Increasing Students' Activities and Abilities of Spatial Visualization material Using CTL Method for Class VI SDN Genengan 01

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Abstract **:** In the ever-growing digital era, the integration Spatial Visualization in education and daily lifes are becoming increasingly important to improve students' competional thinking abilities and problem solving skills. One effective approach is the use of CTL in leaning Spatial Visualization . This research aims to examine the effect of using CTL on students' activities and abilities in learning Spatial Visualization . The method used is quantitative experimentation with a pretest-posttest design for the experimental class and control class. The research sample consisted of 50 grade 6 elementary school students at SDN Genengan 01 who were randomly divided into experimental classes and control classes. The experimental group used CTL in the learning process, while the control group used a conventional learning model. The instruments used include pretest and posttest . Data analysis was carried out using the t test to determine significant differences between the two groups. The research results show that students who learn about Spatial Visualization using CTL have significant improvements in active and abilities compared to students who learn

Spatial Visualization using conventional learning model. This research indicates that the integration of CTL is effective in improving students'activities and abilities in learning Spatial Visualization .
Keywords: *CTL;Spatial;Visualization;Activities;Abilities*

INTRODUCTION

The curriculum in Indonesia has undergone many changes, including the Merdeka Curriculum which offers varied, fun and pressure-free learning to develop students' talents. This curriculum allows teachers to choose teaching tools that suit students' needs and develop thematic projects to strengthen the profile of Pancasila students without being tied to certain learning outcomes (Kemendikbudristek, 2022). Schools are given three options for implementing independent learning, independent change, and independent sharing to suit their individual readiness, although challenges in implementation must still be faced for long-term benefits for students (Iskandar et al., 2023).

In order to realize an independent curriculum that offers varied, fun and pressure-free learning to develop students' talents, one of the skills needed is the ability to understand Mathematic especially about Spatial Visualization of cube Shape has been implemented globally, including in daily life, at the elementary school level. Spatial Visualization of cube Shape is the ability to solve problems that very close with the leaners daily life. although it does not always involve use . As an essential skill, Spatial Visualization of cube Shape is relevant for everyone, because it can be applied to a variety of everyday problems that very close to the leaners life.

Geometry is a unifying theme for the entire mathematics curriculum and as such is a rich source of visualization for arithmetical, algebraic, and statistical concepts; For example, geometric regions and shapes are useful for developmental work with the meaning of fractional numbers, equivalent fractions, ordering of fractions, and computing fractions. Every geometry course taught calls on logical reasoning and spatial ability (Mitchelmore, 2002). Spatial visualization is related to the content of mathematics, such as geometry. Because of geometry's visual nature, spatial visualization has been linked with geometry achievement. McGee (1982) describes spatial visualization, a particular subset of spatial skills, as "the ability to mentally manipulate, rotate, twist, or invert a pictorially presented stimulus object" (p.893). Lappan (1999) describes visualization as "the mental understanding of visual information" (p. 196).

Spatial visualization ability is an important factor in solving geometric problems because when studying three-dimensional shapes students are not only asked to count to determine a value but also must be able to visualize an object in their minds. If this spatial visualization ability is not developed, it is likely that students will experience difficulties in learning geometry.. Creative thinking skills involve the ability to create something in a new and unique way or idea, as well as produce a unique solution to a problem, with indicators including fluency, flexibility, originality and elaboration (Kumala, Yasa, Salimi, et al., 2024) .

Lam (1994) found a statistically significant positive correlation between spatial skills, measured at the end of the year, and final grades in geometry. Indeed, the lack of basic visualization skills sometimes results in insecurity which has led many students to perform below their potential in geometry (Bishop, 1983; Clements & Battista, 1992; Del Grande, 1987; Drickey, 2001). Thus, investigating spatial visualization is important because of logical-intuitive support for its relationship to geometry In the world of education, computational thinking makes it easier for students to solve mathematics or science problems. This method also supports the development of skills to design and implement effective and efficient solutions by utilizing technology. In addition, computational thinking allows someone to recognize errors or deficiencies in a solution and make improvements quickly (N. Christi & Rajiman, 2023).

