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Profile of Students' Computational Thinking Using Problem-Based Learning Models in Review from Learning Style at SMA N 1 Langsa

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ABSTRACT

This research examines students' computational thinking abilities in problem-based learning (PBL) classes. (2) Kolb's learning style profile towards students' computational thinking in the PBL context. This type of qualitative research is descriptive in nature, analyzing class XI MIA 4 students at SMAN 1 Langsa using data reduction techniques in assessing Kolb-type learning styles, computational thinking tests, interviews, and documentation. (1) The results of the computational thinking test using the problem-based learning (PBL) learning model showed that the low category was 9 people (25%), the medium category was 15 people (41.44%), and the high category was 12 people (33.33%). Nine low categories, 15 medium categories, and 12 high categories show this. Most students are intermediate computational thinkers. (2) Profile of MS participants with a convergent learning style with indications of decomposition (4 and 90.33%); pattern recognition (3 and 88.35%); thinking algorithm (3 and 72.85%); and patterns of abstraction and generalization (3 and 69.71%). Various learning styles with indications of decomposition (4 and 90.33%); pattern recognition (3 and 80.15%); thinking algorithm (3 and 71.85%); and pattern abstraction and generalization (3 and 69.40%) constitute the profile of DYZ subjects.

A. INTRODUCTION

Due to the difficulties presented by an ever-evolving educational curriculum, Indonesia is putting a greater emphasis on the construction of a strategic educational framework. This is done in order to better prepare the country to compete in the 21st century, which is marked by rapid technical and informational advancements. If the skills needed by someone to face the digital era are not prepared immediately now, then students will become victims of the modern era because they are unable to deal with the rapid development of communication technology as well as the increasingly difficult and complex problems they will face in the future (Surya, E., & Syahputra, 2017). Students will become victims of the modern era because they are unable to deal with the rapid development of communication technology as well as the problems they will face in the future. In order to prepare for this, the OECD (2019) asserts that in order to successfully transition into the 21st century, a person needs to be able to generate new values through creative thinking, the development of innovative products and services, new types and methods of work, new ways of thinking, and changing individual mentalities to be collaborative, communicative, and open-minded. In other words, they need to be able to create new values.

The execution of the PISA test, which takes place once every three years, provides a means by which the educational achievement of pupils in Indonesia may be evaluated in relation to the 21st century. Totok Suprayitno, the Head of the Research and Development Agency (Balitbang), revealed that the execution of the study (OECD, 2019) was attended by 399 education units with 12,098 pupils. This information was provided by Totok Suprayitno. The first time that Indonesia participated in the PISA study, which is conducted entirely online, was in 2018. Because Indonesian students are not yet proficient in information and communication technology (ICT), one of the suggestions that has been made is to improve their use of information and communication technology (ICT) so that they can learn more effectively. This demonstrates that simply having access to information and communication technology (ICT) infrastructure is not sufficient; there must also be its implementation in education. In addition to the challenges presented by information and communication technology, the students of Indonesia need to enhance their mathematical literacy in order to

raise the bar for the mathematics category in upcoming PISA examinations. According to the framework (Hewi, La., and Shaleh, 2020), mathematical literacy, which initially focuses on basic computing abilities, needs to be redefined by paying attention to very fast technology advancements. This is because mathematical literacy has traditionally focused on basic computational abilities. In PISA 2021, it strengthens the connection between mathematical reasoning, problem-solving cycles (mathematical modeling), mathematical content, context, and abilities appropriate for the 21st century (Anggraena., 2021).

