



P-ISSN 2355-2794
E-ISSN 2461-0275

Fostering Critical Thinking Using Graphic Organizers in English Language Reading Class

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Abstract

Fostering students' critical thinking (CT) is an increasing concern in EFL classrooms in China as many students struggle to utilize the skill, particularly in EFL reading comprehension classes. This study investigated the effects of graphic organizers (GOs) on 60 Chinese senior high school students' CT skills (analyzing and generalizing) in EFL reading classes. This study adopted a quasi-experimental mixed-method research design involving an experiment and an interview. The findings of this study showed the positive impacts of GOs on students' CT skills. After the intervention, the results of the experimental group improved significantly. The findings showed that GOs could effectively improve the analytical and generalization skills of Chinese high school English reading class students. The students in the experimental group reported that the instructions received were motivating, increased their comprehension, made them more focused on reading and aware of CT skills and how to apply them in real reading contexts. This study implies that teachers may

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Citation in APA style: Min, G. S., Albakri, I. S. M. A., Ismail, N., Mokhtar, M. M., Zulkepli, N., Tahir, M. H. M., & Khalid, P. Z. M. (2023). Fostering critical thinking using Graphic Organizers in English language reading class. *Studies in English Language and Education*, 10(3), 1309-1325.

Received December 31, 2022; Revised June 20, 2023; Accepted August 8, 2023; Published Online September 16, 2023

<https://doi.org/10.24815/siele.v10i3.29973>

consider GOs an alternative teaching tool to improve CT skills in English Language reading classes, particularly in EFL contexts. Guidelines for teachers to use the different types of GOs to promote critical thinking should also be prepared to ensure the effective use of GOs in promoting reading comprehension and critical thinking skills.

Keywords: Analyzing, critical thinking, generalizing, graphic organizer, reading.

1. INTRODUCTION

One of the areas that has received the most significant concerns in the education context is the need to equip students with 21st-century skills (Albakri et al., 2021; Ismail et al., 2014). Critical thinking skill (CT) is one of the most important components of 21st-century skills (Geisinger, 2016; Sarudin et al., 2019). The integration of CT in the context of language teaching and learning has been highlighted by numerous researchers, and language teachers are encouraged to infuse them into the activities conducted in class (Bao, 2019; Hazaymeh & Alomery, 2022; Ismail et al., 2010; Salleh & Halim, 2019).

CT has been defined in a variety of ways. Facione (2010) viewed CT as a series of cognitive process that requires students to analyze, evaluate, explain, and self-regulate. It emphasizes goal-oriented tasks as well as judgment. Fitriani et al. (2019) defined CT as the ability to think logically and clearly about one's actions and beliefs. It involves autonomous and reflective thought. Critical thinkers can link concepts logically, evaluate arguments objectively, spot errors in thinking, and consciously consider their judgments and values.

As critical thinking is one of the most significant skills in the 21st century (Ismail et al., 2010; Salleh & Halim, 2019), learning to think critically is one of the most desirable goals of the education system. Educators and researchers have explored the approaches to foster students' CT skills as it is essential for students to solve problems in various situations and communicate effectively and accurately. Many researchers highlighted that the best way to teach CT skills is to infuse them into school subjects (Arase et al., 2016; Bao, 2019; Salleh & Halim, 2019).

In the context of English language teaching in China, several studies have reported that many Chinese high school students lack CT skills like reasoning, judging, generalizing, and analyzing, and they argued that the lack of CT skills among the students is due to the traditional teacher-centered, examination-oriented teaching (Nan, 2018; Yang & Wu, 2012; Zhao et al., 2016). Thereupon, Dong (2018) thought that teachers' role should be changed from a dominant role in knowledge delivery to a guide who cultivates critical thinking among students. She further explained that high school students needed more chances to apply their CT skills rather than rote memorization of fact knowledge. Teachers should also be given training on the skills and knowledge to foster students' CT in their teaching.

