



How Thinking Routines Enhance Critical Thinking of Elementary Students

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ABSTRACT

Learning English as a foreign language within a primary school in Indonesia tends to be teacher-centered and focuses on the single correct answer. The demands of tests and covering textbook materials for tests prevent students from becoming active thinkers. Specific strategies have been proposed to promote critical thinking skills. Previous studies focused on applying thinking routines either in early childhood or higher education. This study examines the effect of thinking routines on sixth-grade elementary school students' critical thinking ability within an English lesson. The quasi-experimental research was conducted with 64 students divided into a control group (N=32) and an experimental group (N=32) at two different schools. This research was conducted online due to the COVID-19 pandemic. The data is analyzed statistically using the Mann-Whitney U Test. Critical thinking ability tests and observation sheets were used as data collection tools. The results reveal that thinking routines significantly improved sixth-grade students' critical thinking skills. The result suggests using thinking routines in teaching and learning to support students thinking from different points of view.

INTRODUCTION

Communicating in a language other than one's mother tongue has become essential in participating in the globalized community. Indonesian education has encouraged the study of English as a foreign language at the elementary level to develop the use of the language and positive awareness of the global community. If it is conducted since elementary school, students would have a positive attitude toward people who use the language. English in elementary schools in Indonesia is not compulsory. English would accommodate the community's needs in globalization, along with Indonesian and regional languages (Zein, 2016). There is a tendency to learn English that is teacher-centered. Students consider the teacher the only source of learning, resulting in students acting passively in learning. In addition, orientation to face tests and material demands in textbooks can prevent students from becoming active learners (Zein, 2016). The questions in the books tend to focus on a single correct answer. This fact would force students to think English is similar to computation or a lesson emphasizing the correct answer. Students must activate their thinking skills to become active learners, including in English lessons.

The culture of thinking is produced from the continuous practice of thinking processes. One strategy to facilitate this process is the thinking routines. In forming a class that has a rich learning experience culture, routines are one essential thing that is needed. Routines provide scaffolding for students' thinking at one time by providing tools and thinking patterns that each can use. The other essential things are

expectations, time, giving examples, environment, and interactions in the classroom that foster student involvement in learning (Ritchhart, 2015).

Thinking routines allow students to explore ideas, practice, and reflect on their thought processes. Based on a constructivist paradigm, thinking routines are the core of Visible Thinking (Ritchhart et al., 2011). The center of this paradigm is the students and aims for students to develop cognitive process skills (Kilbane & Milman, 2014). Thinking routines are part of visible thinking which resulted from research development at Harvard University in collaboration with school teachers from various countries (Project Zero, 2016). The teachers participated in the research conducted by Harvard to facilitate students to think and visualize their thoughts. The teacher used routines to support students' thinking (Arends, 2016). Thinking Routines are also applicable in an English as a Foreign Language class. While doing thinking routines, students actively talk with each other to help each other with grammar and vocabulary (Mertens, 2018). Three ways to look at thinking routines: as tools for promoting thinking; as structures to support and structure students' thinking; and as behavior patterns. Reflecting on its practical nature, thinking routines can be carried out continuously in the classroom, shaping students' understanding of learning and forming a thinking culture (Ritchhart et al., 2011).

There are three categories of thinking routines. They are routines for introducing and exploring ideas, synthesizing and organizing ideas, and the last category is routines for digging deeper into ideas. The category used in this study was the category of exploring more profound ideas. The routines were given names such as "What makes you say that," "Take note," Claim-Support-Question, and Tug of War (Ritchhart et al., 2011). For this study, two routines of exploring more profound ideas were used. They were "What Makes You Say That" and "Take Note ."Some studies used the "What Makes You Say That" routine to see thoughts supported by facts or evidence (Senokossoff & Fine, 2013). In addition, the routine was chosen because it helped students share their interpretations, understand alternatives, and have diverse perspectives (Salmon et al., 2017).