It is necessary to improve and increase student understanding of mathematical concepts through the quality of learning that can present the abstract becomes concrete. The learning is Contextual Teaching and Learning (CTL). Contextual Teaching and

Learning (CTL) helps teachers to connect between the material and the student's real-world situations and emphasizes students make connections between knowledge and its application in everyday life. Components of Contextual Teaching and Learning (CTL) as follows: 1) Constructivism, 2) Ask, 3) Found, 4) Community learning, 5) Modeling, 6) Reflection, and 7) The actual assessment (Azess Yudha 2005)

Based on the results of interviews with teachers at SDN Genengan 01, it appears that Spatial Visualization skills still need to be improved. Through Contextual Teaching and Learning (CTL), an understanding of mathematical concepts can be developed. According to TT LAM stated that the approach Contextual Teaching and Learning (CTL) can strengthen students' mathematical knowledge before and increase student learning about a new concept to solve some real problems . The problem of this research is how to increase students' the approach Contextual Teaching and Learning (CTL) on the ability of students' understanding of mathematical concepts? The teacher explained that most were able to solve problems a structured and patterned way, but they often still needed assistance to solve problems in a structured and patterned way. In terms of digital skills, teachers found that most students were able to find information to solve problems through technology. Learning processes that rely on interactive technology such as microsites are considered effective in students' ability to use technology in their learning process. Based on this, teachers hope that with ongoing training, students' digital skills will further develop, preparing them better to face the challenges of global technological developments.

METHOD

This research is included in the type of quantitative experimental research. Experimental quantitative research aims to test the influence or effect of an independent variable on a dependent variable in a controlled and measurable way. In this case, this research examines the effect of using CTL method.

This research uses a quasi-experimental design (quasi-experiment). Quasi-experimental research is an experiment in which the placement of the smallest experimental unit into the experimental group and the control group is not carried out randomly (nonrandom assignment). This research design is often used in field settings such as schools. Experimental Group/Class: Class 6A students who will be treated using CTL model and Control Group/Class: Can consist of other classes (6B) who did not receive treatment or were given conventional learning. Researchers will measure changes in activities and ability in both groups/classes, to analyze the effects of using CTL model.

The data sources used in this research consist of 2 data, namely primary data and secondary data. Primary data is data that directly provides data to data collectors, while secondary data is data sources that do not directly provide data to data collectors (Astari & Muhroji, 2022). The data used in this research came from observations, tests and questionnaires with sixth grade students.

RESULTS AND DISCUSSION

Based on the results of the normality test conducted on the activities of the control class, the Sig. pretest data was obtained at $0.034 < 0.05$ which means that the pretest data of the activities of the control class was not normally distributed. Meanwhile, in the posttest, Sig. data of $0.996 > 0.05$ was obtained, which means that the posttest data of the activities of the control class was normally distributed.

The results of the normality test conducted on the activities of the experimental class, obtained Sig. pretest data of $0.019 < 0.05$ which means that the pretest data of the activities of the experimental class is not normally distributed. Meanwhile, in the posttest, Sig. data of $0.004 < 0.05$ was obtained, which means that the posttest data of the activities of the experimental class was also not normally distributed.

To analyze data that is not normally distributed, a non-parametric test can be performed using the Mann-Whitney U test. Sig (2-tailed), if the value is Asymp. Sig (2-tailed) < 0.05 then the data can be said to be significant.

The results of non-parametric tests that have been carried out using the Mann-Whitney U test in the control class show Asymp values. Sig (2-tailed) is <,001, if the value of Asymp. Sig (2-tailed) < a significance value of 0.05, then the data can be said to be significant. The results of the Mann-Whitney U test in the control class showed Asmp values. Sig (2-tailed) < 0.05 so that significant activities data was obtained from the control class.