On the basis of these facts, there ought to be a breakthrough in terms of finding solutions to the issues that have been plaguing Indonesia's educational system. (Ansori, 2020) The capacity to think computationally, or computational thinking, has become increasingly important in today's industrialized nations, and one strategy for addressing this issue is to educate kids on how to develop this skill. Computational Thinking is frequently cited as one of the skills that will be necessary in order to maintain the educational system in the 21st century by a wide range of experts. Decomposition, pattern recognition, algorithmic thinking, and pattern abstraction are a few examples of the computer science techniques and ideas that are utilized in computational thinking. Computational Thinking is a method for comprehending and resolving difficult situations. Students who take classes in computational thinking are encouraged to develop abilities in critical thinking, creativity, communication, and the ability to work effectively with others to find solutions to issues. In addition to this, computational thinking helps develop a character that is self-assured, open-minded, tolerant, and sensitive to environmental factors (Kalelioglu., 2018). This is because it helps hone understanding of logical systems, mathematical systems, mechanical systems, and computer systems.

However, the reality is that the educational system in Indonesia has not done a very good job of training pupils in computational thinking skills. The following is a report on the results of the test questions that researchers in class XI MIA 4 at SMA Negeri 1 Langsa carried out. This report was written in light of some of the issues that were discovered by researchers when carrying out earlier research at SMA Negeri 1 Langsa, to be more specific in class XI MIA 4.:

Table 1. Data on Students' Computational Thinking Ability Results

No	Computational Thinking Skills	Score	Category
1	Decomposition	50	Enough
2	Pattern recognition	65	Enough
3	Algorithmic Thinking	43	Not enough
4	Generalization and Abstraction of Patterns	40	Not enough

Based on table 1, data from the results of testing questions related to computational thinking skills with the There is still room for improvement with regard to the aforementioned four indicators. in order to bolster charges of a lack of computational thinking skills. If during the teaching and learning process the teacher is solely dominating and does not utilize any learning models other than unsystematic lecture, note, and discussion models, then the condition of the students is not independent, and it will be difficult to export their computational thinking skills. (Sinaga. C. V. R, 2020) Teachers require a problem-based learning approach (also known as Problem Based Learning) as an alternative to active learning for the purpose of increasing students' capacity to solve problems. (Rustam.E., Sidabutar.D.R., 2017) Students will develop more creative thinking and problem-solving skills through education that is oriented on real-world issues that arise in everyday life and must be handled by the students themselves through independent investigation. Applying the Problem-Based Learning learning model is one way to put computational thinking into practice, which is the learning model that is generally accepted as being appropriate for the 21st century.

Students are anticipated to be able to acquire higher level skills and inquiry, build their own knowledge, and develop independence and self-confidence while using the Problem Based Learning learning model (Trianto, 2016), which is a learning technique that places students on actual (real) challenges. This is consistent with the viewpoint presented in Sugiyono (2015), which asserts that problem-based learning is defined by students working in pairs or small groups to investigate real-world problems. This assertion is supported by the fact that this assertion is supported by the evidence. It is anticipated that the students will be better able to acquire the information and ideas they learn, as well as to find solutions to the difficulties that they are now experiencing, if learning involves grouping.

Problem-Based Learning (Fardani, Z., Surya, 2021) involves students working on actual challenges to build their knowledge, skills, independence, and self-confidence. Problem-Based Learning also actively engages pupils in mathematics problem-solving. Problem-based learning develops critical thinking, problem-solving,

and intellectual skills by organizing lessons around real-life events. Direct learning and lectures enable professors impart enormous volumes of knowledge. Problem-based learning teaches these skills.

Students learn through problem-based learning (PBL), and teachers engage in activities that include bargaining with one another. Students are able to stimulate their minds to make existing concepts logical through learning activities on issues that interest students, always trying to solve problems, improve communication in learning, focus on the process of inquiry and reasoning in problem solving, and develop students' confidence in using mathematics when they face situations that they encounter in everyday life (Kamil., 2021). This is all made possible by learning using the PBL model, which allows students to stimulate their minds to make existing concepts logical through learning activities on issues that interest students. Students may be given the opportunity to develop their own knowledge using this paradigm, which will allow them to gain knowledge, locate, recognize, and eventually be able to solve problems.