There are many definitions of critical thinking found in teaching research. Ennis (1996) defines it as reasonable and reflective thinking that focuses on making decisions about what to believe or do. The other definition is reasonable and reflective thinking that focuses on deciding what to believe or do (Brookhart, 2010). Paul & Elder (2020) defined critical thinking as a way of thinking about a subject, material, or problem in which the thinker improves the quality of his thinking skillfully using elements or structures inherent in thinking and using intellectual standards in measuring that structure. This definition breaks down critical thinking into nine intellectual standards. The intellectual standards are 1) clarity, departing from the need to communicate specific meanings in achieving goals, 2) accuracy, based on facts stating as it is in achieving goals, 3) precision, based on facts, specifications, and details in achieving goals, 4) relevance, based on the fact that even correct information cannot answer specific questions, 5) depth, looking at the complexity of the issue, 6) breadth, based on another point of view, 7) logic, based on mutually supporting and make sense thoughts, 8) fairness, based on all relevant viewpoints and 9) sufficiency, based on sufficient information (Paul & Elder, 2020).

The ability to think critically at the elementary school level is acquired over time, allowing children to manifest spontaneously, without limitation, whenever there is a learning situation (Florea & Hurjui, 2015). For students to think critically, teachers must teach through explicit instruction (Elder & Paul, 2007). Several studies have examined the links between thinking routines and critical thinking. A previous study on early childhood reported that thinking routines stimulated students to externalize students thinking in learning English as a second language. The thinking routines also improved students' language and literacy skills because of the opportunity to activate and externalize thinking. They used their mother tongue for deeper thinking and used the second language to present it in class (Salmon, 2008). A previous study in higher education reported that thinking routines helped students use collaboration, communication skills, and higher-order thinking, as well as increased students' involvement in every learning process. They could learn from each other, and the routines could be integrated into many lessons. Some students mentioned that they analyzed, synthesized, evaluated, reflected, and expanded their thinking (Gholam, 2018).

In another study, using a concept map was one of the routines used by a third to eleventh-grade students. The result revealed that students' thinking concepts increased with age, and their thinking expanded through classroom culture, concluding that thinking routines activated students' thinking skills and helped them visualize their thinking (Ritchhart et al., 2009). The previous study stated that thinking routines could be used at any educational stage, from pre-school to secondary level (Leonardi, 2019; Pinedo et al., 2018). However, there were few studies on applying thinking routines within elementary schools. One was conducted on fourth and fifth-grade elementary school students in Palestine. The findings concluded that students were more engaged in exploring, connecting ideas, and delving deeper to understand better the topics discussed. Therefore, thinking routines can be seen as a pedagogy to enhance students' engagement and cultivate a culture of critical and creative thinking (Dajani, 2016). However, to the best of the author's knowledge, no report has been found so far applying thinking routines in English lessons to enhance the critical thinking of elementary students. The primary objective of this study was to determine whether thinking routines significantly affect the critical thinking skills of sixth-grade students. The central question in this study asks how thinking routines enhance the critical thinking of sixth-grade elementary school students.

RESEARCH METHOD

General Background

This study used a quasi-experimental design by comparing the control and experimental groups (Creswell, 2014). The experimental group used the thinking routines as the intervention. These two types of groups will be given a pretest, then an intervention will be carried out on the experimental group, and then a posttest will be given to see the differences between the two groups (Creswell, 2012).

Participants

The researched subjects in this study were 64 sixth-grade students at two different elementary schools enrolled in the 2020/2021 academic year. There are two variables in this study. The independent variable is the thinking routines, and the dependent variable is critical thinking ability.

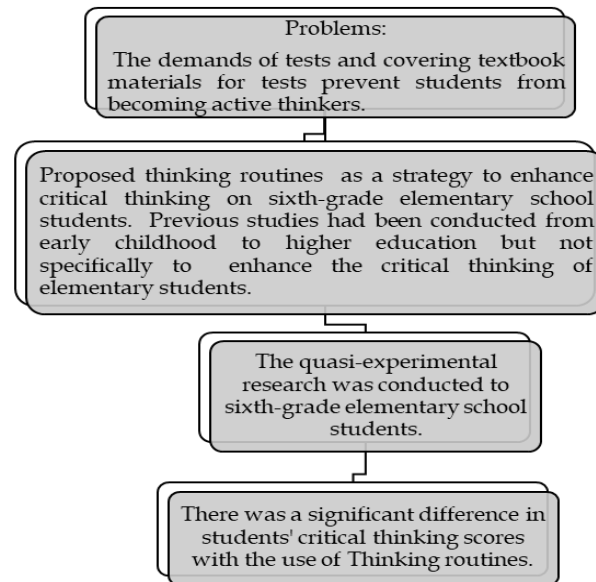


Figure 1. Research flowchart.

