

THE IMPROVEMENT OF STUDENTS' ABILITY TO LEARN CELL BIOLOGY AND DISCUSS ITS APPLICATION IN LIVE THROUGH THE IMPLEMENTATION OF THE STUDENT TEAM ACHIEVEMENT DIVISIONS (STAD) WITH LESSON STUDY (LS)

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Abstract

The purpose of the research is to improve students' ability to learn Cell Biology and discuss its application in live through the implementation of the Student Team Achievement Divisions (STAD) with Lesson Study (LS) in lecture. The experiment was conducted by applying the LS activities involving six lecturers and eleven final year students who are members of the LS team for fourteen meetings on Biology Cell lectures. There are seven Cell Biology materials that were implemented in two different classes with the use of STAD models. The Lesson Study that include Plan, Do, and See activities was implemented with the purpose of improving the quality of teaching learning processes. The data of learning ability was measured using quiz at the end of each lecture, while the discussion ability data was obtained through observation of the 2nd, 3rd, 4th, 5th, and 7th using the observation sheet with aspects of observations: a) the contribution to the task, b) leadership, c) collaboration, d) ability to cooperate, e) understanding of the materials, f) presentation style, and g) the quality of the questions raised. Descriptive data were analyzed qualitatively for the observed components. The highest results of the average of quiz of seven Cell Biology materials was the result of learning on the Nucleus and Genetics Materials. On the average the highest quiz result on this seventh meeting for class A was 67.93 and for class B was 64.21. The discussion abilities of the five materials discussed during Cell Biology lectures was during the discussion of the Structure and Function of the Cytoskeleton. On the average the discussion abilities on this fifth discussion for class A was 68.08 and for class B was 73.50.

Keywords: Cell Biology, Student ability, lesson study, Student Team Achievement Divisions (STAD), .

1. INTRODUCTION

This study is based on an important question how the application of learning model student team achievement development (STAD) using lesson study (LS) can improve the quality of teaching-learning process and enhance discussion-presentation process in Biology Cell subject. STAD by using LS will provide important insight to better understand the difficulties faced by students, so that the lecturers will be able to develop a form of learning that is focus on appropriate material [1]. Furthermore, LS explains that active learner is an important key to improve the ability of critical thinking skills [2].

The main object of this study is Biology Cell which discuss about fundamental knowledge and activities of life, both microscopic, sub-microscopic and molecular level. With it demands of an understanding of important aspects of cell biology related to the structure and function, metabolism, growth and reproduction, aging and cell death, apoptosis, and signal transmission, the lecturers need teaching plan to deliver those abstract material optimally [3]. Cell Biology topics which were studied include seven (7) materials consisting of a) cell structure, the advantages and disadvantages of Cell Biology, and various tools and techniques used in the study of cells, b) inorganic and organic chemical components of cells, c) structure of the cell's membrane and its permeability character, d) the endo-membrane system; supporting organelle and its mechanism, e) the structure and function of the cytoskeleton, f) the structure and function of mitochondria and chloroplast, and g) and the core of genetic material. The results of observation and experience in teaching Cell Biology show that understanding the concept about phenomena, linkages, as well as the mechanism of cells in a network [4] is an important thing to note that impact on improving students' learning abilities.

Problems faced related to biology cell are the abstract and large amount of material that often makes its own difficulties for lecturers to explain in detail on each part. These problems make the students' learning ability runs low because of the difficulty in understanding the material. The methods that have been used are discussion and presentation to enhance students' participation. The process of discussion-presentation is a solution that is able to activate the lectures, but these activities have not been implemented in a structured way therefore it needs to be repaired with clear syntax through the use of STAD by using LS [5].

2. METHOD

The research were applied in two classes, defined by purposive sampling, the number of students for each class is 26, so the total sample is 52. The second semester students who attended Cell Biology class in the schooling year 2011-2012 were taken as the subjects.

2.1. Presentation of Material

Cell Biology material is adapted to be implemented with STAD indicator-based on LS during seven sessions which outlined in Table 1. as follows.