Students will learn to approach problem-solving in a methodical and organized fashion if they participate in Problem-Based Learning, which requires that students solve issues in line with the steps of the scientific method. When students wish to find solutions to the challenges they are facing, these students must utilize a variety of methods such as thinking about the problem, asking questions about the problem, and attempting to solve the problem (Minarni, 2018). Students who are accustomed to solving problems methodically and in a planned manner will have the capacity or skills to search for data, plan how to solve problems, solve problems, present and explain the results gained. In addition to this, the student will have a proactive demeanor, habits of critical thinking, creative abilities, and analytical prowess.

Learning styles, math anxiety, lack of self-confidence, surroundings, instructor beliefs, lack of parental attention, and gender are just few of the many elements and variables that might contribute to a student's struggle to learn. A person's preferred mode of thinking, processing, and interpreting information is referred to as their learning style. According to Bire (2014), students do not all have the same approach to learning, meaning that each student has an approach to learning that is both natural and comfortable for that student. Some students feel more engaged in the learning process when their teacher writes everything that they need to know on the board for them to read and comprehend. However, there are other children who would like the teacher present the information verbally so that they can listen and comprehend it. There are some pupils who would rather talk about the topics at hand in intimate settings with their fellow classmates. In addition, there are certain students who find that learning through the use of visual aids is most beneficial to them.

According to the findings of the preliminary interviews conducted with the students of class XI MIA 4, it has been determined that learning styles emerge initially as a result of previous experiences; once these experiences have been appropriately evaluated and thought about in order to form a conclusion or speculation, this then constitutes a new experience for the students. Therefore, there is a connection between gaining knowledge through experience and gaining knowledge of mathematics through schooling. According to Kolb, student learning styles can be broken down into four distinct stages of development, as stated by (Ramadan, 2019). Concrete experiences, introspective observation, abstract conceptualization, and active exploration are the stages that most people go through in this order. This indicates that students engage in real-world activities, after which they watch and reflect on those activities from a variety of perspectives, after which they formulate abstract concepts and generalize those concepts into theories, and finally, after which they actively experience these theories and test what they have learned in a variety of complex scenarios. There are four different learning styles that may be determined by looking at these four factors: converger, assimilator, diverger, and accommodator. In brief interviews conducted inside a single class, a variety of learning styles were discovered. It is highly crucial for teachers to recognize the different learning styles of their students. This is due to the fact that pupils who are aware of the sort of learning style they employ will be able to modify how they learn in the classroom in order to be successful learners. In the meantime, according to (Ripai., 2019), the identification of learning styles "can help students to become effective problem solvers." In addition, Afif and A.M.S. (2016) state that a student's "own learning style is one of the factors that influences how students learn mathematics."

According to (Lestari, 2015) if the teacher is able to adjust to the different learning styles possessed by his students then students will have an interest in learning mathematics. In addition, this learning style is important to determine in this research activity in order to find out which students are categorized as divergers, assimilators, convergers and accommodators who can achieve computational thinking processes using the Problem Based Learning learning model. Based on the description of the background above, it is necessary to carry out further research regarding "Students' Computational Thinking Profiles Using Problem Based Learning Models in terms of Learning Styles at SMAN 1 Langsa".

B. RESEARCH METHODS

The objective of this study is to analyze the cognitive profiles of students who make use of the Problem-Based Learning (PBL) instructional paradigm and to discuss such profiles in light of the many different learning styles. In the process of evaluating the information collected, this research uses qualitative descriptive data analysis. This study made use of research instruments such as learning implementation plans, student worksheets, computational thinking ability assessments, and questionnaires of the Kolb type. All of these were incorporated into the research process. Students from class XI at SMA Negeri 1 Langsa's MIA 4 were recruited to take part in this study as participants. This research was carried out on a total of 36 different college students. These students participated in classes that utilized the Problem-Based Learning (PBL) instructional technique during the odd semester of the school year 2022/2023. Through the use of questionnaires and student interviews, one can observe indicators of students' computational thinking in relation to problem solving. These indicators can be viewed in accordance with the Kolb type of learning style. In particular, the implementation of the Problem-Based Learning (PBL) instructional paradigm onto the material that has been structured in sequential and serial fashion.