Data collection tools

The schools were selected based on a degree of homogeneity of the textbooks and assessment procedures. Sixth-grade students were chosen since they have adequate English vocabulary compared to the other grades in elementary school. In addition, they had entered the final stage of concrete operations and the formal operational stage. They can discuss a learning topic with more logical, idealistic thinking and start thinking abstractly (Santrock, 2011).

Data collection was collected through observation to see how the thinking routines were applied in the learning. Sources of data were derived from researchers, teachers, and students. Things observed were the activities of teachers and students in applying the thinking routines in the English lesson. In addition to the observation sheet, a test was used to measure critical thinking ability. This test was given as a pretest and posttest to four classes to determine the results after the intervention. The test will be used as a reference for testing hypotheses and drawing conclusions. The test to measure critical thinking skills refers to the elements of reasoning and intellectual standards proposed by Paul and Elder (2020).

Materials used in determining critical thinking and writing

The topic of the material was chosen from the school's textbooks. The materials are developed and based on the standard of English as a foreign language. It is essential to align with the standard to ensure the topic is suited to the student development stage and the difficulty level of sixth-grade students. Expert validations were used to ensure whether the materials aligned with the teaching and learning for sixth-grade students.

After getting expert feedback, the chosen topic was the interesting objects around the world. This topic was related to several interesting places in several countries that have not been known to many people. In addition, this topic was chosen because it is understandable for sixth-grade students.

The purpose of choosing this topic was to invite students' curiosity so that they could formulate questions and find out why they formulate those questions. In line with the previous study, the topic and chosen text containing ambiguous things will open up opportunities to use thinking skills (Hooper, 2016).

Test

The critical thinking test had two dimensions; elements of reasoning and intellectual standards. The criteria used were taken from two elements of reasoning; making questions about facts or evidence that need to be sought and selecting the required information with supporting evidence. The criteria used for the intellectual standards were accuracy and relevancy. Accuracy means answering the questions based on the facts, and relevancy means how relevant the facts that students had to answer the questions (Paul & Elder, 2020).

The aspect of critical thinking skills in this study was how students asked questions about facts or evidence that needed to be sought related to the topic. Moreover, the critical thinking aspect was how to answer questions correctly or accurately. In answering questions, students must choose the information that was relevant to the question. Based on the information, there would be facts or supporting evidence. Therefore, students should also know whether their information was sufficient or required additional information.

The expert validated the test used in this study. The test items were revised based on the experts' input. After that, the trial test was conducted for the specific class assigned only to the trial. The assessment guidelines were tested on the class for trial. Then item validation was carried out to see the level of validity per item of the test. The test validity was conducted by correlating each item/indicator score with the total score using the Pearson Correlation (Product Moment) technique. After being tested statistically, the result showed that one number was invalid. Therefore, this number was deleted and then retested using the same test. The test results stated that all items were valid to be used in research. After the validity test, a reliability test was conducted using Cronbach's Alpha technique. The score was 0.669 (>0.6 reliable) means all indicators were reliable.

Data Analysis

The study's data analysis was performed using the SPSS 25.0 package program. An Independent Samples Test was conducted on the pretest to ensure the equivalence between the control and experimental classes. The results of the independent samples t-test showed the number 0.202 (sig > 0.05). It showed no significant difference in the critical thinking ability between the experimental and control groups. Moreover, descriptive analyses of the pretest and posttest scores, such as mean, standard deviation, minimum and maximum, were used in the data analysis. After that, normality analyses were performed. The researchers analyzed the distribution of normality of the pretest and posttest scores.

Kolmogorov-Smirnov analyses were conducted to check the distribution of the normality. The significance of the results indicates that the data did not show normal

distribution. After the normality test was performed, the data analysis would be adjusted to the normality result. The pre and posttest data for the experimental group showed normal distribution, so the analysis was performed using a paired-t-test to reveal whether there was a significant difference between them. For the control group, the pre-and posttest scores did not have a normal distribution, then Wilcoxon analysis was performed.

The analysis continued with the posttest scores to check the normality distribution. The result showed that the posttest scores did not have a normal distribution. Therefore nonparametric analyses were performed in this study. The Mann-Whitney U test was performed to analyze whether the data obtained from two independent samples created a significant difference concerning each other.

