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Building Up Student Learning Outcomes through Contextual Teaching and Learning (CTL) Approaches in Discrete Mathematics Subjects in the Computer Engineering Study Program of South Aceh Polytechnic

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ABSTRACT

Students graduating with a minimum score of C in 2018/2019 even semester is 47%. Given the course objectives' importance and the low learning outcomes achieved, a learning approach expects to create active learning for students. To present active learning, the learning approach used must be familiar with students' daily lives. One learning approach that can emulate students' daily lives is the Contextual Teaching and Learning (CTL) learning approach. The formulation of the problems in this study are a) is the application of CTL able to improve the learning outcomes of students in semester II of the Computer Engineering Study Program in Discrete Mathematics courses?, b) how do lecturers manage learning with the CTL approach ?, and c) how are student learning activities using CTL? The purpose of this study was to a) determine the improvement of student learning outcomes, b) to assess the ability of lecturers to manage learning activities, and c) to evaluate student activities in learning. The research approach used in this research is quantitative and qualitative methods, while the type of research is classroom action research (PTK). The subjects of this study were 16 students in the second semester of the Computer Engineering Study Program. The data collection techniques used in this study were a) test questions and b) observation sheets. The study consisted of 2 (two) cycles, where the first cycle consisted of 3 meetings, while the second cycle consisted of 2 sessions. The results showed that lecturers' ability to manage learning processes I and II were in a suitable category. The power of lecturers to learn increased compared to cycle I to cycle II, from 3.88 to 4.06. Student learning activities in process II increased when compared to process I. The results of the first cycle test showed that 11 students completed, while in cycle II the results obtained 12 students completed. The percentage of student learning completeness during the first cycle to the second cycle was 68.75% and 75%. The increase in student learning completeness between process I and cycle II is 75% - 68.75% = 6.25%.

I. Introduction

A. Background

Discrete Mathematics courses - especially the discussion of associations - are compulsory subjects in the Computer Engineering Study Program curriculum at the South Aceh Polytechnic. This course is intending as a provision for students to solve problems in other issues that have a relationship with mathematical concepts. Student learning outcomes with a minimum pass grade of C are 47% in the even semester 2018/2019. Given the importance of these courses' objectives and the low learning outcomes, a learning approach is applied to bring active learning to students. The

learning approach must be familiar with dynamic students' daily lives. One of the learning approaches that can present students' everyday life situations is the contextual learning approach (Contextual Teaching and Learning).

According to [1], the word Contextual's language definition comes from the phrase context, which means "relationship, context, atmosphere, or state." Thus, contextual is defined as "related to the atmosphere (context)," so that contextual teaching and learning (CTL) can be interpreted as learning related to a particular atmosphere. Then [2] explained that knowledge using the CTL approach focuses on packaging the subject matter according to the nuance or context in student life.

In a contextual approach, the concept of learning is raise. The lecturer presents real-world situations and encourages students to connect their knowledge and its application in their lives. A contextual approach is also a learning approach that emphasizes the importance of the natural environment created in the learning process. Students are more active and meaningful because students experience what they learn for themselves.

B. Problem Formulation

The formulation of the problems in this study are a) is the application of CTL able to improve the learning outcomes of students in semester II of the Computer Engineering Study Program in Discrete Mathematics courses ?, b) how do lecturers manage learning with the CTL approach ?, and c) how are student learning activities using CTL?.

C. Purpose

The purpose of this study was to a) determine the improvement of student learning outcomes, b) to assess the ability of lecturers to manage learning activities, and c) to assess student activities in learning.

II. Literature Review

A. Learning

Learning is a process recognized by changes in a person. The change resulting from the learning process can be shown in various forms, such as changes in knowledge, understanding, behavior, skills, habits, and changes in the aspects of learning. According to [3], education changes behavior towards better behavior, where these changes occur through practice or experience. Furthermore, [4] explains that learning and teaching as the main activities in school include three elements, namely teaching objectives, teaching and learning experiences, and learning outcomes.

