementation of the first cycle found several things and events that received special attention and had to be improved, so that they did not recur at the time of the implementation of the second cycle. Some of these things or events include:

a. There are some students who are not used to making mind mapping
b. Problems raised by students do not lead to the material
c. At the time of discussion there were several groups when asked for opinions which tended to follow the answers of previous groups
d. Teachers often cancel questions raised by students during discussions because they do not fit into the material
e. Lack of class management at the time of discussion and supported by the last lesson so students tend to be passive and less active
f. Students complain that the observation time and work on the UKBM (Self Learning Activity Unit) are lacking to correct deficiencies.

Plans for improvement in the implementation of the second cycle, among others.

a. The teacher gives examples and explains in writing on the blackboard and dislide the LCD how to make mind mapping independently
b. The teacher accommodates all problems from students and directs the problems according to the material
c. The teacher appoints students equally and asks for opinions and assessments of the problems of the discussion and disseminates questions to all students, especially students who are passive to actively participate in the discussion
d. The teacher accommodates all student questions so that students are not discouraged
e. Teachers further improve classroom management skills, especially the provision of reinforcement and the teacher must be strict on students who are busy and give instructions to pay attention during the discussion so that all students can carry out the discussion properly.
f. The teacher tries to optimize the time in accordance with the learning plan that has been prepared.

The data of the results of the second cycle are carried out during 3x meetings with 5 x 45 minutes learning time allocation. The implementation of the action and observation cycle II is carried out during 3 x meetings, namely on 6, 10 and 13 September 2019. Student Orientation Stage on Actual and Authentic Problems (Presentation of Material), at this stage students are given a trigger of problems in the form of videos, articles, and pollution photos along with UKBM. Then students are asked to present their mindmap to find problems in the articles and photos they have observed. Furthermore, students and teachers have an improvement from the first cycle activities where, students have been able to make a mindmap correctly independently, but the teacher is still giving direction to students.

Furthermore, students are asked to write down problems and hypotheses that they find in the UKBM that have been provided.

Stage Organizing Students for Group Learning, students work in groups in groups and then discuss solving problems that arise, students do brainstorming and review the literature. Students look enthusiastic and more active in groups. During the learning activities took place the observer recorded the implementation of learning, the teacher was also an aspect that was observed there during the observation.

The stage presents the results of the problem solution in front of the class. Starting with the draw, the selected group presents the results of the group discussion. The presenter group looks ready and mastered the material, it can be seen from the ability to answer questions raised by their friends. Some objections were also conveyed so that the class discussion went well. Students seemed no longer awkward in expressing opinions, questions and refutations. Although there are still students who repeat the answers of their friends, students are able to give an assessment of the answers of friends and express different reasons.

Evaluation Phase, the evaluation phase is carried out after the discussion stage, students are given a number of quiz questions through the k-hoot application. The Scoring and Group Rewards Stage. This stage is carried out by the teacher before the implementation of the next learning. Individual improvement scores and scoring can be watched on the LCD screen live. Learning outcomes data were obtained from quiz scores conducted at the end of each cycle. The summary data on the learning outcomes of the second cycle is shown in Table 4.6

Table 4.6 The number of students completeness learning cycle II.

Table 1. Table Formats of IJOBE

Mastery Learning Students	**Total students**
Students Complete Learning	29
Students Not Completely Studying	5

The percentage of completeness of Student Learning cycle II are:

$$\text{TB} = \sum \frac{student\ with\ score\ above\ 75\%}{all\ student} \text{X } 100\%$$

$$\text{TB} = \sum \frac{34}{42} \text{X } 100\% = 85{,}29$$

Reflection of Cycle Actions II. The implementation of learning cycle II generally went better than cycle I. Some deficiencies in cycle I were successfully corrected according to the results of reflection and action planning. The observations in Cycle II did not show any significant problems or obstacles. Learning Outcomes, based on the results of data analysis in cycles I and II, it is known that there is an increase in the percentage of mastery learning. In summary the increase in the percentage of mastery learning in cycles I and II is listed in Table 4.9.