Experimental Process

To introduce the routine, the teacher showed the video. In each routine, teachers started by questioning, listening, and documenting the students' thinking. Due to the COVID-19 pandemic situation, learning applications were used, such as Padlet, to document the students' thinking. The digital tool can address the challenges of the transition to remote learning (Ben Abu & Kribushi, 2022).

The researcher prepared materials used before the lessons. These materials included detailed lesson plans prepared so that no details were missed during the teaching process. Texts, thinking routines introduction videos, and learning applications such as Padlet and Microsoft forms were prepared by the researcher and used by the teachers to facilitate online learning.

Findings

The study findings will be presented according to the changes within the groups and the differences between the groups. The findings on the difference in students' critical thinking are shown in Table 1.

Table 1. Descriptive statistics on score obtained from the critical thinking test.

Group		N	Minimum	Maximum	Mean	Std. Deviation
Experimental	Pre-test	32	14.29	85.71	52.0089	18.69987
	Post-test	32	71.43	100.00	83.7894	10.42755
Control	Pre-test	32	7.14	85.71	33.4821	23.68583
	Post-test	32	28.57	92.86	68.3034	16.72014

Table 1 indicates that the students in the experimental group showed an increasement in their scores from the pre- to post-test. The minimum score showed a definite increase in the pre-and post-test. The average score they obtained from the pre-test was $M=52$, and in the post-test was $M=83.8$. The students in the control group also showed an increasement in their scores from the pre- to post-test. The minimum score showed a definite increase in the pre-and post-test. The average score they obtained from the pre-test was $M=33.4$, and in the post-test was $M=68.3$.

The Kolmogorov-Smirnov analyses were conducted to ensure the data's normality for the experimental and control groups. For the experimental group, the difference in the pre-and post-test scores was normal, so it was continued with the paired t-test. On the other hand, the control group did not have a normal distribution, so the Wilcoxon analysis was performed. The analyses are summarized in Table 2.

Table 2. Statistic test results for pre and post test.

Test	Groups		Statistics	Sig. (2-tailed)
Paired Samples	Experimental	Pretest	-11.378	0.000
		Post test		
Wilcoxon Signed Ranks	Control	Pretest	-4.667	0.000
		Post test		

Table 2 shows a significant difference in the sixth-grade critical thinking scores with the intervention group ($t=-11.378$, $p<0.05$). There is also a significant difference in the result with the control group ($Z=-4.667$, $p<0.05$). The Mann-Whitney U test was performed to determine whether there was a significant difference between sixth-grade students after applying the Thinking routines for the intervention and control groups. The test result is summarized in Table 3.

Table 3. Mann Whitney U-Test Result for the difference.

Mann-Whitney U	Wilcoxon W	Z	P
235000	763000	-3.757	.000

Table 3 shows a significant difference in the sixth-grade critical thinking scores between the intervention and control groups ($z=3.757$, $p<0.05$). However, the mean in the experimental group was higher than in the control group. According to this finding, it has been observed that thinking routines positively affected sixth-grade students' critical thinking.

RESULTS AND DISCUSSION

The present study was designed to determine the effect of thinking routines on the critical thinking skills of sixth-grade students. The results of this study indicate that thinking routines improved critical thinking significantly. The results of the Mann-Whitney test have proved that the significance value was 0.000. Therefore, there was a significant difference in the experimental and control groups' critical thinking skills scores. In addition, the experimental group's average score of critical thinking skills was higher than the average value of critical thinking skills in the control group. The average for the experimental group was 83.7, and the average for the control group was 68.3.

Thinking routines develop a thinking culture that provides space for students to think. This condition enables students to think both in formulating and answering questions. The results of the study stated that students were able to ask questions according to facts and evidence. Some questions were raised about the cause of the sank island and condition of the people in that city. After the students read the text about the lost city. This finding is consistent with findings of the past study in higher education. In the beginning, students wrote based on their personal opinions. However, on the final test, the students wrote statements accompanied by supporting evidence (Hooper, 2016).

Thinking routines also provide space for students to question their understanding. Based on what the students read, they formulated questions about facts or evidence that needed to be searched according to the topic. This finding is in line with the past study, which evaluates the presence of deep thinking movements after using thinking routines. At the primary level, thinking routines increase the level of students'

wondering and asking questions (Pinedo et al., 2018). The finding is also consistent with the previous study in elementary school that students could think critically about what is presented. Thus a culture of critical thinking has been built (Dajani, 2016). Similarly, a past study found that thinking routines have successfully affected students' higher-order thinking skills. Several students mentioned that they analyzed, synthesized, evaluated, reflected, and expanded their thinking (Gholam, 2018).

