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Computational Thinking with a Multi-literacy Model Using Interactive PowerPoint Media: An Experiment in Elementary Schools

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Abstract.
Elementary school students need to acquire computational thinking as a crucial skill in the digital age. Similar to mathematical skills, computational thinking is a fundamental competence in digital literacy. It is used to solve problems in learning. One approach is to facilitate children's learning by emphasizing computational thinking, such as using the multi-literacy model with interactive Power-Point slides. This study aimed to assess and characterize the influence of multi-literacy models aided by interactive PowerPoint media on the development of computational thinking skills in elementary school students , considering their prior knowledge. Involving a total sample of 56 4th grade elementary school students, this quantitative study employed a 3 x 2 factorial design. The sample included 14 students in the high group, 28 in the medium group, and 14 in the high group. The research revealed that the implementation of a multi-literacy learning approach, assisted by interactive PowerPoint media, significantly enhances student's acquisition and improvement of computational thinking skills. This is because children can develop computational thinking skills in an enjoyable environment using PowerPoint media. Another study revealed that students in the high group performed much better on average when it came to learning computational thinking skills. Meanwhile, the average gain of computational thinking skills in the medium group was only slightly different from that of the low group.

Keywords: computational thinking, multi-literacy model, interactive powerpoint media.

1. INTRODUCTION

In the twenty-first century, computational thinking is a fundamental capacity that everyone in the world needs. Computational thinking skills can aid problem solving and are a required skill for success in the twenty-first century [1]. It is vital to incorporate computational thinking into mathematics instruction because later students will enter

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the professional sector [2]. Computational thinking includes understanding difficulties, solving problems with appropriate descriptions, reasoning at various levels of abstraction, and finding automatic answers [3, 4]. Computational thinking is a cognitive skill that enables educators to spot patterns, break down complex problems into basic steps, organize and build a set of procedures to solve problems, and simulate data representations. Computational thinking is a learning approach that can be utilized to assist pupils solve arithmetic issues [5, 6].

Math is a field of science that has a large impact on students, hence it is studied at all levels of education. Many students, on the other hand, believe that mathematics is a tough subject, and as a result, they lose interest in learning it. This computational thinking ability is expected to help pupils solve complex mathematical issues and increase their interest for math. Computational thinking is a technique for identifying, evaluating, and implementing effective and economical solutions to problems [7]. The abilities to properly address a problem are referred to as computational thinking abilities [8]. Statistics is one of the math subjects that students are required to learn in primary school. Statistics provides students with practical experience with the importance of data and how it is presented. Furthermore, elementary school statistics are designed to assist students in developing a strong literacy foundation [9].

In learning, it is frequently discovered that a student's developed concept is not always in conformity with the actual concept. Differences arise as a result of participants' differing experiences and knowledge (misconceptions). This is also due to the teacher's failure to employ the proper method and theory of learning. So that the teacher can remedy the issue, he or she must have prior knowledge and misunderstanding participants must learn what happened as a first step in determining the right learning approach [10].

In relation to the preceding point, many explain the significance of a system or knowledge that begins with a child or individual. Assimilation and accommodation are two terms used to describe how new information or schemes emerge. Assimilation is a cognitive process in which people adopt a scheme to begin to grasp the world, which includes attempting to connect something new with what they already know. As for accommodation, it is a cognitive process that occurs when new information or knowledge is presented that does not conform to the previous scheme, requiring the individual to adapt their scheme in order to comprehend new information [11, 12].

As a result, several students may participate in class, each with a distinct plan, resulting in a wide range of knowledge. This can make it difficult for the teacher to apply what they've learned. Because of this, make certain that a teacher has neither

the knowledge nor the ability to qualify as a strategic accept view and knowledge participation diverse learners without blaming the pupils [13]. As is well known, in learning, participants educate have varying levels of intellectual development, so it is critical for teachers to comprehend the condition with link comprehension and summarize ability level differences among participants educate with explanation and diverse strategies [14, 15].

The Covid-19 virus's growth has influenced shifting habits in a range of industries, including education. With the implementation of the learning from home policy, the traditional classroom learning system was turned into a virtual or online learning system that could be completed from the comfort of one's own home. In situations like this, technology can be employed as a solution for distance learning. In situations like these, interactive power-points are one sort of teaching media that can be used [16]. The goal of interactive PowerPoint is to develop interactive teaching materials by combining various learning elements such as audio, video, text, or visuals that are all interactive, i.e. producing cause and effect [17].