Several studies have reported specific strategies to improve CT in English classrooms. One of the strategies used to foster CT is using Graphic organizers (GOs). GOs use visual symbols to convey meaning, similar to thinking maps (Kurniaman & Charlina, 2019). GOs can project material into visual symbols like lines, arrows, and

circles for learners to quickly express their ideas and concepts. Vacek (2009) considered GOs a fundamental tool in developing CT skills in education. Research shows that GOs enhance problem-solving and other CT skills (Omar & Albakri, 2016; Salleh & Halim, 2019; Santiago, 2011).

GOs can be an alternative tool for Chinese high school teachers to foster critical thinking skills among Chinese high school students. English language teachers can integrate thinking skills in their language teaching as a tool to develop students' independent thinking. As for the students, using the GOs will give them the opportunities to analyze various materials logically, reflect on their thinking process, organize their ideas, and express their ideas critically. Using the GOs, teachers can assist students in developing their critical thinking skills while strengthening their pedagogical skills, extending their teaching experience, and increasing their knowledge about the instruments used.

Hence, this research aims to explore the effects of GOs on senior high school students' CT skills, mainly focusing on analyzing and generalizing skills in English reading classes in Ningxia, China. Analyzing and generalizing skills are two critical thinking skills lacking among high school students in China (Zhang & Kim, 2018; Zhou et al., 2015). One of the reasons is that the students did not receive enough practice in using the skills as the common practice is that students prepare for tests; hence, they tend to memorize facts and accept the information without thinking and analyzing.

Besides that, studies about the specific strategies to improve students' CT skills in English classes in China are also limited, particularly the experimental research to test the efficiency of concrete strategies (Guo, 2013). This study also aimed to explore how graphic organizers affect students' critical thinking skills, mainly analyzing and generalizing. The GOs used in this research are two groups of organizers: Hierarchy Diagram and Big Question Map for analyzing practice; Main Idea Detail Map and Topic-Main Concept Map for generalizing exercise. These GOs were chosen because they have their characteristics in assisting specific CT skills development in this study.

This research focuses on answering the following research questions:

1. What are the effects of GOs on students' CT skills in English reading class?
 - a) Is there any significant difference in the pre-test reading comprehension test scores between the control and the experimental groups?
 - b) Is there any significant difference in the scores of the reading comprehension test between the pre-test and the post-test of the experimental group?
 - c) Is there any significant difference in the scores of the reading comprehension test between the pre-test and the post-test of the control group?
 - d) Is there any significant difference in the reading comprehension test scores between the control and the experimental groups in the post-test?
2. How do GOs affect students' CT skills in English reading class?
 - a) Is there any significant difference in the scores of analyzing skills in the experimental group between the pre-test and the post-test?
 - b) Is there any significant difference in the scores of generalizing skills in the experimental group between the pre-test and the post-test?
3. What are the students' perceptions of GOs in promoting CT skills?

As part of the experimental study, the following research hypotheses were tested:

- Ho₁: There is no significant difference in the reading comprehension test scores between the control and the experimental groups in the pre-test.
 - Ho₂: There is no significant difference in reading comprehension scores between the pre-test and post-test of the experimental group.
 - Ho₃: There is no significant difference in the reading comprehension test scores between the pre-test and the post-test of the control group.
 - Ho₄: There is no significant difference in the reading comprehension test scores between the control and experimental groups in the post-test.
- Ho₅ and Ho₆ are generated from research question 2.
- Ho₅: There is no significant difference in the scores of analyzing skills in the experimental group between the pre-test and the post-test.
 - Ho₆: There is no significant difference in the scores of generalization skills in the experimental group between the pre-test and the post-test.

2. LITERATURE REVIEW

In China, senior high school students refer to students aged 16-18 years old. Senior high school is a critical transition period for Chinese students. In Chinese senior high schools, the score is the only focus. [Huang \(2019\)](#) addressed senior high school students as ‘intimating robots’ who are deemed non-beneficial to the education system in the country.

