

Implementation Instructional Technique Teacher's Questions In Meeting The Problem Of Problem Based Learning to Increase Pattern Concept Map Scores

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Abstract. The aims of research to increase pattern scores in the concept map by instructional techniques teacher questions in meeting the problem stage of problem based learning. This research is a class action research with 2 cycles. The research was 30 participants of high school students. There are procedure of the research: planning to prepare research instruments, implementing instructional and reflection on subsequent actions. The data are: score patterns, teacher and student interview and learning documentation. Validation by triangulation technique to verification of pattern scores, learning documentation and interviews. Data analysis as qualitative descriptive with the stages of data reduction, data presentation, and drawing conclusions. The average of pattern score in pre-research, cycle I, and cycle II were 33,3%; 39,3% and 80%, thus implementation instructional techniques teacher's questions in meeting the problem of problem based learning able to increase pattern concept map score.

Keywords: questions, pattern, problem based learning

1. Introduction

The aims of research to increase pattern scores in the concept map by instructional techniques teacher questions in meeting the problem stage of problem based learning. This research is a class action research with 2 cycles. The research was 30 participants of high school students. There are procedure of the research: planning to prepare research instruments, implementing instructional and reflection on subsequent actions. The data are: score patterns, teacher and student interview and learning documentation. Validation by triangulation technique to verification of pattern scores, learning documentation and interviews. Data analysis as qualitative descriptive with the stages of data reduction, data presentation, and drawing conclusions. The average of pattern score in pre-research, cycle I, and cycle II were 33,3%; 39,3% and 80%, thus implementation instructional techniques teacher's questions in meeting the problem of problem based learning able to increase pattern concept map score.

Concept map/CM is a graphic form that has a meaningful hierarchy and represents the mastery of the concepts of students [1]. CM has six elements with their respective specifications, namely valid relationship, branching, hierarchy, cross-link, example, pattern [2]. Pattern is a structured of

relationships between all concepts in CM [3]. Pattern represents the mindset of students towards the overall understanding of the material [4], thus forming a meaningful relationship.

The mindset of understanding material as a whole is trained through the activities of reasoning, analyzing, and solving complex problems [5]. Complex problems are ill-structured problems [6] that require various points of view of science to create solutions [7]. The learning model that accommodates ill-structured problems is Problem Based Learning/PBL [8].

PBL has five stages: meeting the problem, problem analyzes and learning issue, discovery and reporting, solution presentation and reflection, overview integration, and evaluation [8]. The part of PBL is ill-structured problem [9] that facilitates students to find and construct knowledge independently [5].

The result observation pattern in PBL showed an average pattern score is 33.3% with a range of scores of 20% - 40%; thus PBL was less effective in increasing the pattern score, so PBL modification was needed. Modification of PBL learning is done by adding instructional techniques' teacher's questions because teacher questions make it easier for students to organize and connect the concepts found [10]. Instructional techniques' teacher's questions can be applied at all stages of PBL [11]. A crucial difficulty in implementing PBL is finding and solving unstructured main/big problems [12]. The PBL stage that accommodates the process of finding and resolving significant problems that are not structured is the meeting of the problem stage [8], thus modifications are made at the meeting the problem stage by adding instructional techniques' teacher's questions.

Instructional techniques' teacher's questions can actively involve students and encourage students to find concepts [13]. Instructional techniques' teacher's questions are used as a systematic guide to improving student performance in the learning process [14].

The application of instructional techniques' teacher's questions at the meeting the problem stage helps students focus and make it easier for students to find concepts [10], to solve ill-structured problems [15]. The concepts of knowledge that are found are then linked so that they form a pattern of the overall conceptual relationship represented in the pattern [16], thus the purpose of the study is to measure the improvement of the pattern score in students' CM by applying instructional techniques' teacher's questions at the meeting the problem stage in PBL.

2. Method

This research is a classroom action research consisting of 2 cycles with research subjects of 30 high school students of X Mathematics and Natural Sciences class. The determination of research subjects was based on initial observations with the results of the pattern score that was less optimal.

Research procedures included: the planning stage for developing research instruments, the implementation phase by applying pure PBL to the pre-research followed by the application of instructional techniques' teacher's questions at the meeting the problem stage in PBL in cycle I and II, the reflection phase to determine the next course of action. The pre-research learning topics were types of pollution, cycle I sources and pollutants, cycle II pollution indicators.

The research data was in the form of score pattern with supporting data that was the results of interviews and learning documentation. The data validity test used was data triangulation techniques [17] to confirm pattern scores with interviews and documentation. The data analysis was descriptive qualitative analysis which consists of 3 stages, namely data reduction, data presentation, and drawing conclusions [18].

The pattern score calculation was based on expert CM, and the pattern calculation in percentage is presented in Table 1 and Table 2.

Tabel 1. The scoring rubric of pattern score [2]

Treatment	Expert CM		Pattern Score Calculation	Pattern score in percentages
	Max Hierarchy	Max Pattern		
Pre- research	5	5	$5/5 \times 5 = 5$	$5/5 \times 100\% = 100\%$
Cycle I	5	5	$5/5 \times 5 = 5$	$5/5 \times 100\% = 100\%$
Cycle II	3	5	$3/3 \times 5 = 5$	$5/5 \times 100\% = 100\%$

3. Result and Discussion

3.1 Result

Pattern describes the overall structure of knowledge by students. The percentage of pattern score on CM from pre-research to cycle II had different results. Comparison of the results of the percentage pattern score is presented in Figure 1.