Table 1. The Schedule and Cell Biology Material applied using STAD - LS based during seven sessions on two sample classes

No	Material	STAD with LS	STAD with LS
1	Cell structure, the advantages and disadvantages of Biology Cell, and various tools and techniques used in the study of cells.	March 22, 2013 (A class)	March 24, 2013 (B class)
2	Inorganic and organic chemical components of cells.	April 1, 2013 (B class)	April 3, 2013 (A class)
3	Structure of the cell's membrane and its permeability character.	April 8, 2013 (B class)	April 10, 2013 (A class)
4	Endo-membrane system; supporting organelle and its mechanism.	April 15, 2013 (B class)	April 17, 2013 (A class)
5	Structure and function of the cytoskeleton	April 26, 2013 (A class)	April 27, 2013 (B class)
6	Structure and function of mitochondria and chloroplast	May 2, 2013 (A class)	May 4, 2013 (B class)
7	Core of genetic material	May 9, 2013 (A class)	May 11, 2013 (B class)

2.2 . Teaching- learning Method

LS activities are "plan", "do", and "see", conducted using STAD based on the schedule shown in Table 1. STAD steps were done by doing these activities: a) delivering of objectives and the provision of apperception to motivate students, b) presenting information, c) organizing students into cooperative groups, d) guiding working and learning groups, e) giving tests/quizzes , f) providing awards, and g) closing. Thus the results of "see" in class A is used as a basis for improvement do activities in class B , and vice versa..

2.3 . Data and data analysis

Data taken during the research activities are: 1) the learning ability data which is obtained from quizzes at the end of the session. The quizzes consist of three subjective questions on the level of understanding (C3) to analysis (C5). 2) the discussion-presentation data which is taken by using observation sheets which have components: a) contribution to the assignment, b) leadership, c) collaboration, d) cooperation, e) understanding material, f) presentation style, and g) quality of raised questions.

Descriptive data were analyzed qualitatively by calculating the mean of the quizzes which are held during seven (7) sessions and presentations-discussion activities during five (5) sessions. The interpretation and conclusion are made after that.

3. RESULT

3.1. Learning ability of Cell Biology

The results of the study by measuring quizzes at the end of the sessions showed there are increasing mean during seven sessions of Cell Biology subject in two different classes. The summary of mean can be observed in Figure 1.

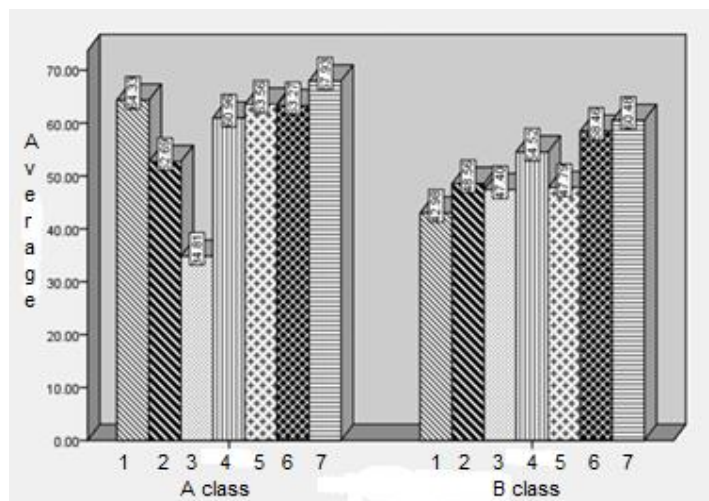


Figure 1. The mean of quizzes for two sample classes during seven sessions with the implementation of STAD models through lesson study.

Figure 1 shows the highest mean of the learning ability is in the 7th session for both class A and class B, with respective values are 67.93 and 64.21. In that session, the materials are the core and the genetic material. The lowest mean in both classes are in the 3rd session which the value is 34.81 in class A and 41.11 in class B. In the 3rd session, the materials are the cell membrane structure and its permeability character.

3.2. The activeness of students in discussion

Observation activity of students in discussion-presentation is conducted using observation sheets which focus on: a) contribution to the assignment, b) leadership, c) collaboration, d) cooperation, e) understanding material, f) presentation style, and g) quality of raised questions. The result can be seen in Fig.2.

