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# THE EFFECTIVENESS OF POWERPOINT-ASSISTED CONTEXTUAL TEACHING AND LEARNING ON STUDENTS' CRITICAL THINKING SKILLS: A CASE ON GEOMETRY MATERIAL

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**ABSTRACT**

Based on the problems faced in schools from the results of interviews with the lack of student learning outcomes on the circumference and area of flat shapes this is due to the lack of media and approaches used by classroom teachers, so researchers want to improve students' critical thinking skills by developing power point learning media assisted by the Canva application that can help students understand the material and various questions with critical thinking skills, as well as a contextual teaching and learning approach that makes students find out and be active in learning. The research method used is Research and Development from Borg and Gall with the following stages: 1) Research, 2) planning, 3) product development, 4) limited test, 5) Revision, 6) wider test, 7) final product . For the results of the teacher's response, 84% are in good category and 73% are in good enough category. For the results of improving students with the n-gain test, the limited trial was 0.65 and the broad trial was 0.66, including the medium category. The normality test in the limited test is 0.200 and 0.068 while for the broad test it is 0.256 and 0.813 so that the distribution is normal. Paired simples test in limited trials and wide trials 0.000 <0.05 then H0 is rejected, Ha is accepted. So there are significant and effective differences in learning.



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## INTRODUCTION

Critical thinking skills are fundamental in today's educational landscape, especially in subjects like mathematics. These skills enable students to analyze problems, evaluate solutions, and

make informed decisions, all of which are essential for solving complex, real-world issues. According to the World Economic Forum (2016), critical thinking has been identified as one of the most crucial skills for the 21st century, allowing individuals to navigate a rapidly changing global environment. In Indonesia, like many other parts of the world, the lack of critical thinking abilities among students, particularly in mathematics, is a pressing issue that impacts their problem-solving and decision-making capabilities. The Programme for International Student Assessment (PISA) results between 2000-2018 show that Indonesian students' performance in critical thinking and mathematics lags behind other countries, ranking 72nd out of 78 countries with a proficiency level of only 71% (Kearney in Istiqomah & Indarini, 2021):

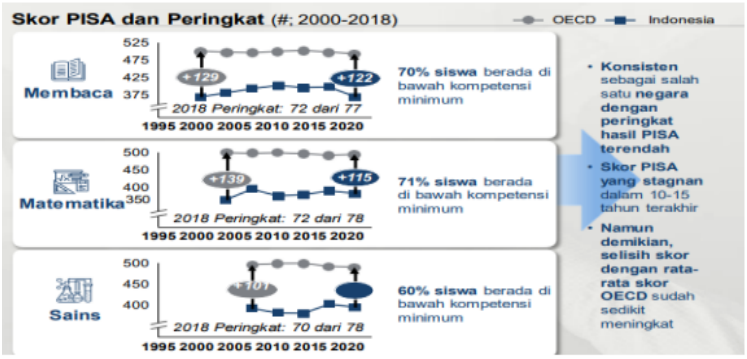


**Figure 1.** Critical Thinking on PISA

A significant challenge arises in geometry, a key area of mathematics, where students often struggle to understand concepts like perimeter and area. These concepts require not only rote memorization of formulas but also the ability to apply reasoning and critical thinking in problem-solving. Research by Akinoglu and Tandogan (2007) points out that many students face difficulties in understanding geometry due to the abstract nature of the subject, which makes it hard for them to visualize and apply geometric concepts. Moreover, studies by Lehtinen et al. (2015) indicate that conceptualizing geometric shapes and using mathematical formulas effectively requires a solid foundation in spatial reasoning, a skill that many students lack. This aligns with findings by Sokolowski and Meagher (2018), who explain that the challenges in mastering geometric concepts are often due to students' difficulty in linking the formulas to real-world contexts, which in turn affects their ability to think critically and solve complex problems. These struggles hinder the development of critical thinking skills, essential for success in both mathematics and other academic disciplines.

One approach that has shown promise in addressing these issues is Contextual Teaching and Learning (CTL). CTL is a pedagogical approach that connects lesson material with students' everyday lives, encouraging active engagement and deeper understanding. According to Sugandi and Bernard (2018), CTL integrates seven key components: constructivism, inquiry, questioning, learning community, modeling, reflection, and evaluation. Research by Rusgianto (2021) highlights that CTL helps students actively construct their knowledge by relating it to real-world experiences, fostering a deeper understanding and improving critical thinking skills.