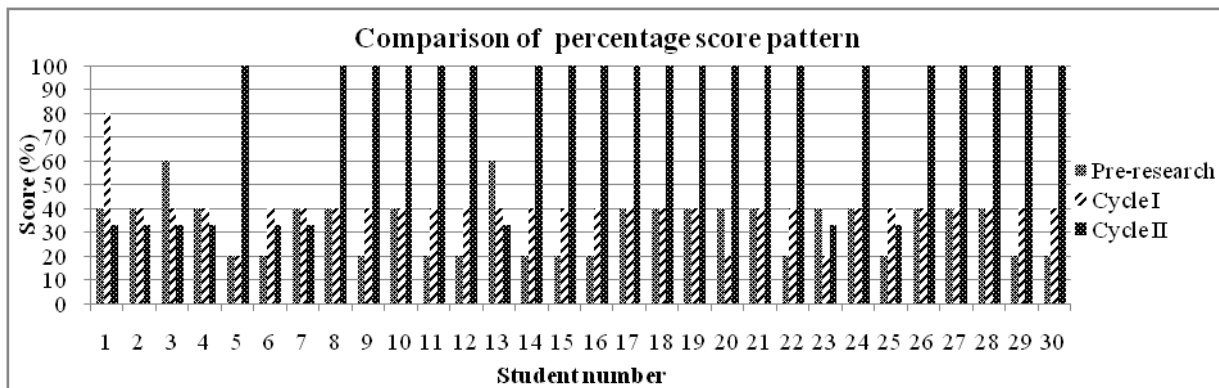


Figure 1. Comparison of percentage score pattern

The percentage of pre-research pattern scores had a class average of 33.3%, with details of 60% of the total number of students getting a score above the average and 40% of the number of students getting a score below the average, thus the application of PBL has not been effective in increasing scores pattern, so it needed improvement in further learning.

The implementation of the first cycle was done to improve the learning process in pre-research, by applying instructional techniques' teacher's questions at the meeting the problem stage in problem-based learning on the topic of learning resources and pollutants.

The pattern score percentage of cycle I had an average of 39.3% with a breakdown of 90% of the total number of students who scored above the average and 10% of the number of students who scored below the average, even though 90% of students were above the average; however, the average pattern yield was still low, so it needed to be continued to improve in the next cycle.

The pattern score percentage of cycle II had an average of 80% with a breakdown of 70% of the number of students who scored above the average and 30% of the number of students who scored below the average. Students who experienced an increase from cycle I to cycle II was 70%. The average pattern score from cycle I to cycle II has increased by 40.7%; thus, the pattern score has increased from cycle I to cycle II with an average score of 80%.

The result of the percentage score pattern of each action has a difference. Cases of students who experienced a decrease in pattern score from pre-cycle to cycle II is 20% with student numbers 2, 3, 4, 7, 13, 23. Students experience an increase in trend from pre-cycle to cycle I by 40% with student numbers 5, 8, 10, 17, 18, 19, 20, 21, 24, 26, 27, 28.

The results of the average percentage of score pattern from pre-research to cycle I and cycle II respectively were 33.3%; 33.9%; 80%. The percentage of the number of students who experienced an

increase from pre-research to cycle I was 40%, cycle I to cycle II was 70%; thus the application of instructional techniques' teacher's questions at the meeting the problem stage in problem-based learning increased the pattern score.

3.2 Discussion

The results of comparison percentage score of each individual pattern is different. The results show students have increased and decreased individually. The percentage of the average pre-study pattern score, cycle I and cycle II had a linear increase.

The percentage result of the pattern scores has increased linearly from pre-research to cycle II. The increase in patternscore is due to the mindset of students who have improved [4] to understand a material [19], so students are able to make a pattern of overall conceptual relationships well [3].

The overall conceptual relationship pattern, is related to students' reasoning in constructing knowledge [20]. Teacher questions optimize the process of constructing knowledge to students [21], because teacher questions become a reference for students to proceed in learning [22]. Students who process learning have a mindset towards mastering optimal knowledge [4], so that students' mindsets can be improved through teacher questions.

Instructional techniques' teacher's questions at the meeting the problem stage can direct students to search for information [23] as the basis for solving complex problems [24]. Optimal problem-solving at the problem meeting stage indicated that students could understand the material. The overall understanding of the material is the basis for students to construct CM, one of which is a component [25].

Patterns in CM represent general organizational concept patterns to more specific concepts [26]. Concept organization deals with students' thought patterns in mastering concepts [27]. Students' mindset toward conceptualization of concept is visualized from the pattern [4], thus the pattern score can be improved through the application of instructional techniques' teacher's questions at the meeting the problem stage in problem-based learning.

Cases in students who experienced a decrease due to differences in the complexity of the material for each cycle. Complex material requires a high interest in learning to proceed in learning [28]. Student learning interest is indicated through student involvement in learning [29] so that they can understand complex material.

Understanding complex material requires more time [30]. Longer time allocation facilitates students in understanding complex material and connecting concepts in the form of CM. CM is constructed from information that students find [31], so it becomes a pattern in connecting concepts represented by patterns [3].

Time allocation in the learning process is very limited so that it affects students in understanding the material. Limited time results in the CM construction process [32], because the preparation of CM requires complex thinking [33], so that the overall conceptual relationship pattern is formed which is visualized from the pattern score; therefore the process of constructing a complex CM need more time, to achieve optimal results.

4. Conclusion

The application of instructional technique teacher's questions at the meeting the problem stage in problem-based learning can improve the ability to find information that affects the mindset of understanding knowledge that is visualized through pattern concept map score.

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