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PGSD student's mathematical creative thinking skills judging from creativity quotations by making vba-based teaching

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Abstract. This study aims to examine the mathematical thinking ability of PGSD students in terms of Creativity Quotient by making props based on VBA Ms. Excel. The method used in this study was a qualitative method, carried out in a University in Cimahi City. The analysed data was obtained through the results of props products, questionnaires and interviews for mathematical creative thinking ability in terms of Creativity Quotient. Result shows that students' mathematical creative thinking ability are better than before learning process that conducted by making props based on the VBA Ms. Excel. In addition, almost all students said that they were very happy with learning to make props based on VBA Ms. Excel, they were more active and creative in following the stages in learning process, so as to lead to high learning motivation.

1. Introduction

Skills in thinking are needed to find and overcome a problem. When a person is faced with a problem that must be resolved, then at that moment thinking skills will emerge. Thinking skills needed in solving problems are thinking critically, systematically, logically and creatively. The ability to think creatively is needed by someone, considering that today science and technology is developing very rapidly and allows anyone to be able to obtain information quickly and easily with abundance from various sources and anywhere in the world. This has resulted in rapid changes in the pace of life and global changes in life.

If students are not equipped with the ability to think creatively, they will not be able to process, assess and retrieve the information they need to face these challenges. Creative ways of thinking must be trained early because not everyone has the ability to think creatively in a natural way, continuous awareness and training are needed to improve those abilities. In line with Adams and Hamm [1] who said, "The ability to think creatively is indeed a natural potential possessed by humans, but more important is creative thinking is also a natural process that can be increased through awareness (awareness) and practice (practices)".

The ability to think creatively is the ability of a person to give birth to something new, both in the form of ideas and really works that are relatively different from those that already existed before. Laurence [1] says, "Creativity is a skill that can be learned". A person's failure to make an innovation or create a creation is not due to a lack of potential to be creative but because of a lack of knowledge in managing all the potential, he has to achieve a goal. Therefore the ability to think creatively is an important ability in mathematics courses. Most elementary school teachers have difficulty in delivering learning material, especially math lessons which are often considered difficult. Elementary



teachers often have difficulty finding ways that are effective, innovative, and creative so that learning is more interesting and quickly understood by students. In this case, the main cause is the skill of an elementary school teacher in his creative thinking that is still low.

In delivering elementary school math material, teachers usually only use the lecture method, question and answer, and discussion. They rarely use learning that is innovative, creative, and follows technological developments. In reality elementary school students are very enthusiastic about the learning atmosphere and interesting delivery from their teachers, in this case one of them is learning mathematics using VBA Ms. assisted teaching aids. Excel.

From these descriptions, mathematical creative thinking skills should be developed or improved in learning mathematics in college. Creativity Quotient is another internal factor that is important in mathematics learning which also affects the ability to think creatively. According to [2], "Creative, professional, and fun teachers must have various concepts and ways to boost the quality of learning by developing emotional intelligence, developing creativity (creativity quotient) in learning, disciplining students with compassion, arouse learning passion, solve problems, utilize learning resources, and involve the community in learning".

Creativity Quotient is a person's potential to bring forth a new invention in the field of science and technology and all other fields. Its characteristics are the ability to produce many ideas (fluency / fluency), the ability to propose various ways of solving problems (flexibility), being able to produce original or original ideas (authenticity), the ability to describe things in detail (decomposition), ability to review a problem in a different way from the usual (reformulation).

Visual Basic Application For Excel is a programming language that gives commands needed in Microsoft Excel to speed up the operation automatically. In accordance with Chotimah, et al., [3] that VBA (Visual Basic Application) or macros are functions and program commands in MS Office (including Excel) stored in the old Visual Basic, or Visual Basic before the .NET framework version is present. With VBA, a work in Office can be optimized. Microsoft Excel is generally used by most people in numerical processing because of the many mathematical functions that can be associated with Statistics, Economics, Engineering and more. VBA in Excel can be utilized more usefulness. Some advantages of usage the props making using VBA in Excel are: (i) the picture can be made as an interactive image, so the students become active and fun to learn mathematics, (ii) to make the props, it is not need much big cost, (iii) the use of Microsoft Excel Software is accessible for computer users [4-6]. The results of previous studies conducted by [3] stated that contextual approach aided application of excel VBA learning media can improve the ability of reasoning and mathematics disposition of high school students.

2. Methods

This research is a descriptive qualitative study with a case study method with researchers as the main informant. In this research, there were several stages as follows [7, 8]: description stage, reduction phase, and verification stage or conclusion drawing.