Recent innovations in educational technology have further enhanced the effectiveness of CTL. For instance, gamification-assisted CTL and Canva-assisted CTL have proven to increase student engagement and motivation, thereby improving learning outcomes. Similarly, PowerPoint-assisted CTL offers a flexible and interactive way to present lesson materials, allowing for dynamic visual aids and engaging activities that can stimulate students' critical thinking. As such, PowerPoint is becoming an increasingly popular tool for enhancing CTL,

providing opportunities for students to engage actively with the content and apply critical thinking skills in a variety of contexts.

This research aims to explore the effectiveness of PowerPoint-assisted CTL in improving critical thinking skills, particularly in the context of geometry, for fourth-grade students. By utilizing PowerPoint as an instructional media tool, the study seeks to provide a solution to the challenges faced by students in developing critical thinking skills in mathematics, thereby enhancing their overall academic performance.

## METHOD

The method employed in this study is the Research and Development (RnD) method, as defined by Putra. This method is used to create a product, assess its effectiveness, and refine the product, a process commonly known as Research and Development (Sudaryono, 2016). According to Borg and Gall (Sanjaya, 2013), educational products resulting from RnD are not limited to learning materials such as textbooks and educational films; they can also encompass processes and procedures such as teaching methods, instructional techniques, and the organization of learning. Therefore, the RnD approach is used not only to produce a product but also to evaluate and improve its effectiveness.

This research aims to develop PowerPoint-based instructional media using the Contextual Teaching and Learning (CTL) approach to enhance students' critical thinking skills, particularly in the area of perimeter and area of plane figures. The study follows the ten stages outlined in the Borg and Gall RnD model: 1) Research, 2) Planning, 3) Product Development, 4) Limited Testing, 5) Product Revision, 6) Wider Testing, 7) Product Revision, 8) Field Testing, 9) Product Revision, and 10) Dissemination.

## RESULTS AND DISCUSSION

### *Results*

Based on the responses from teachers and students regarding the PowerPoint-based instructional media using the Contextual Teaching and Learning approach to improve students' critical thinking skills on the topic of perimeter and area of plane figures for fourth-grade students, the respondents were surveyed using a Likert scale questionnaire consisting of: strongly agree (4), agree (3), somewhat disagree (2), and disagree (1). This questionnaire was distributed to fourth-grade teachers and students after conducting limited and wider trials to assess the feasibility of the instructional media developed by the researcher. The results of the respondents' evaluations are as follows:

**Table 1.** Recapitulation of Teacher Response Questionnaire Results

| Category | Interval | % Persentation | Frequency | Score of Miss Aida | | Score of Miss Indriani | | Average | | Maximum Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Score | % | Score | % | Score | % | |
| Excellent | 38-44 | 90-100 | 0 | **32** | **80%** | **35** | **87.5%** | **34** | **84%** | **40** |
| Good | 31-37 | 75-89 | 2 | | | | | | | |
| Fair | 24-30 | 65-74 | 0 | | | | | | | |
| Poor | 17-23 | 55-64 | 0 | | | | | | | |
| Very Poor | 10-16 | 0-54 | 0 | | | | | | | |
| **Sum of Teachers** | | | **2** | | | | | | | |

**Table 2.** Recapitulation of Student Response Questionnaire Results

| Category | Interval | % Persentation | Frequency of Wider Trial | Frequency of Limited Trial | Average Percentage of Wider Trial | Average Percentage of Limited Trial | Wider Trial Score | Limited Trial Score |
|---|---|---|---|---|---|---|---|---|
| Excellent | 38-44 | 90-100 | 2 | 1 | | | **989** | **428** |
| Good | 31-37 | 75-89 | 13 | 3 | **73** | **67** | | |
| Fair | 24-30 | 65-74 | 13 | 6 | | | | |
| Poor | 17-23 | 55-64 | 6 | 5 | | | | |
| Very Poor | 10-16 | 0-54 | 0 | 1 | | | | |
| **Sum** | | | **34** | **16** | | | **1360** | **640** |

The results of the teacher respondents' assessment showed that the limited trial score was 32 and the wider trial score was 35, resulting in an average score of 34 and a percentage of 84%, which falls into the good category. Meanwhile, the student questionnaire responses were used to determine the feasibility of the developed product. Based on the limited trial, a score of 428 was obtained from 16 students, while the maximum expected score was 640, resulting in a percentage of 67%, categorized as fairly good. In the wider trial, a score of 989 was obtained from 34 students, with a maximum expected score of 1,360, resulting in a percentage of 73%, also categorized as fairly good. Therefore, the use of the instructional media and learning approach is deemed feasible for the learning process.