The results of non-parametric tests that have been carried out using the Mann-Whitney U test in the experimental class show Asymp values. Sig (2-tailed) is <,001, if the value of Asymp. Sig (2-tailed) < a significance value of 0.05, then the data can be said to be significant. The results of the Mann-Whitney U test in the control class showed Asmp values. Sig (2-tailed) < 0.05 so that significant activities data was obtained from the experimental class.

In the pretest homogeneity test, a significance value (Sig.) Based on Mean of 0.966 > 0.05 was obtained, so it can be concluded that the variance of the pretest data for computational thinking ability in both the control class and the experimental class is the same or homogeneous.In the posttest homogeneity test, a significance value (Sig.) Based on Mean of 0.623 > 0.05 was obtained, so it can be concluded that the variance of posttest data on activities in both the control class and the experimental class is the same or homogeneous. In the normality test of spatial visualization, it is known that the significance value (Sig.) of each class in the Shapiro-Wilk test > 0.05, so it can be concluded that the data from spatial visualization in both the control class and the experimental class are normally distributed.In the spatial visualization homogeneity test, it is known that the significance value (Sig.) Based on Mean is 0.836 > 0.05, so it can be concluded that the variance of spatial visualization data in both the control class and the experimental class is the same or homogeneous.

Results indicated that the model format produced less cognitive load compared to the isometric and the orthographic formats. No significant difference was found between the model and the isometric-plus-model formats on all measures. There appear to be mixed results from studies on training in spatial visualization research and individual differences in this area leave the field open for further research.Therefore, it can be interpreted that there is a significant difference in the value of learning outcomes for grade VI students who follow learning about Spatial and Visualization with CTL model.

Table I. Independent Samples t-test

	Class	N	Mean	Std. Deviation	Std. Error Mean	Sig (2-tailed)
Posttest	Control Classes	25	42.27	17.354	3.525	<.001
	Experimental Classes	25	80.22	15.560	3.185	<.001

The results of the independent samples t-Test on the data of the control class and the experimental class obtained a significance value of Sig. (2-tailed) of <.025 < 0.05, then H0 was rejected and Ha was accepted, so it can be concluded that there is a difference in the average value of the control class of (69.71) and the experimental class of (74.08).

So it can be interpreted that there is a significant difference in the spatial visualization skills questionnaire scores of grade VIA students who take part in learning with the spatial visualization model CTLwith grade VIB students who learn spatial visualization without CTL model.

Tabel II. Independent Samples t-test Spatial Visualization Skills

	Class	N	Mean	Std. Deviation	Std. Error Mean	Sig (2-Tailed)
Class	Control Classes	25	68,71	6.364	1.340	.025
	Experimental Classes	25	74.24	6.57	1.332	.025

Based on the results of the independent samples t-test, a Sig. (2-tailed) value of <.001 < 0.05 for Spatial Visualization ability, it can be concluded that there is a difference in the average score of the posttest for the control class using conventional learning model of (42.27) and the posttest of the experimental class using CTL learning model of (80.22).

While the results of the independent samples t-test obtained a Sig. (2-tailed) value of 0.025 < 0.05 for spatial visualization can be concluded that there is a difference in the average score between the control class that follows the Conventional model of (69.71) and the experimental class that follows the CTL Model of (74.08).

This difference occurs because students who take part in CTL model have more practice and do self observation. Meanwhile, learning carried out in the control class using conventional model ,centered on teachers explanation . While the students were passive during the learning period in class.

The CTL approach can improve the students activities by integrating various disciplines that encourage students to solve problems systematically and creatively. Through CTL Project , students are invited to identify problems, design solutions, and implement them, which is the core of computational thinking. For example, in one study, the application of STEAM project-based learning helped students understand the process of making hazelnut oil, which involves computational thinking steps such as decomposition and algorithms (Aurel & Ginting, 2024). In addition, the integration of STEAM in learning allows students to understand and apply concepts in real contexts, thereby improving critical thinking and problem-solving skills that are essential in computational thinking (Pasca Emilidha & Waluya, 2024).