Table 4.9 Increased Percentage of Mastery Learning in cycle I and II

Percentage of completion of the learning cycle I (%)	Percentage of completion of the learning cycle II (%)	Enhancement (%)
73,52	85,29	11,77

Based on table 4.9 it is known that there was an increase in the percentage of mastery learning from cycle I by 73.52% to cycle II by 85.29% with a difference of 11.77% increase.

STAD is the simplest cooperative learning model and is suitable for teachers who are just starting to use the cooperative learning model (Slavin, 2010). The selection of this learning model as a learning model based on the results of interviews with the observations of researchers with teachers in schools who generally still use learning models that are teacher-centered, even though the current educational paradigm has experienced a change into student-centered learning. Group learning is learning that is often applied but only as a distraction and the focus remains teacher-centered. The advantages of this STAD with its ease of application make this learning model an alternative way to activate students.

The results of research abroad were found to show positive results on the application of the STAD learning model. According to Norman (2006) who conducted research on the effect of the STAD learning model on English learning outcomes in elementary schools in South Korea found that this learning model had a positive impact on improving their English learning outcomes. Other results were also presented by Muraya and Kimamo (2011) about their research on biology learning in schools in Kenya that "cooperative learning approaches are an effective teaching approach which Biology teachers should be able to use". Armstrong, et al. (2007) also revealed something that is more or less the same as other studies that "in addition, students viewed cooperative learning activities are very favorably" and found that the formation of small groups and then the strengthening of interactions between teachers and students can improve student learning outcomes even in class by the number great student. A similar study conducted by Maloof and White (2005) for two years of biology students in the laboratory revealed that "in the first year of the study, when students had training in the strategy, the mean improvement in scores between pre and post -tests was 35.5%, but in

the second year, when students did not have training in this strategy, the mean improvement was 18.6% ".

In Indonesia, research on the application of the STAD type cooperative learning model has also been carried out for a long time and shows results that are more or less the same as abroad. As found by Adib (2009) that there is a significant effect of STAD learning using animation and molymod media on student achievement on hydrocarbon compounds. Meanwhile Arifin (2011) also obtained results that there was an effect of STAD learning using animation and elearning media on student achievement in plant transportation material.

Mind Mapping is a learning technique that emphasizes organizing information that has been learned. This is done to facilitate the learning process carried out using a variety of colors, lines, images, symbols and keywords. This Mind Mapping technique plays a role in making summaries or notes of information that will help students in learning. The advantage of Mind Mapping is that it is easy to make, helps show the relationship between separate parts and allows one to group concepts and then help to compare them (Buzan, 2009).

Various research results reveal that Mind Mapping can have a positive impact on student learning. Jones, et al. (2012) revealed that various types of mind map creation and completion had a positive effect on student motivation based on the questionnaire distributed after the study. Al-Jarf (2011) in the Asian EFL Journal also mentioned that Mind Mapping can be used to assist students in teaching spelling material in English classes. Tjahjono and Aji (2010) found that the average post-test of students in the experimental class taught by the Mind Mapping technique was higher than the control class taught by the cera ¬mah technique for environmental material.

The cognitive abilities of students in the form of remembering, understanding, applying, and analyzing are cognitive abilities that can be developed through STAD learning models with Mind Mapping techniques. These four abilities can be accommodated through the learning phases of the STAD syntax with the Mind Mapping technique.

The relationship between STAD syntax with Mind Mapping techniques with the cognitive abilities of the first phase students is related to cognitive ability to remember (C1). The learning step in the form of delivering goals and motivating students is expected to be able to develop the process of taking knowledge needed from long-term memory.

The second phase is expected to develop two cognitive aspects of students, namely remembering and understanding. The learning step in the form of presenting initial information to students such as asking about biodiversity in Indonesia which is produced will spur students to recall the material that they learned at the previous meeting, this process can develop cognitive abilities to understand that is the process of linking new knowledge with their old knowledge.

