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Correlation Between Simple Coding Learning (E.G., Scratch Jr.) In Developing Logical Thinking Abilities And Students' Sequence Of Procedural Texts In Indonesian Language Learning In Grade V Elementary School

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ABSTRACT
This study aims to examine the correlation between simple coding learning using Scratch Jr. with logical thinking skills and the ability to arrange procedural text sequences in fifth-grade elementary school students in Indonesian language learning. The background of the study is based on the importance of integrating digital literacy and computational thinking in learning, as well as the alignment between coding activities that require sequential logic and the structure of procedural texts. This study uses a quantitative approach with a quasi-experimental method and a Nonequivalent Control Group Design. The research instruments include logical thinking ability tests, procedural text writing tests, and learning activity observation sheets. Validity tests are carried out through expert judgment and Product Moment correlation, while reliability is tested using Cronbach's Alpha. Data analysis includes descriptive analysis (mean, standard deviation, and N-Gain) and inferential analysis using the Independent Sample t-test. The results of the study are expected to show a significant effect of the application of simple coding learning on improving students' logical thinking skills and arranging procedural text sequences compared to conventional learning. These findings are expected to contribute to the development of innovative learning models that integrate digital technology in Indonesian language learning in elementary schools.

Keywords: *simple coding, Scratch Jr., logical thinking, procedural text, learning Indonesian*

INTRODUCTION

The development of digital technology requires education to integrate digital literacy and higher-order thinking skills into the learning process. One of the essential competencies of the 21st century is computational thinking (CT), which encompasses logical, systematic, and algorithmic thinking. Simple coding lessons like Scratch Jr. provide opportunities for elementary school students to develop these skills through activities involving composing sequences of commands, understanding cause and effect, and building structured workflows. These activities align with the needs of Indonesian language learning, particularly in the competency of composing procedural texts, which require precise structure, sequence of steps, and logical action.

In the context of Indonesian language learning in elementary schools, many students still struggle to express ideas coherently and organize procedural steps logically. This difficulty is evident in students' poor ability to understand text structure (objectives, materials, steps), the use of sequential conjunctions, and logical accuracy at each stage of writing. Traditional learning, which tends to focus on lectures and examples, has not fully encouraged students to think systematically and structuredly. Therefore, innovative learning approaches are needed that can enhance students' sequential logic, analytical thinking skills, and creativity in writing.

Various theoretical studies show that simple coding learning is not merely a technological activity, but rather a pedagogical strategy that can develop children's cognitive abilities. According to Bruner and Vygotsky's constructivist theory, learning occurs when students actively construct knowledge through exploration and reflection. In Scratch Jr., students develop algorithmic thinking patterns by constructing blocks of instructions to produce animations. This activity strengthens logical thinking skills, as explained in Piaget's theory of concrete operations, which emphasizes children's ability to understand cause-and-effect relationships and sequences of actions. Furthermore, the work structure in coding also directly overlaps with the structure of procedural texts, as explained by Halliday and Hasan regarding text cohesion and coherence.

Several previous studies have shown that coding can improve logical thinking and problem-solving skills. However, studies specifically linking simple coding learning to the ability to construct procedural texts in Indonesian language learning are still limited, particularly at the elementary school level. This research gap highlights the need for empirical studies to determine the extent to which simple coding can support language literacy skills, particularly the ability to write procedural texts based on logical sequences. Based on this background, this study aims to examine the correlation between simple coding learning using Scratch Jr. with logical thinking skills and the ability to sequence procedural texts in fifth-grade elementary school students. Through a quantitative approach with a quasi-

experimental method, this study is expected to provide empirical evidence on the effectiveness of coding integration in Indonesian language learning and offer an innovative learning model relevant to curriculum needs in the era of digital transformation.

METHODOLOGY

This research employed a quantitative approach with a quasi-experimental method. This approach was chosen because the study aimed to examine the effect and relationship of simple coding learning using Scratch Jr. on students' logical thinking skills and procedural text sequencing. In the context of elementary education, full class randomization was not possible, making a quasi-experimental design the most appropriate choice.