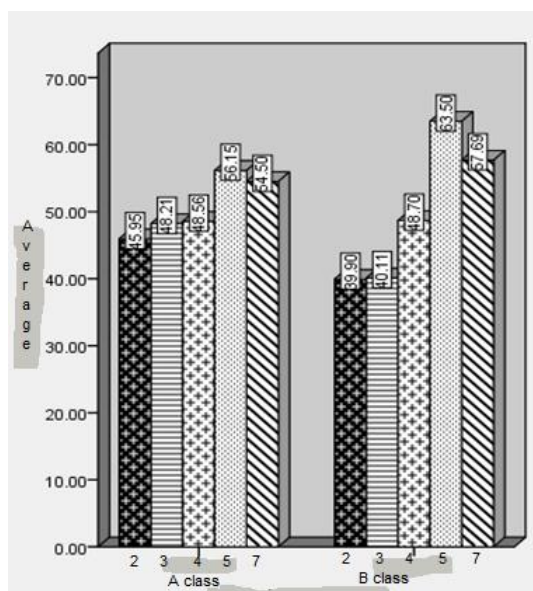


Figure 2. The mean Value of Discussion-Presentation during the 2nd, 3rd, 4th, 5th, and 7th sessions in Two Sample Classe

Figure 2 shows the mean value of Discussion-Presentation during the 2nd, 3rd, 4th, 5th, and 7th sessions. Both classes have the highest value of discussion-presentation in the 5th session when discuss the structure and function of the cytoskeleton. The highest mean is 56.15 for class A and 63.50 for class B. While the lowest mean in both sample classes obtained in 2nd session when discuss organic and inorganic needed by components of the cell. The lowest mean is 45.95 for class A and 39.90 for class B.

The implementation of STAD which was conducted for 7 sessions in two sample classes runs in the appropriate syntax. LS with activity “plan”, “do”, and “see” are implemented by a team of lecturers and senior students in every material of Cell Biology. LS activities include preparation (“plan”), implementation (“do”) and

assessment/reflection (“see”). In the preparation stage, the whole team plans and refines the lesson plan (RPP), handouts, power point, and student worksheets that had been prepared in advance by the model- lecturer.

The Implementation stage (“do”) is conducted by the entire students and the lecturers function as the observers. The focus of observation is the students’ difficulty in studying Biology Cell. The result of observation is delivered at the reflection and it shows that the difficulty are: a) the lack of understanding on the relationship between structure and function of organelle, b) metabolic mechanism such as protein synthesis, the process of obtaining ATP through glycolysis, the difference of working mechanism between chlorophyll mitochondria, the mechanism of the endo-membrane system and cell organelles which related to that system, c) the lack of students’ focus to deliver answers and questions, and d) the power-point form which is not pointing to the important point. To overcome those problems, then steps planned are, a) optimizing the group work by emphasizing the individual assignment which presented to the group at the end, b) delivering and providing a good example of the power-point making process, c) multiplying analogies to explain the relationship between structure and function of organelle, and d) training students to organize the proper sentence in delivering answers or questions in a way to write it down first and then make correction .

4. DISCUSSION

4.1 . Active Learning in Biology Cell with STAD by using LS

The learning process by implementing STAD through discussion-presentation activity shows that students’ learning ability, can be seen from the mean of quizzes scores, has increased from the first to the seventh session in each of sample classes. STAD done with the planning, implementation and evaluation of learning that involves lecturers and senior students as the designer and observers. In the planning stage there are a lot of feedback and suggestion obtained by model-lecturer, including the material which should be presented in more detail. Thus, the understanding of students in Cell Biology is not only related to the definition but also to the processes and mechanism in the working system and the cell’s coordination, shape, number, and material in the quizzes are things which planned by the LS team. Another factor that makes the increase of learning ability is supported by pushing students to be active in their learning activities [6], [7] and [8], especially with the student worksheets (LKM) that have been designed by LS team. LKM variations are: a) the formulation of questions that require answer in the form of understanding and analysis, b) the working process of the LKM answers in the form of crossword puzzle, c) the use of case studies, and d) the use of concept map. LKM varied forms facilitate the student groups to enhance an active learning. The existence of LKM are basically as the complement of the existing biology cell modules and as the support students’ participation. That condition is supported by the results of the study [9] which shows that the use of structured modules will make the students learn to be more active.