The subjects of this study were prospective elementary school teaching students who were still active in lectures at one of the private universities in Cimahi City. In this study, we examined students based on their creative thinking abilities, including fluency, flexibility, authenticity, and elaboration. To categorize students into these four characteristics, a test was conducted with the creativity quotient questionnaire. The data collection technique that used in this study was triangulation methods, namely by combining several techniques such as interviews, observation, surveys, and documentation.

The instrument used in this research was creativity quotient to categorize students into four characteristics of creativity quotient. A test was done to see the students' creative mathematical thinking skills using elementary school mathematics problems. Observation guidelines were used to find out the learning process. Interview guidelines as a guide to get the interview going well and correct.

Data analysis is not only done when all data has been collected but is also done while in the process of retrieving data. According to Kurniawan [9], the steps in analyzing the data are as follows data presentation, data reduction, conclusion drawing or verification.

3. Result and Discussion

Before conducting teaching and learning activities, researchers conducted observations in the classroom to find out how much students were able to solve mathematical problems in elementary school material. Previously students were introduced to ICT-based learning and basically, they also understood Visual Basic Application for Microsoft Excel.

The most basic problem is the natural number that will be displayed in Microsoft Excel. Students give an initial description by changing the numbers on a cell that will increase by 1 each by pressing the button.

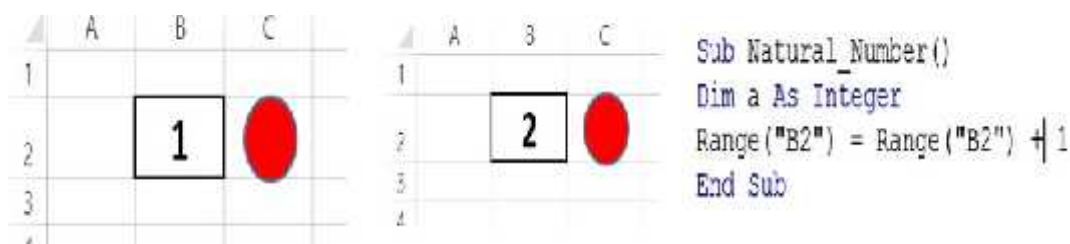


Figure 1. Basic Student Knowledge

Figure 1, the initial way of making students to bring up numbers in Microsoft Excel. In VBA language, students have been able to master integer counting operations. From 42 students, 37 students (88.09%) have been able to complete the program, 4 students (11.91%) have completed the program but there is an error writing the function so that it takes correct mistakes.

When researchers give students time to think to come up with ideas that can be developed from display Figure 1. From the observations of 42 students found that 7 students (16.67%) can express their ideas. Of the 7 students including 3 students (7.14%) expressed their ideas related to mathematics and 4 students (9.52%) others were not related to mathematics.

Table 1. Disclosing Student Ideas

Student Code	Relating to Mathematics	Not related to mathematics
S-1	How to display the whole number	
S-2	Give different colors to even and odd numbers.	
S-3		Adding images so Excel is not monotonous
S-4	How to generate negative numbers	Provide written information How to make a number format automatically. How to make a frame on a cell.
S-5		
S-6		
S-7		

Table 1 explains 7 students' opinions about expressing ideas which are divided into two groups, namely groups of students whose ideas are related to mathematics and groups of students whose ideas are not related to mathematics. From the table above, the two groups of student opinions can be combined, so that the picture of the 7 students' opinions can be displayed to be more interesting. The goal is to encourage students to create something new. Display combination as follows:

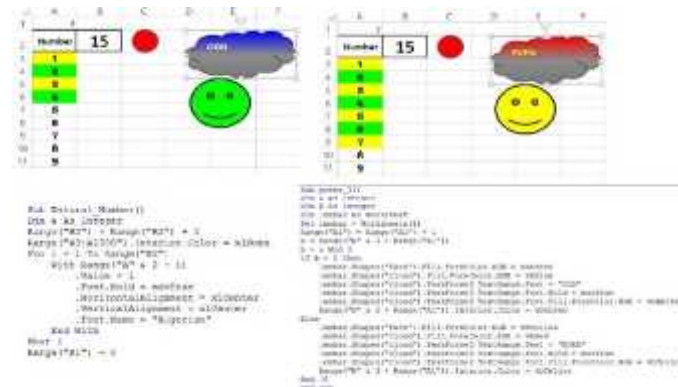


Figure 2. The Display According to Input

Figure 2 shows media results of discussion with students to publish all inputs based on the ideas of 7 students to display images through Excel VBA. Here, students begin to be motivated to express many new ideas and there is an urge to make teaching aids. To see the response from students, a questionnaire based on Creativity Quotient indicators was given.