The student's critical thinking tends to develop more in a learning environment that provides discussion and learning experiences using argumentation. In this study, some discussions were conducted in each session, such as before reading the text, while reading, and after reading activities. Before reading, one of the discussion examples was asking students' opinions on whether an island could be lost or what caused an island to be lost. The discussion while reading the material was about the island's initial conditions and what happened afterward. If the teacher asks questions by being receptive to accepting various opinions, then the students will express their arguments freely. Students were also expected to answer based on existing facts or evidence. This fact is in line with a past study that stated that most students could give reason or evidence after applying one thinking routine (Pinedo et al., 2018).

Students shared their thoughts in written form while sharing their thoughts. Afterward, the teacher documented the writing and sorted the irrelevant responses to the reading material. This document will be displayed to be discussed in the next lesson. The discussion would focus on sorting relevant and irrelevant responses. Moreover, the discussion would focus on why the responses were irrelevant. With a meaningful discussion experience, students are expected to be able to develop their thinking so that they can think critically. If thinking routines are associated with Bloom's taxonomy, the thinking routines used in the study aimed to provide reasoning with evidence. This result includes understanding, applying, and analyzing or relating to high-level skills (Heredia, 2017). For example, applying thinking routines in English class supports the students in accepting feedback from the teacher. This is because they show their thinking through thinking routines by activating their prior knowledge and then connecting it to new things they encounter (Mertens, 2018).

Teachers need to expose a problem to students and instruct students to respond gradually. This stage begins by eliminating requirements that make students focus on a single solution. This stage will motivate students to find solutions in various ways, challenge ideas, and foster persistence in problems (Bowie, 2018). Practically, thinking routines help students see a problem from one point of view and many points of view. Thinking Routines also increase students' involvement in thinking deeply about the topic being investigated (Flossie, 2016). By introducing thinking routines early on and allowing sufficient time to investigate and reflect on the reading, students will be actively involved in learning (Kelly, 2017). A supportive classroom environment, such as strengthening motivation, respect, and a culture of thinking, will produce visible thinking processes (Ritchhart & Perkins, 2008). Most students are unaware of critical thinking at the expected level, but it is the teacher's job to facilitate students in developing critical thinking skills (Tosuncuoglu, 2018).

CONCLUSION

The present study was designed to determine the effect of thinking routines on the critical thinking of sixth-grade students. The result of this investigation showed that there was a significant difference in students' critical thinking scores with the use of

thinking routines. The finding is consistent with the findings of past studies by authors. The present study makes several noteworthy contributions for teachers to apply thinking routines as a tool to enhance the critical thinking of elementary school students. This research has several practical applications. Firstly, it points to teachers applying the routines in their teaching by exposing a problem that students can think about some solutions in different ways. Secondly, teachers need to create a positive learning atmosphere by encouraging a sense of respect among the students to visualize or tell their thinking from different points of view.

Several limitations and perspectives need to be identified. First, this study was only conducted in English lessons for a short period. It is suggested that further research can also be done over a more extended period and should be used in the other lessons where there are discussions. The reason is also to see how a thinking culture has been formed. Second, if this research uses a larger sample, the result will reveal a larger thinking pattern. Third, it would be better to use various categories of routines, focusing on routines for digging deeper into ideas and the other categories. Further research can be started by using the routines for introducing and exploring ideas when opening the topic, synthesizing, and managing ideas for closure. It is expected that students will produce a larger thinking space.

Given the limitations of this study, several things can be done. First, teachers need to set aside time to explore parts of the reading material and allow sufficient time for students to think and reflect on the material. This preparation will make students more actively involved and see the impact or application of the material read. Second, the teacher needs to expose the problem to students and instruct students to respond gradually. This stage eliminates requirements that make students focus on a single solution or answer. It is expected to motivate students to find solutions in various ways, challenge ideas, and foster persistence in problems. Third, if thinking routines are practiced with discussions with classmates, they will increase students' motivation to become active thinkers. It is recommended that further research be undertaken in the following areas: Further experimental investigations are needed to estimate the effect of thinking routines on the lessons conducted in students' first language. The purpose is to ensure that the limitation of vocabulary will not hinder the students from expressing their opinions. It is expected to give a broader perspective on students' reasoning for the result.

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