C. RESULT AND DISCUSSION

Computational Thinking Ability Level Students Use The Problem Based Learning Learning Model

On the basis of the results of the students' computational thinking skills exam, a score was assigned to each student, and from that score, a description of the computational thinking abilities of the students was obtained. Because of this, all of the student answer sheets from the test results are collected, and then each student is given a score after the examination. The rules for grading students' computational thinking abilities are used to provide a score to each student's answer. After that, the total score of each student is obtained to determine their level, and then that level is categorized depending on the scoring category.

The student will be evaluated on their ability to think computationally by responding to five questions written in the form of descriptions and covering topics related to sequences and series. It was determined, based on the findings of the validation and testing of the instrument, that the answers to the five questions could be utilized without being revised, that they were valid, and that their reliability was excellent. The evaluation of the students' capacity for computational thinking will take place on Saturday, December 3, 2022, for a duration of one hour and ninety minutes. The computational thinking tests that students take are administered by the students themselves in an open and honest manner, and they are directly supervised by researchers. You may get an idea of the pupils' general degree of computational thinking by looking at Table 2 down below.:

Table 2. Level of Computational Thinking Ability of Students

Value Intervals	The number of students	Percentage	Assessment criteria
$\mathbf{0 \leq SKBKS < 50}$	9 Person	25%	Low
$\mathbf{50 \leq SKBKS < 80}$	15 Person	41,66%	Currently
$\mathbf{80 \leq SKBKS < 100}$	12 Person	33,33%	Tall

According to Table 2, it was discovered that the degree of students' computational thinking skills was found to total 9 individuals in the low assessment category (25%), 15 people in the medium assessment category (41.66%), and 12 people in the high assessment category (33.33%). After the adoption of the Problem-Based Learning (PBL) model, the level of students' computational thinking skills can be determined to be, for the most part, somewhere in the medium assessment category.

Students who were placed in the high category were successful in finding a solution to the challenge. Students who fall into the high category have also had the opportunity to finish student computational thinking tests on the Decomposition indicator (students are able to identify known information, and are asked about the students are able to recognize the same or different patterns or characteristics in solving problems), Pattern Recognition (students are able to recognize the same or different patterns/characteristics in solving problems), Thinking Algorithms (students are able to mention the logical steps used to construct a solution), and Generalization and Pattern Abstraction (students are able to mention the logical steps used to construct a solution), and Problem Solving (students are able to solve the problems given), Thinking Al Students who are considered to be in the moderate range have also been successful in finishing students' computational thinking assessments on markers of decomposition, pattern identification, and algorithmic thinking; despite this, the students who fall into the moderate range have been able to finish the tests, there are some students who are

unable to answer certain questions, particularly question number 4, where some students have not been able to mention general patterns of similarities/differences and have not been able to draw conclusions from this pattern in an appropriate manner. Students who fall into the moderate category have also been able to complete students' computational thinking tests on indicators of decom.

Learning Style Questionnaire Results

Based on the results of filling out the Kolb type learning style questionnaire conducted by 36 students of class XI MIA 4 SMA Negeri 1 Langsa, the results of learning styles are shown in table 3 below:

Table 3 Results of the Student Learning Style Questionnaire

Learning Style	The number of students	Percentage
Accommodator	4 Person	11,11 %
Divergers	6 Person	16,67 %
Assimilator	21 Person	58,33 %
converter	5 Person	13,8 %

According to Table 3, it was discovered that pupils exhibit all of the learning styles described by Kolb and Kolb. There are a total of 4 pupils in this population (11.11%), and they demonstrate characteristics of the Accommodator learning style. There are a total of six students who fall into the Diverger learning style category, which represents 16.67% of the student body. Twenty-one students, or 58.33 percent of the total, have been identified as having an Assimilator learning style. There are a total of five students (13.89%) who fall into the category of having a Converger learning style.