The four cognitive abilities examined in this study were accommodated in the fourth phase of STAD learning with Mind Mapping techniques. The phases are in the form of work and study in groups where in the form of UKBM work, which contains questions or problems and analyzes the various levels of biodiversity in Indonesia and their threats and preservation.

The making of mind maps as a step in the fifth phase aims to develop cognitive abilities of remembering, understanding and analyzing. The aspect of remembering is trained through how they can recall memories in their memory about the material they have learned at the meeting to be described / written in the mind map. The aspect of understanding can be known based on the ability of students to make mind maps because basically, mind maps themselves are summaries of the material they have learned. The creation of the mind map will accommodate the ability to analyze students because they must describe and include material that is considered important in learning and then connect it to form a concept in accordance with the theme for learning that day.

Evaluation activities in the form of quizzes or presentations are steps in the sixth phase that can develop a variety of students' cognitive abilities. The ability of students to answer quiz questions or questions and responses given by their friends or other groups after a presentation will naturally integrate the ability to remember, understand, apply and analyze.

The third and seventh phases which are the phases of group formation and the rewards phase play an indirect role in training students' cognitive abilities. The formation of groups will be a means of preparation for students before conducting group learning activities which will certainly make students do various preparations to practice the four cognitive abilities that are expected to be achieved. The awarding in the form of stickers is expected to strengthen the cognitive abilities of remembering, understanding, applying, and analyzing what he has trained throughout the learning process.

STAD with the Mind Mapping technique has previously been applied by Mustami (2007) in his thesis which found that the synectics learning model combined with STAD's mind maps and cooperative learning had a positive effect on the mastery of biology material in Makassar city junior high school students. The results obtained in this study show different results compared to previous studies. Based on the theory that there are two factors that can affect student learning outcomes, namely internal factors and external factors. Farkhana (2010) in his thesis revealed that internal factors, namely motivation and health of students and external factors, namely teachers, scholarships, and facilities, could influence

student achievement and between them, external factors that had more dominant influence.

As is the case with discussions on student creativity, the time and habituation factors that are part of external factors are undeniable factors that greatly affect student learning outcomes. The results are more or less the same as the results of this study revealed by Wickramasinghe, et al. (2011) where as many as 74 new students who entered the Faculty of Pharmacy University of Colombo were treated, they learned a new material which some learned with mind map techniques while others used the learning methods they used. After studying for about 45 minutes for each group and then given a test, it was found that the average increase in learning outcomes of students who learn with a mind map is lower than students who learn with the methods commonly used ¬ it even though 91.4% students who learn by using mind maps claim that they are interested in using mind maps in their later learning. These results reinforce that the time, practice, or habituation factor will greatly affect student learning outcomes which certainly does not neglect various other factors.

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the class action research it can be concluded that the application of the STAD Cooperative Learning Model and mind mapping in general can improve the learning outcomes of class X MIPA-3 students of SMAN 4 Magelang. Increasing the percentage of mastery learning from cycle I amounted to 73.52% to cycle II amounted to 85.29% with a difference of increase of 11.77%. While the average score of test results in the first cycle was 72.11 while in the second cycle was 75.50.

ACKNOWLEDGEMENT (OPTIONAL)

The author would like to thank the Director General of BELMAWA, Ministry of Research and Technology through the PDS (School Lecturer Assignment) program to enable this research to be carried out. Thank you also to Tidar University for choosing SMAN 4 Magelang as a partner in this 2019 PDS activity.

REFERENCES

Adib, M. 2009. *Model Pembelajaran Student Teams Achievement Division (STAD dengan teknik Mind Mapping) pada Mata Pelajaran Kimia dengan Media Animasi dan Molymod Ditinjau dari Kemampuan Berpikir Abstrak dan Kreativitas Siswa*. Tesis tidak diterbitkan. Surakarta: Universitas Sebelas Maret.

Al-Jarf, R. 2011. Teaching Spelling Skills with a Mind-mapping Software. *Asian EFL Journal Professional Teaching*, 53(Juli): 4 – 16.