The analysis of improvement in critical thinking skills was conducted by analyzing students' learning outcomes using the n-Gain test and testing the difference between posttest and pretest results. This was used to observe the increase in students' critical thinking skills after using the PowerPoint-based instructional media. The n-Gain test in the limited trial showed an average pretest score of 42 and a posttest score of 79, resulting in an average n-Gain of 0.65, which falls into the moderate category. In the wider trial, the average pretest score was 34 and the posttest score was 77, resulting in an average n-Gain of 0.66, also categorized as moderate. Thus, there was a significant difference before and after using the instructional media.

The effectiveness of the product was tested using normality and t-tests. The normality test was conducted on the pretest and posttest results to determine whether the sample data were normally distributed. The results from both limited and wider trials are as follows:

**Table 3.** Normality Test Results for Limited Trial

| | *Kolmogorov-Smirnov*[a] | | | *Shapiro-Wilk* | | |
|---|---|---|---|---|---|---|
| | *Statistic* | *df* | *Sig.* | *Statistic* | *df* | *Sig.* |
| *Pretest* | .160 | 16 | .200* | .951 | 16 | .503 |
| *Posttest* | .206 | 16 | .068 | .869 | 16 | .026 |

**Table 4.** Normality Test Results for Wider Trial

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| *Pretest* | .169 | 34 | .015 | .938 | 34 | .055 |
| *Posttest* | .105 | 34 | .200* | .972 | 34 | .528 |

The results of the limited trial showed a significance value of 0.200 for the pretest and 0.68 for the posttest, indicating a normal distribution. Meanwhile, in the wider trial, the significance

values were 0.15 for the pretest and 0.200 for the posttest, which indicates a non-normal distribution since the pretest significance value was ≤ 0.05. Therefore, the researcher conducted a one-sample Kolmogorov-Smirnov test and opted to use the exact significance values as follows:

**Table 5.** Normality Test Results for Wider Trial

***One-Sample Kolmogorov-Smirnov Test***

| | | *Pretest* | *Postest* |
|---|---|---|---|
| *N* | | 34 | 34 |
| *Normal Parameters*[a,b] | *Mean* | 34.12 | 77.21 |
| | *Std. Deviation* | 16.988 | 11.625 |
| *Most Extreme Differences* | *Absolute* | .169 | .105 |
| | *Positive* | .070 | .105 |
| | *Negative* | -.169 | -.100 |
| *Test Statistic* | | .169 | .105 |
| *Asymp. Sig. (2-tailed)* | | .015[c] | .200[c,d] |
| *Exact Sig. (2-tailed)* | | .256 | .813 |
| *Point Probability* | | .000 | .000 |

*a. Test distribution is Normal.*
*b. Calculated from data.*
*c. Lilliefors Significance Correction.*
*d. This is a lower bound of the true significance.*

The pretest significance value was 0.256 and the posttest significance value was 0.813, indicating that the data were normally distributed. After conducting the normality test, a paired samples test was performed. This test was used by the researcher to determine the difference in mean scores between two dependent groups by testing the effectiveness of the pretest and posttest using PowerPoint-based instructional media with a Contextual Teaching and Learning approach to improve critical thinking skills in the topic of perimeter and area of plane figures for fourth-grade students.

Based on the paired samples test data from both the limited and wider trials, the two-tailed significance value was 0.000 < 0.05, leading to the rejection of the null hypothesis (H0) and acceptance of the alternative hypothesis (Ha). Therefore, it can be concluded that there is a significant difference in the average learning outcomes before and after the test, indicating an effect of using PowerPoint-based instructional media with the Contextual Teaching and Learning approach to improve critical thinking skills on the topic of perimeter and area of plane figures in grade IV students.