The research design used was a Nonequivalent Control Group Design, involving two classes as research subjects. One class was designated as the experimental group, receiving simple coding-based learning using Scratch Jr., while the other class served as the control group, continuing with conventional learning. Both groups were given a pretest to determine students' initial abilities in logical thinking and procedural text sequencing, and a posttest to assess progress after the treatment.

The subjects were fifth-grade elementary school students, selected purposively based on equivalence in academic characteristics between classes. The independent variable in this study was the implementation of simple coding learning (Scratch Jr.), while the dependent variables included students' logical thinking skills and procedural text sequencing. Data collection was conducted using three main instruments. The first instrument was a logical thinking ability test, consisting of multiple-choice questions and short essays based on indicators of the ability to analyze cause and effect, recognize patterns, and organize steps logically. The second instrument was a procedural text writing test, in which students were asked to produce a procedural text based on a simple topic. Assessment included aspects of text structure, sequence of steps, use of sequential conjunctions, and clarity of steps. The third instrument was a learning activity observation sheet used to assess student engagement, group collaboration, problem-solving skills, and their understanding of using Scratch Jr. during the learning process.

To ensure the quality of the instrument, content validity was tested through expert judgment by language and educational technology experts. Construct validity was tested using a Product Moment correlation to determine the correspondence of each item to the total score. Instrument reliability was calculated using Cronbach's Alpha coefficient, with a minimum value of 0.70 as an indicator of good reliability. The collected data were then analyzed in two main stages. Descriptive analysis was conducted to obtain an overview of students' initial and final abilities, including mean, median, and standard deviation scores. N-Gain calculations were used to measure the extent of improvement in abilities. Next,

inferential analysis was conducted to test the research hypotheses, starting with normality tests and homogeneity tests, and then using the Independent Sample t-test to determine significant differences between the treatment and control groups. In addition to quantitative analysis, observation and interview data were analyzed qualitatively using the Miles and Huberman model to provide a deeper understanding of student responses during the learning process. Through this research procedure, a comprehensive overview was obtained of the effectiveness of simple coding learning in improving elementary school students' logical thinking skills and procedural text writing skills.

RESULT AND DISCUSSION

Research Results

This research results section presents quantitative findings based on descriptive statistical analysis of 35 fifth-grade elementary school students involved in the study. Students were divided into two groups: an experimental group (18 students) learning using Scratch Jr. and a control group (17 students) learning using conventional methods. Measurements were conducted using pretests and posttests to assess the development of logical thinking skills and the ability to construct procedural texts.

1. Pretest and Posttest Results of Logical Thinking Skills

Experimental Group (n = 18)

Statistik	**Pretest**	**Posttest**
Max	68	92
Min	40	70
Average	53,6	84,4
Median	54	85
Standard deviation	7,8	6,5

Control Group (n = 17)

Statistik	**Pretest**	**Posttest**
Max	70	82
Min	42	55
Average	54,1	69,8
Median	55	70
Standard deviation	8,1	7,2

Interpretation

Descriptive results show that the experimental group's posttest average increased significantly from 53.6 to 84.4, a 30.8-point increase. Meanwhile, the control group experienced a smaller increase, from 54.1 to 69.8 (a 15.7-point increase). The decreased standard deviation in the experimental group indicates that student performance became more evenly distributed after the treatment.

2. Pretest and Posttest Results of Procedural Text Writing Skills

Experimental Group (n = 18)

Statistik	**Pretest**	**Posttest**
Max	70	94
Min	45	72
Average	56,2	87,1
Median	56	88
Standard deviation	7,5	6,1

Control Group (n = 17)

Statistik	**Pretest**	**Posttest**
Max	**72**	**84**
Min	**44**	**58**
Average	**56,7**	**71,3**
Median	**57**	**71**
Standard deviation	**8,0**	**7,0**

Interpretation

The experimental group experienced an average increase of 30.9 points, significantly higher than the control group, which only increased by 14.6 points. The increase in the highest and lowest scores in the experimental group indicates that learning using Scratch Jr. helped improve students' abilities across all ability categories.