The formation of the group is done in the beginning of the session as the STAD base. This process is able to make the members of the group get used to with discussion and also to recognize the habit of each members. The introduction of the members’ characteristics is important in supporting students to adapt to the group. The existence of the group resulted in a learning environment of mutual support with the activities of listening to each other, making analysis and synthesis, and evaluating. The improved understanding through discussion among the members of the group is done by discussing and writing questions [10]. Many discussions were recorded during learning activities, it is found that there are students of Cell Biology state analogy of the material with the condition in their daily lives. As the example when the material discussed is organic and inorganic components of cells, there are members who stated that the material has similarities with their necessity to eat. Or when discussing the nature of the semi-permeability of the cell membrane, there was one member of the group in the class B which equate these conditions with the 'door' which serves to secure the condition of members in the house.

The planning process continued with the implementation which involves the observer to observe the learning process with the result that STAD generally has been done well. The technical coordination of the class is the main input, such as the use of images or videos that come from students’ assignment should be explained by the students themselves. In addition, the preparation of power point is a kind of copy-paste activity and it shows the lacks of the results or thinking concepts related to the material being discussed. Based on that result, it was planned for class B that the team would give the material about power point making technique to emphasis on important point. For the assessment of the observation sheet, there was a suggestion to compile the assessment of discussion and presentation to be more effective and efficient.

4.2 . Learning ability of Cell Biology using quizzes

Learning ability of students can be seen by the quiz score held at each end of the learning activities. The result shows that the highest mean of the learning ability is in the 7th session which discuss the material on core and genetic material for both class A and class B, with respective values are 67.93 and 64.21. When the discussion method is implemented, the readiness of group tends to be better so the presentation can make impact on students' learning. There were two groups that were able to present a detailed picture and a supported animated video of the structure and function's core in presentation process. These conditions described the process of communication and efficient division of assignment within the group to present the material optimally. The same thing is shown by the results of the study [7], that the group members are individually able to contribute ideas and find solutions to solve problems.

Cell membrane structure and its permeability material are supposedly difficult for students to grasp. This condition is shown by the lowest mean score on the quizzes 34.81 in class A and 41.11 in class B. This result revealed when the observer records the reflection activity, that there are two different groups of students who claimed to have difficulties in understanding the material. Students have difficulties in adjusting the theory and the structure of the cell membrane images. The material on shape of the cell membrane which is phospholipid-bilayers structure with amphiphatic character needs for reviews more than once in the group discussions. That condition is resolved by the lecturers who provide assistance by drawing a model of cell membrane which is then compared with the original cell membranes photos that are already found in the textbook, where the image is the result of TEM observation of cells under a microscope.

4.3 . Discussion-presentation with STAD cooperative learning using LS

LS came into value-added activities of STAD because it helps the lectures to set the detail of learning that help students understand the material of Cell Biology, especially on the difficult parts. By using LS, there is a good dynamics in the class with the increasing interaction between students and lecturers. Discussion-presentation that is already implemented in previous lectures enhances the group to work better. Students actively try to apply their understanding through discussion on assignment. The lecturers had concerns on students' difficulties then provide help to them.

The existence of groups in the STAD cooperative learning is becoming a trend research in the last ten years [8], and is considered to be effective in improving the ability of individual members of the group. The condition is relatively similar to the result of this study which shows the improvement of the dynamics of group work, so that the students appear to be more confident when doing presentation. Each member of the group acknowledges responsibility in completing the assignment, so it becomes structural in preparing presentations, planning and monitoring of the results of their work. [7] in the research result proves that when the student can explain what is learned to their friends, the students will learn better rather than just listening or reading by themselves. Thus, the existence of the group has the ability to make students construct knowledge by listening, writing, reading and reflecting on what has been learned include the content, ideas, processes and learning outcomes that have been obtained.

5. CONCLUSION

The result of the data analysis in this study shows that the application of learning model student team achievement development (STAD) by using lesson study (LS) can improve the quality of teaching so as to improve the learning ability of students and the presentation-discussion process in the subject of Cell Biology. Thus, the group learning activities which is supported by the LS can be used to support the overall learning processes.

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