DISCUSSION

This research was carried out at SMAN 1 Langsa to establish the profile using the Problem-Based Learning (PBL) instructional approach to examine the students' computational thinking from the perspective of different learning styles. The outcomes of the research that was discussed earlier served as the foundation for the research that was carried out here. The students were given written tests, questionnaires, and interviews in order to obtain information about the degree of computational thinking abilities possessed by the students as well as the profiles of the four indicators of computational thinking in terms of learning styles. This was done in order to determine the profiles of the four indicators of computational thinking in terms of learning styles. In the class XI MIA 4, which had a total of 36 students, there was one student who represented each of the four learning styles: the diverger, the converger, the assimilator, and the accommodator. The different Kolb learning styles are taken into account while grouping students into their respective classes. According to the findings of research (Prihastyo., 2019), Prihastyo discovered that problem-based learning helped students become more independent in their mathematical education. The title of Prihastyo's study was "Problem-Based Learning Approach to Problem Solving Ability and Mathematics Learning Independence in terms of Learning Styles," and it was titled "Problem-Based Learning Approach to Problem Solving Ability and Mathematics Learning Independence in terms of Learning Styles." There are parallels to be seen between the research carried out in the past and the research that will be carried out in the future, as well as differences to be found between the two. The investigation of these two subjects is where the parallels between this research and the research that the researcher will carry out can be found. These similarities can be found in terms of Learning Styles and the technique of Problem-Based Learning (PBL). This study and the research that was carried out differ in that this study focuses on the development of problem-solving skills and mathematical independence, whereas the research that was carried out used computational thinking, which is comprised of four indicators: decomposition, pattern recognition, algorithmic thinking, and generalization and pattern abstraction. In other words, this study focuses on the development of problem-solving skills and mathematical independence, whereas the research that was carried out used computational thinking.

In a study titled "Analysis of Computational Thinking of Elementary School Teachers in Solving Problems related to Scale" (Danoebroto., 2020), researchers analyzed the computational thinking of elementary school teachers. This research is more on the descriptive side of things. The information was gathered by administering a mathematics competency test that was comparable to the USBN, and it was then descriptively assessed with reference to the qualities of computational thinking. According to the findings of the study, the method that the educator employs in the process of resolving issues that are associated with scale is to generate

pictures or sketches that are furnished with the information or data that is provided. Nevertheless, the mathematical models and words have not been presented in a communicative manner. 2 Calculations that are incorrect or a failure to use logic when evaluating the connections between pieces of information are two common causes of errors. The average % results for each indication of computational thinking are achieved, such as the following when referring to the findings of research on the level of computational thinking capacity using the Problem Based Learning (PBL) learning model: excellent degradation on average

D. CONCLUSION AND SUGGESTIONS

The test results for the level of students' computational thinking skills utilizing the Problem Based Learning (PBL) learning paradigm determined that the most common level of students' computational thinking abilities fell into the medium category. This was determined by the results of the test for the level of students' computational thinking skills. It was determined that the process of learning was carried out in accordance with the indications based on the profiles of the students on each indicator of computational thinking towards each learning style. This conclusion was reached after it was found that the learning process was carried out in accordance with the suggestions. The responses of the students to questionnaires regarding the ways in which they prefer to acquire knowledge served as the basis for the creation of these profiles. the suggestions that were developed as a result of this investigation In this study, it was shown that the level of attainment of students' computational thinking profiles when using the Problem-Based Learning (PBL) learning model in terms of Kolb's learning style had varied achievement markers. This finding was made possible by the fact that the PBL learning model was used. As a result, it was suggested that further research be carried out to discuss the topic of improving the thinking skills of student computing. When carrying out the process of assessment, the teacher should pay attention to the challenges and errors experienced by students in students' computational thinking in order for the teacher to be able to remind students to continue to hone students' computational thinking properly and correctly and not to repeat the same mistakes when solving student computational problems.

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