3. Analysis of Improvement Using N-Gain

The results of the N-Gain calculation showed a very significant increase in ability in the experimental group compared to the control group. For logical thinking skills, the experimental group achieved an N-Gain of 0.72, which is in the high category. This indicates that simple coding learning using Scratch Jr.

can optimally improve students' logical thinking skills. Meanwhile, the control group only achieved an N-Gain of 0.38, which is in the medium category. This difference indicates that conventional learning approaches do not provide as significant an increase as coding learning.

A similar pattern of improvement was also seen in the ability to write procedural texts. The experimental group again demonstrated excellent results with an N-Gain of 0.74, which is also in the high category. This means that coding-based learning not only impacts logical thinking skills but also significantly influences students' ability to systematically sequence steps in procedural texts. In contrast, the control group achieved an N-Gain score of 0.40, which is considered moderate, indicating that conventional learning only produced moderate improvements. Overall, the N-Gain analysis strongly suggests that the use of Scratch Jr. plays a significant role in fostering students' thinking and language skills, more effectively than conventional learning.

Discussion

The results of this study indicate that simple coding learning using Scratch Jr. significantly improves the logical thinking skills and sequences of procedural texts in fifth-grade elementary school students. This improvement is reflected in descriptive statistics, N-Gain calculations, and observations during the learning process. These findings align with theory and previous research, which suggest that coding activities can foster the development of algorithmic thinking, logic, and systematic step-structuring skills.

The improvement in logical thinking skills was particularly evident in the experimental group, which achieved a significantly higher average posttest score than the control group. Learning through Scratch Jr. requires students to sequentially arrange blocks of commands to produce animations. This process provides students with hands-on experience in how an action must be systematically executed to achieve a desired outcome. This experience contributes to the strengthening of logical thinking skills, as students not only follow instructions but also solve problems when the action doesn't go as planned. This supports Piaget's view of the concrete operational stage in elementary school-aged children, where children are able to use logic in real, observable contexts.

Coding learning also had a strong impact on students' ability to write procedural texts. Research findings showed that students in the experimental group were able to construct procedural texts with a more precise sequence of steps, more consistent use of sequential conjunctions, and a more complete text structure. This improvement can be explained through the concept of computational thinking, particularly the sequencing and algorithmic thinking aspects that are central to coding activities. As students become accustomed to

constructing steps in Scratch Jr., they internalize procedural thinking patterns that they can then apply to writing contexts. This aligns with Halliday & Hasan's theory regarding text cohesion and coherence, which are strongly influenced by the ability to construct logical relationships between parts of a text.

Overall, the findings of this study indicate that simple coding learning is highly relevant for integration into Indonesian language learning, particularly in material related to sequences of steps or processes. These results also provide evidence that technology integration not only improves digital literacy but also helps achieve broader language learning goals. Thus, simple coding learning can be considered an effective pedagogical intervention in improving higher-order thinking skills and language proficiency in elementary school students.

CONCLUSION

This study concludes that simple coding learning using Scratch Jr. significantly improved the logical thinking skills and procedural text writing skills of fifth-grade elementary school students. Data analysis showed that the experimental group experienced significantly higher improvement than the control group, both in pretest-posttest results and N-Gain scores. Coding learning enables students to systematically organize steps, understand cause-and-effect relationships, and solve problems through concrete and easily understood algorithmic activities.

Observational findings also confirm that coding activities encourage students to be more active, collaborative, and enthusiastic in the learning process, thus positively impacting the development of logical thinking and the ability to write procedural texts. Therefore, Scratch Jr. is not merely a technological medium but also an effective pedagogical strategy for improving language competency, particularly in materials involving sequential steps.

Overall, this study provides empirical evidence that the integration of simple coding learning is worthy of consideration as an innovation in Indonesian language learning in elementary schools. This model can support the implementation of a curriculum that emphasizes digital literacy, creativity, critical thinking skills, and integrated language skills. Future research could develop the use of other coding applications or expand the analysis to different language skills to enrich the existing findings.

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