B. Contextual Teaching and Learning (CTL)

The contextual approach (CTL) has seven main components namely, constructivism, finding (Inquiry), asking (Questioning), community-learning (Learning Community), modeling, reflection, and actual assessment (Authentic)) [5].

C. Overview of Discrete Mathematics Courses

Set / association theory is one of the materials taught in Discrete Mathematics courses. In this research, the material discussed is the association theory. The sub-material of set theory taught is (1) Definition of sets and membership of a group and declaring a group, (2) Empty set, universal set, and Venn diagram, (3) Subset (4) Set slice and set combination, (5) Set difference and set complement, (6) Use of Venn diagrams for slices and set combinations.

D. Framework

The role of lecturers in classrooms managed with a contextual approach is to help students achieve their goals. Lecturers maneuver more on strategy than on providing information. The lecturer's task is to manage the class as a team working together to find something new for students. Something new comes from finding themselves instead of what the lecturer said. The contextual approach emphasizes the way students construct their knowledge in learning, then reflect on this knowledge to solve the problems they face in everyday life. The thinking framework in this study can be described as follows:

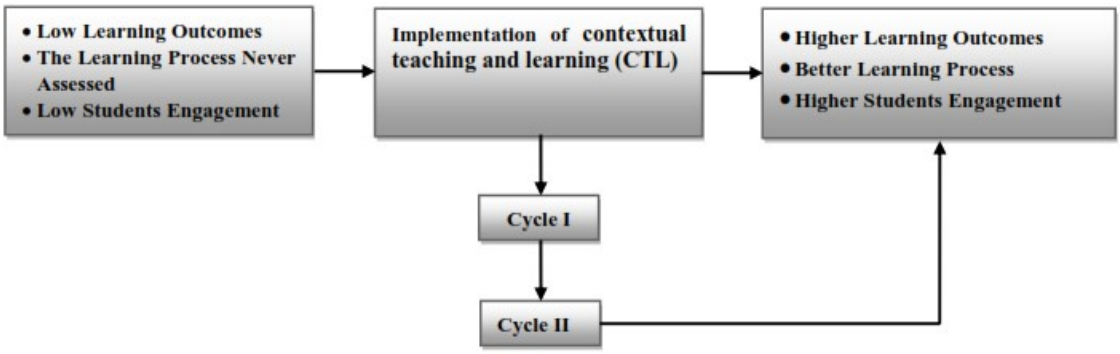

Figure 1. Research Framework

E. Action Hypothesis

Based on the framework above, the research action hypothesis proposed in this study is that the contextual teaching and learning (CTL) learning approach can create an active learning environment and improve student learning outcomes in Discrete Mathematics courses.

III. Research Method

A. Research Design

This type of research is the PTK research (classroom action research) with quantitative and qualitative approaches.

B. Research Cycles

Each cycle's learning process goes through several stages, namely planning, implementing, observing, and reflecting. The research cycle is described in the following flow chart.

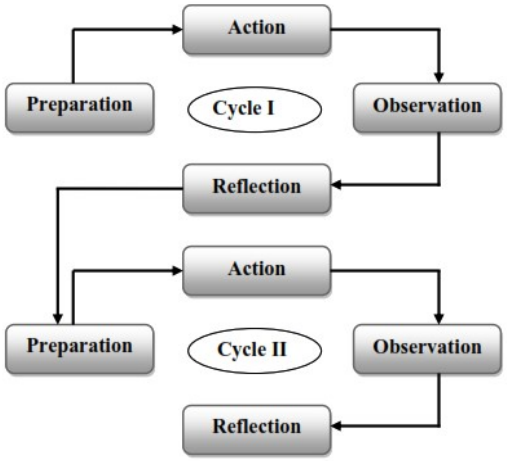

Figure 2. Research Cycles

C. Research Subject and Location

The research subjects were 16 students in the second semester of the Class Computer Engineering Study Program, namely class 2B members.

D. Data Collection Techniques

Data collection techniques used were in the form of test questions and observation sheets of student learning activities and lecturers' ability to manage learning activity.