The objective of this research was to look at and explain the computational thinking abilities of primary school kids who were given a multi literacy model with interactive power point media on statistical information. This study is unique in that it examines the effect of a multi-literacy model aided by interactive power point media on computational thinking abilities in elementary schools, as well as differences in elementary school students' computational thinking based on prior knowledge and the interaction between learning and prior knowledge levels on computational thinking abilities.

2. RESEARCH METHOD

A Factorial design 3 x 2 study design was used by the researcher. There are two independent factors in this study: learning and prior knowledge level. When it comes to learning, students are divided into two groups: those who receive a multi-literacy model and those who receive a scientific approach. Meanwhile, pupils' past knowledge is divided into three categories: excellent, good, and poor. The 3 x 2 factorial design used in research on computational thinking skill scores is shown below. The investigation was carried out in stages [18].

During the academic year 2021/2022, all fourth grade students in Bandung's elementary schools took part in this study. In a Bandung elementary school, the study was done on two study groups. Purposive sampling was used to select schools because the study groups selected were thought to be representative of the learning design to

		Learning	
		Multi-literacy	*Scientific*
Prior Knowledge	High		
	Medium		
	Low		

Figure 1: Factorian design method.

be implemented, and they had two parallel classes that matched the study's design, resulting in similarities in characteristics between one class group and the next. Each class has 28 pupils, bringing the total number of students to 56.

The data collected in this study pertains to computational thinking abilities. A test is used to acquire this information. The test approach is used to collect information about computational thinking skills. The exam questions for computational thinking abilities are presented in the form of ten problems to solve. Create a question grid first, then organize questions with alternate answer keys and scoring standards for each item. The indications for computational thinking abilities are listed in Table 1 [19].

TABLE 1: Computational thinking skill instruments.

No	Indicator	Description
1	*Decomposition*	The ability to break complex problems into small or simple parts that are easier to understand and solve
2	*Generalization*	Ability to formulate solutions in general terms so that they can be applied to different problems
3	*Abstraction*	Achievement targets that students have when learning mathematics
4	*Algorithm*	Ability to design a series of operations/actions step by step (step by step) on how to solve a problem
5	*Debugging*	Ability to identify, delete and fix errors

The data in this study is analyzed using descriptive and inferential statistics. This descriptive statistical analysis technique was used to assess the data from the pre-test and post-test findings of computational thinking skills. This approach is used to calculate the mean, standard deviation, and range. The inferential statistical analysis technique is used to test the study hypothesis. The study hypotheses that emerged from this investigation were tested using the Two-Way Anova test.

3. result and discussion

3.1. Computational Thinking Ability Overview

Table 2 shows a description of computational thinking skills for students who have been taught using a multiliteracy model with interactive and scientific power point media. It also offers the description of computational thinking capacity as measured by prior knowledge level.

Table 2: Descriptive statistics computational thinking.

Class	Prior Knowledge	Mean	Std. Deviation	N
Multi-literacy Model	Low	68.13	2.588	8
	Medium	75.83	4.174	12
	High	86.25	3536	8
	Total	76.61	7.824	28
Scientific Approach	Low	56.88	2.588	8
	Medium	68.33	4.924	12
	High	78.13	2.588	8
	Total	67.86	8.968	28
Total	Low	62.50	6.325	16
	Medium	72.08	5.882	24
	High	82.19	5.154	16
	Total	72.23	9.435	56

Table 2 reveals that students taught using a multi-literacy model have a computational thinking ability of 76.61 with a standard deviation of 7.824, which is greater than the average computational thinking ability of students who are taught using a scientific approach. With a standard deviation of, the average score was 67.86. Students with a high level of prior knowledge have the highest average score of 82.19, which is 10 points more than students with a medium level of prior knowledge, who have an average of 72.08, and students with a low level of prior knowledge, who only have an average of 72.08. The average score for computational reasoning is 62.50.

Learning with a multi-literacy model and power point media, according to the score's description, can help with computational thinking skills. Students are not forced to study because the multi-literacy approach allows them to create completion plans based on their own trains of thought [20, 21]. Meanwhile, students can use interactive power point media to generate diagrams in a fun and engaging method [22].