Arifin, A. 2011. *Pembelajaran Biologi Menggunakan STAD dengan teknik Mind Mapping dengan Animasi Komputer dan Elearning Ditinjau dari Motivasi Belajar dan Kreativitas Siswa*. Tesis tidak diterbitkan. Surakarta: Universitas Sebelas Maret.

Armstrong, N., Chang, S., dan Brickman, M. 2007. Cooperative Learning in Industrial-sized Biology Classes. *CBE—Life Sciences Education*, 6(summer): 163 – 171.

Buzan, T. 2009. *Buku Pintar Mind Map*. Jakarta: PT. Gramedia Pustaka Utama.

Farkhana, N. 2010. *Analisis Faktor – Faktor yang Mempengaruhi Keberhasilan Siswa Sekolah Menengah Pertama Di Kecamatan Demak*. Skripsi tidak diterbitkan. Semarang: Universitas Diponegoro.

Joesmani. 1988. *Pengukuran dan Evaluasi dalam Pengajaran*. Jakarta: Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Pendidikan Tinggi Pengembangan Lembaga Pendidikan Tenaga Kependidikan.

Jones, B.D., Ruff, C., Snyder, J.D., Petrich, B., dan Koonce, C. 2012. The Effects of Mind Mapping Activities on Students' Motivation. *International Journal for the Scholarship of Teaching and Learning*, 6(1): 1 – 21.

Maloof, J. dan White, V.K.B. 2005. Team Study Training In The College Biology Laboratory. *Journal of Biological Education* , 39(3): 120 – 124.

Muraya, D.N. dan Kimamo, G. 2011. Effects of Cooperative Learning Approach on Biology Mean Achievement Scores of Secondary School Students' in Machakos District, Kenya. *Educational Research and Reviews*, 6(12), 726 – 745.

Mustami, M.K. 2007. *Pengaruh Model Pembelajaran Synectics yang Dipadu Mind Maps dan Kooperatif STAD terhadap Kemampuan Berpikir Kreatif, Sikap Kreatif, dan Penguasaan Materi Biologi Siswa SMP Kota Makassar*. Disertasi tidak diterbitkan. Malang: Universitas Negeri Malang.

Norman, D.G. *Using STAD in an EFL Elementary School Classroom in South Korea: Effects on Student Achievement, Motivation, and Attitudes Toward Cooperative Learning*. (Online). (http://asian-efl.journal.com/Norman_thesis_2006.pdf, diakses 11 Juni 2012).

Nurjanah. 2011. *Peningkatan Hasil Belajar Biologi Dengan Model Pembelajaran Aktif Card Sort Disertai Mind Mapping Dengan Media Gambar Pada Pokok Bahasan Sistem Peredaran Darah Pada Manusia Siswa Kelas VIII D Smp Negeri 1 Ngemplak Boyolali*. Skripsi tidak diterbitkan.

Surakarta: Universitas Muhammadiyah Surakarta.

Slavin, R.E. 2010. *Cooperative Learning Teori, Riset, dan Praktik*. Bandung: Nusa Media.

Sugiri, B. 2011. *Mind Mapping: Sebuah Kiat Sukses Belajar*. (Online). (http://hmkuliah.wordpress.com/2011/05/08/mind-mapping-sebuah-kiat-sukses-belajar/, diakses 11 Oktober 2019)

Sutarni, M. 2011. Penerapan Metode *Mind Mapping* dalam Meningkatkan Kemampuan Mengerjakan Soal Cerita Bilangan Pecahan. *Jurnal Pendidikan Penabur*, 10(16): 26 – 33.

Tjahjono, A. Dan Aji, C.P. 2010. Implementasi Peta Pikiran (Mind Mapping) dalam Meningkatkan Hasil Belajar IPS Siswa SMP Di Kota Semarang. *Lembaran Ilmu Kependidikan*, (April): 36 – 47.

Wickramasinghe, A., Widanapathirana, N., Kuruppu, O., Liyanage, I., dan Karunathilake, I. 2011. Effectiveness of Mind Maps as A Learning Tool For Medical Students. *South East Asian Journal of Medical Education*, (Inaugural Issue): 30 – 32.