E. Data Analysis Techniques

1) Analysis of Student Learning Outcomes

To determining student learning outcomes, the percentage formula is used according to [6] is:

$$\%\ Learning\ Completedness = \frac{Number\ of\ Students\ Pass}{Total\ Number\ of\ Students\ in\ Class} \times 100\% \quad .....1)$$

A student is said to be complete individually if he gets ≥ 69% of the total score. Classical completeness is obtained if there are ≥ 80% of students who have completed separately.

2) Analysis of Student Activity Data

To determining student activity, it is analyzed by using the percentage formula as follow:

$$P = \frac{f}{N} x100\% \quad .....2)$$

Information:

P = percentage
F = students activity frequency
N = number of students activity

Table 1. Criteria for Ideal Time for Student Activities in Learning

Observation Aspects of Student Activities	Conformity Percentage (P)	
	Ideal Time	Tolerance
Listening / pay attention to the explanations of lecturers/friends.	13%	7%≤P≤18%
Read/understand contextual problems in the worksheet.	10%	5%≤P≤15%
Troubleshoot or find a problem-solving solution	27%	22%≤P≤32%
Compare the findings of the group discussion with the results of the group discussion	30%	25%≤P≤35%
Asking/conveying opinions/ideas to lecturers or a group of friends	10%	5%≤P≤15%
Conclude a concept found or a procedure that is done	10%	5%≤P≤15%
Behavior that is not relevant to teaching and learning activities	0%	0%≤P≤5%

[7].

3) Lecturer Ability Data Analysis to Manage the Learning Process

Data about the ability of lecturers in managing learning were analyzed using the percentage formula.

$$\%\ Observation\ (P) = \frac{The\ Number\ of\ Scores\ Obtained}{Maximum\ Score} \times 100\% \quad .....3)$$

Table 2. Indicators of Lecturer Ability to Manage Learning

Percentage	Criteria
$66{,}66\% \leq P \leq 100\%$	Well
$33{,}33\% \leq P \leq 66{,}66\%$	Good
$0\% \leq P \leq 33{,}33\%$	Less

[8].

IV. Results and Discussion

A. Test Result

The first cycle test showed that 20 students completed, while in the second cycle, the results obtained 20 students completed. Compared to the percentage of student completeness during process I to cycle II, they are 68.75% and 75%. Although the completeness of classical student learning outcomes has not been achieved, student learning outcomes for cycle II have increased

compared to process I. The increase in student learning completeness between cycle I and cycle II is 75% - 68.75% = 6.25%. Based on these results, it can be concluded that the application of the Contextual Teaching and Learning learning approach can improve the learning outcomes of the second-semester students of the Computer Engineering Study Program in Discrete Mathematics courses, especially in association material.

B. The Average Ability of Lecturers

The average ability of lecturers to manage learning activities using the CTL approach can be seen in Table 3.

Table 3. The Average Ability of Lecturers to Manage Learning

Cycle -	1	2
Percentage	77,52%	81,25%
Criteria	well	well

Based on Table 3, it appears that the ability of lecturers to manage learning activities using the CTL approach is in a 'well' category.

C. Students Learning Activity

The average student learning activities can be seen in Table 4.

Table 4. Data on Average Student Learning Activities

Cycle-	1	2
Actively Engage	2, 3, 5	1, 2, 3, 4, 5, 6, 7
Passive	1, 4, 7	-

Based on Table 4, it is concluded that student learning activities in cycle II have increased when compared to cycle I.

V. Conclusion

A. Conclusion

Based on the research results, it can be concluded that:

1) The ability of lecturers to manage learning with the Contextual Teaching and Learning approach has increased, from 77.52% to 81.25%.
2) Student activity in cycle II has increased compared to process I.
3) The application of the Contextual Teaching and Learning learning approach can improve student learning outcomes in semester II of the Computer Engineering Study Program in Discrete Mathematics courses, especially in association material.

B. Suggestion

Based on the above conclusions, the researchers provide suggestions. It is hoped that the Computer Engineering Study Program lecturers pay attention to the characteristics of their students so that they can take action to improve student learning outcomes both on set material and other materials by applying the Contextual Teaching and Learning approach.

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