3.2. Disparities in the Acquisition of Computational Thinking Abilities Among Pupils

Students who receive multi-literacy learning have a stronger average computational thinking capacity than students who receive scientific instruction, according to descriptive statistics, but this must be shown using an average exam. The results of the average test output utilizing the two-way ANOVA test with learning and prior knowledge as independent variables are displayed in Table 3.

TABLE 3: Output anova two ways.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4209.524a	5	841.905	61.322	0.000
Intercept	281937.565	1	281937.565	20535.665	0.000
class	1083.398	1	1083.398	78.912	0.000
SE	3101.711	2	1550.856	112.961	0.000
Class * PK	35.938	2	17.969	1.309	0.279

Table 3 in the class or learning row shows a significance of 0.000 and the score is smaller than = 0.05, indicating that the research hypothesis (H_1) that there are variances in the computational thinking capacity of students who get multi-literacy and scientific learning is accepted. As a result, it's possible to argue that students who are taught multi-literacy and those who are taught science have different computational thinking capacities.

Students who are taught using an interactive power point media and a multi-literacy model are better equipped to carry out the reasoning process according to their own mental models [23, 24]. As a result, pupils with a variety of cognitive processes and prior knowledge are more capable of learning [25]. Furthermore, interactive power point media is great for students' interests since it incorporates technology into the learning process; as a result, students are motivated to learn because the media used has generated a productive mindset [26].

Furthermore, Table 3 in row PK or prior knowledge displays a significance of 0.000 and the score is less than = 0.05, indicating that the research hypothesis (H_1) that there are variations in students' computational thinking abilities in terms of prior knowledge is accepted. As a result, inequalities in pupils' computational thinking ability based on prior knowledge may be discovered. Table 4 will also show the variations in computational thinking abilities between groups so that the best computational thinking ability may be determined.

Table 4: Post-hoc output based on prior knowledge.

Prior Knowledge		Mean Difference	Std. Error	Sig.
High	Medium	10.10*	1.196	0.000
	Low	19.69*	1.310	0.000
Medium	High	-10.10*	1.196	0.000
	Low	9.58*	1.196	0.000
Low	High	-19.69*	1.310	0.000
	Medium	-9.58*	1.196	0.000

Table 4 shows that for post-hoc based on prior knowledge, all significance levels are 0.000, which is less than = 0.05. It's possible to tell if there are differences in computational thinking abilities based on the quantity of prior knowledge. The mean difference score can be used to determine if one group is more than the other. The mean difference between the high and medium groups is 10.10, indicating that the high outperforms the medium, while the mean difference between the high and low groups is 19.69, indicating that the high exceeds the low. The mean difference between the medium and low groups is 9.58, showing that the medium group performs better than the low. As a result, it is reasonable to conclude that students with high self-efficacy are the most successful.

Prior knowledge is extremely important in learning since it influences learning success [27]. Prior knowledge assists pupils in developing good attitudes and learning motivation. It also makes children self-reliant and offers them a lot of fighting power when faced with adversities [25, 28].

4. CONCLUSION

Computational thinking is a required ability for primary school children in the digital age. Computational thinking, like mathematics skills, is a basic digital literacy skill. It is used to solve learning challenges. One alternative is to assist children in learning in a way that stresses computational thinking, such as through the use of the multi-literacy model and interactive Power-Point slides. The purpose of this study was to assess and define the influence of multi-literacy models facilitated by interactive PowerPoint media on the acquisition of computational thinking skills in primary school children in terms of prior knowledge. This quantitative study used a factorial design 2 x 3 with a total sample of 56 4^{th}-grade elementary school pupils, including 14 students in the high group, 28 in the medium group, and 4 in the high group. Following the study's findings, it was determined that using a multi-literacy learning approach helped by interactive

PowerPoint media can significantly improve students' computational thinking abilities acquisition and improvement. This is owing to the fact that by using PowerPoint material, children may develop computational thinking abilities in an enjoyable environment. Another study discovered that students in the high group did significantly better on average while learning computational thinking skills. Meanwhile, the middle group's average growth in computational thinking skills was just little different from the low group's average.

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