Each component in STEAM has its own role in improving computational thinking skills. Science or Natural sciences encourage students to understand phenomena through observation, experimentation, and data analysis. This process involves identifying problems, collecting data, and drawing conclusions based on empirical evidence. This kind of activity is in line with the concept of computational thinking, such as problem decomposition and pattern recognition. For example, in science experiments, students break down complex problems into simpler components to analyze, which is at the heart of decomposition in computational thinking (Aurel & Ginting, 2024). Technology providing tools and platforms for students to practice computational skills. The use of software, applications, and other digital tools allows students to understand programming logic, algorithms, and problem-solving efficiently. For example, through basic programming, students learn how to develop algorithms to solve specific problems, which is a key component of computational thinking (Pasca Emilidha & Waluya, 2024). Engineering or engineering requires students to design, build, and test solutions to real problems. This process involves design iteration, hypothesis testing, and solution optimization, all of which require the application of computational thinking (Atiaturrahmaniah et al., 2022). Arts or the art of encouraging creativity and innovation, which is essential in the development of effective computational solutions. Through art, students learn to think outside the box, recognize patterns, and develop visual representations of data or concepts. (Mariana & Kristanto, 2023). Mathematics or mathematics provides the basis for logical and analytical thinking. Concepts such as algorithms, pattern recognition, and abstraction are closely related to mathematics. In mathematics, students learn to solve problems through systematic steps, using symbols and notation to represent abstract concepts, all of which are essential elements in computational thinking (Widiyatmoko et al., 2024).

Technology Microsite can improve digital skills by providing a platform that allows users to access, manage, and present information in an interactive and structured manner. In the context of education, the use of Microsite As a learning medium, it has been proven to be effective in improving student learning outcomes, especially in certain materials. Microsite offers ease of access, flexibility, and visual appeal that is able to motivate students to learn better. In addition, the process of making and managing Microsite engaging a variety of digital skills, such as web design, content management, and an understanding of information technology, which directly contribute to the improvement of users' digital competencies (Hayu & Suciptaningsih, 2024).

Technology integration Microsite in STEAM learning provides a more interactive and in-depth learning experience for students.

Through this platform, students can access various learning resources, participate in interdisciplinary projects, and develop creative solutions to real problems. This approach not only improves computational thinking skills, but also digital skills that are essential in facing the challenges of the 21st century (Sukmawati et al., 2023).

Facts in the field show that students play a more active role in learning when using the STEAM-based microsite technology model This is because students have accessed microsite technology to learn anywhere and anytime before the implementation of learning and posttests in the classroom. With the application of the STEAM-based microsite technology model , it can reduce the tendency of teachers to use the lecture method, thereby providing greater opportunities for students to develop computational thinking skills from what has been learned through microsite technology.

This is in line with research conducted by Kumala (2024) which shows that learning using STEAM can improve computational thinking skills on each indicator, namely decomposition, abstraction, pattern recognition, and algorithms. Meanwhile, digital skills are supported by research conducted by Fortuna & Kusuma (2023) With results that can help children to explore ideas and ideas and solve problems through proficiency in science, technology, engineering, art, and mathematics.

CONCLUSION

The conclusion of this research is that there is a significant influence between the PPT-based CTL learning model used by the control class and the STEAM-based microsite technology learning used by the experimental class. In this research, it was proven that the STEAM-based microsite technology used by the experimental class had a significant influence on both computational thinking abilities and digital skills. This is shown in the Independent Samples t-test on computational thinking abilities which shows the average value of the control class is 42.17, while the average value of the experimental class is 80.42. In digital skills which were measured using a questionnaire instrument, the average score for the control class was 69.71, while the average score for the experimental class was 74.08.

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