Table 2. Creativity Quotient Questionnaire Results

Indicator	Positive		Negative	
	N	%	N	%
Ability to produce many ideas	35	83.33	7	16.67
Ability to propose a variety of problem-solving approaches	25	59.52	17	40.48
Able to give birth to original ideas	37	88.09	5	11.90
The ability to describe a detail	28	66.67	14	33.33
The ability to examine different issues that are common	20	47.61	22	52.38

N = Total Students

Table 2 explains that the positive response after developing from student input is the ability to produce many ideas, able to produce original ideas, while a positive response is located in the ability to describe a detailed one. For other responses as consideration for developing teaching aids, namely the ability to propose various approaches to problem-solving and the ability to study different issues that are common. This illustrates that the average student has difficulty making the Excel VBA language algorithm process and has not been able to solve the problem because of the limitations of the VBA Excel language while the idea of creating is very large.

The way to overcome this problem is to identify and interpret the logic language found in Excel VBA [10], after understanding, a discussion was held together to create teaching aids from basic logic knowledge, namely, if (condition) Then (Reaction) end if, then developed into many branches is surrounded by if function.

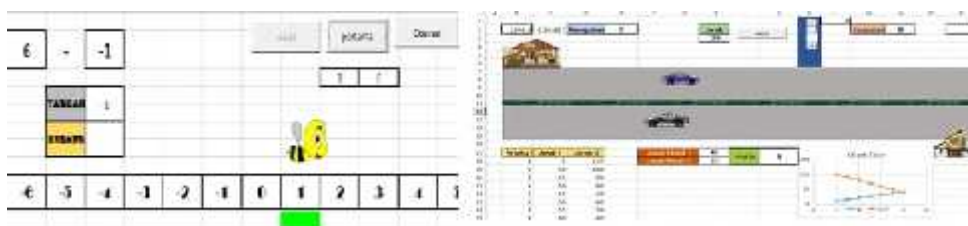


Figure 3. Examples of Media with Simple Languages

Figure 3 explains the results of discussion of examples of media using simple VBA language that can run objects according to orders. The goal is to bring students to be confident that the language which they understand can develop more interactive teaching aids.

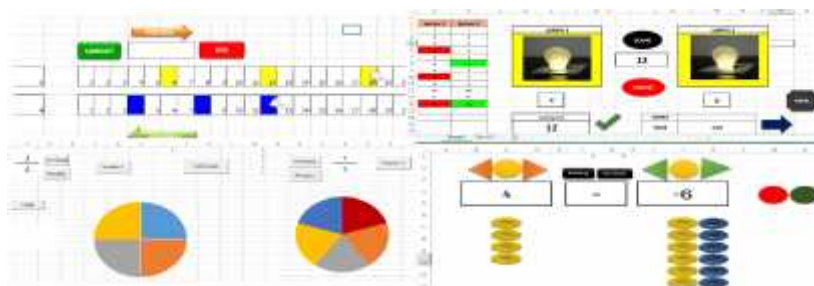


Figure 4. VBA for Microsoft Excel Media Development

Figure 4 explains the results of student development from basic logic program languages and then adds logic program languages such as using the do While Loop function, For Next, and selecting Case End Select. An example of the results of student development makes teaching aids determine the KPK, the second media develops the KPK using two lights, third makes fractional teaching aids and adding and reducing button operations.

For the final results, students are given a questionnaire again after they make teaching aids based on their own ideas.

Table 3. Final Result for Creativity Quotient Questionnaire

Indicator	Positive		Negative	
	N	%	N	%
Ability to produce many ideas	40	95.23	1	4.76
Ability to propose a variety of problem-solving approaches	36	85.71	6	14.28
Able to give birth to original ideas	38	90.47	4	9.52
The ability to describe a detail	37	80.09	5	11.90
The ability to examine different issues that are common	36	85.71	6	14.28

N = Total Students

Table 3 explains that the final response of students as a whole in terms of Creativity Quotient shows a positive impact. Seen from the table above, all percentages of creative thinking ability indicators are in the high category. Giving rise to high motivation to learn and increase the ability to think creatively students who become more active.

4. Conclusion

Based on data analysis, students' mathematical creative thinking ability is better than before in their learning by making teaching aids based on Ms. VBA. Excel. The overall student response in terms of Creativity Quotient shows that almost all students said they were very happy with learning to make teaching aids based on Ms. VBA. Excel, because they can practice their creative thinking skills, they are more active and creative in following the stages of learning provided so as to lead to high learning motivation.

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Acknowledgments

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