### *Discussions*

The results of this study indicate that the use of PowerPoint-based instructional media with the Contextual Teaching and Learning (CTL) approach was effective in improving students' critical thinking skills, particularly in the topic of geometry, which includes the perimeter and area of plane figures. The results from the teacher response questionnaire show that the media was highly rated by teachers, with an average percentage of 84%, indicating that teachers found it to be a practical and effective tool for teaching. This finding is consistent with the study by Naila, Nuhyal, and Rida (2021), where PowerPoint-based media was also found to be highly practical for teaching mathematics.

Geometry, being a subject that requires both conceptual understanding and spatial reasoning, presents particular challenges for students. The study revealed that students in the limited trial had difficulty applying formulas for perimeter and area, leading to errors in solving daily exercises. This aligns with previous research that highlights how students often struggle with spatial reasoning and applying geometric concepts in problem-solving contexts (e.g., Rahayu

& Hidayati, 2018). Therefore, using instructional media such as PowerPoint, which provides interactive and visual support, is crucial in helping students visualize and understand geometric shapes and formulas.

The n-Gain scores in this study (0.65 in the limited trial and 0.66 in the wider trial) indicate moderate improvement in students' critical thinking skills, which is promising. It suggests that using PowerPoint as an instructional tool in conjunction with the CTL approach can help students develop their problem-solving abilities, particularly in applying geometric concepts to real-world problems. The moderate improvement in critical thinking skills is in line with the findings of Sugiono (Ramdhani et al., 2020), who emphasized that n-Gain scores between 0.3 and 0.7 reflect a meaningful improvement in learning outcomes. These results suggest that while PowerPoint-based CTL is effective, further enhancements to the media or teaching strategies could yield even higher improvements.

The normality test results in both the limited and wider trials indicated that the data were normally distributed, which supports the reliability of the findings. Additionally, the significant results from the paired sample t-test ($0.000 < 0.05$) suggest that the PowerPoint-based media with the CTL approach had a significant impact on students' critical thinking skills. This is particularly relevant for geometry, where students need to understand and apply concepts like perimeter and area to various shapes. As previous studies have shown, students' ability to transfer knowledge from theoretical contexts to practical applications is enhanced when the learning materials are engaging and relevant to their everyday lives (Wahyudi, 2020).

Furthermore, the use of PowerPoint-assisted CTL is consistent with contemporary approaches to digital learning. Integrating interactive media with traditional pedagogies helps bridge the gap between theory and practice, making learning more engaging for students. This is particularly beneficial in geometry, where students often need visual and interactive tools to grasp abstract concepts. The findings of this study are in line with those of M. Salahudin, Margiati, and Sugiono (2013), who found that the use of PowerPoint media was effective in improving students' mathematics learning outcomes. In this study, students demonstrated a better understanding of geometric principles when PowerPoint-based media was used, compared to traditional teaching methods that lacked such interactive and visual components.

In conclusion, this study demonstrates the potential of PowerPoint-assisted CTL in improving critical thinking skills in geometry. By using visual aids and interactive activities, PowerPoint-based media helps students better understand and apply geometric concepts like perimeter and area, which are often difficult to conceptualize. The study also supports the use of CTL, as it fosters an active learning environment where students engage with the material in meaningful ways. Future research could explore combining PowerPoint-based CTL with other innovative teaching strategies, such as gamification, to further enhance students' critical thinking abilities in mathematics.

## CONCLUSION

Based on the results of the study, it can be concluded that the PowerPoint-based instructional media using the Contextual Teaching and Learning (CTL) approach is effective in improving students' critical thinking skills, particularly in geometry. The teacher responses were positive, with an average rating of 84%, while student responses were fairly good, averaging 73%. The n-Gain scores showed moderate improvement in critical thinking, with values of 0.65 in the limited trial and 0.66 in the wider trial. These results suggest that the instructional media had a positive impact, but further refinements could enhance its effectiveness. The normality tests confirmed that the data were normally distributed, and the paired samples t-test showed a significant improvement in student learning outcomes. Therefore, the instructional media is effective in the learning process and can be considered a valuable tool for teaching mathematics,

especially geometry. For future implementation, it is recommended to refine the media by incorporating more interactive activities and real-life applications to further engage students. Additionally, integrating PowerPoint with other educational tools such as gamification or Canva could enhance learning experiences. Teachers should also be provided with training to effectively integrate these tools into their teaching. Finally, further research could explore the use of PowerPoint-assisted CTL in other areas of mathematics and investigate the combined use of various digital tools to improve critical thinking.

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