2.1 Theories Related to the Study

Three main theories underpinned this study. The first one is Schema Theory. A schema is a structure of knowledge that guides learners’ cognitive processes. According to [Widdowson \(1983\)](#), learners can make sense of novel experiences as the schema that they have provided the context to enable them to engage in a particular mental process. When we learn new knowledge, we keep the information first to organize the structure in a scaffolded hierarchy. Using GOs makes it much easier to link new concepts or information with old ones and helps students build schema ([Guastello et al., 2000](#)). In this study, the researcher used two groups of maps to promote students’ CT skills in English reading class. These GOs help students to understand the structure of the reading materials and to grasp the interrelationship among the key concepts involved in the material. The second is the Cognitive Load Theory, which upholds that individuals’ memory can deal with limited information. If the information to be stored exceeds the capacity, it is likely to be a failure to store the information ([Kirscher, 2002](#)). As a visual learning tool, GOs can reduce the cognitive load to release more working memory for new material learning. Thus, it is necessary to structure and address the learning material using GOs to reduce complexity and increase logic to increase memory capacity ([Kirscher, 2002](#)).

2.2 Graphic Organizers

GOs are visual displays that can organize ideas and conceptions to illustrate connections and relationships among information. They are helpful tools for learners to locate useful facts, arrange different information, explore inner relations among

parts, and express their opinions and thoughts. GOs are effective visual displays of key content information (Kurniaman et al., 2018). Boykin et al. (2019) defined GOs as tools or frameworks students can use to visually collect, relate, and present ideas or information. Colliot and Jamet (2021) conceptualized GOs as the instrument of representation, modeling, and illustration of ideas in graphic or visual forms, which teachers utilize to aid students learning.

Pedagogically, GOs are helpful tools because learners can organize content and ideas visually and spatially, facilitating learning and acquiring new information (Odiri, 2015). Brady et al. (2021) claimed that students who use GOs can internalize the content of what is being taught more successfully. Teaching students to use GOs in the classroom is of great value in improving CT skills. Integrating organizers with the teaching content significantly promotes instructions and understanding (Heidarifard, 2014; Samba et al., 2020).

In summary, GOs are of great importance. They are tools for organizing information: they are visual illustrations that resemble networks and allow students to reflect on their prior knowledge by making contradictions between new and old knowledge. GOs provide an optional way of representing knowledge, ideas, and concepts discussed in class, leading to understanding ideas and relationships.

2.3 Studies on the Usage of GOs to Promote CT in English Reading Lessons

Many countries acknowledged the importance of CT skills in the EFL teaching contexts. Therefore, efforts have been made to promote teaching CT skills in language classes, focusing on reading classes. As visual tools for the thinking process, GOs have been proven as an alternative tool that can make some difference in promoting CT for EFL learners. GOs help students to analyze, classify, reflect, and evaluate their thinking and ideas while reading printed and online texts.

Moya and Tobar (2017) analyzed different strategies used in reading comprehension for the teaching of EFL. They highlighted the usage of GOs in reading as they supported the interaction and cooperation among peers and helped them to learn effectively. In addition, students can recall the main concept or ideas easily. They also concluded that visual organizers contributed a lot to developing CT skills and promoting autonomous learning and a higher level of reading performance.

The study by Kurniaman and Zufriady (2019) also reported that GOs could be used to classify information and assist learners in analyzing reading materials critically. Furthermore, Hazaymeh and Alomery (2022) studied using visual mind mapping as a reading strategy to develop CT skills among students enrolled in general English courses. Findings in this experimental study showed that visual mind maps strongly impact the students' CT with significant improvements on the CT items. This proved that visual mind mapping effectively inculcates CT and improves reading comprehension.

Based on the substantial research about GOs in EFL reading, it can be concluded that using a tool to promote thinking skills is crucial in reading. Students had to acquire the skills of reading critically. However, it was difficult for students to comprehend the text, analyze, synthesize, and evaluate ideas if they were not taught the skills to be critical in reading.

3. METHODS

This study investigated the effects of GOs in fostering high school students' CT skills in English reading classes.

3.1 Research Design

The design of the present study is quasi-experimental mixed methods. [Creswell \(1994\)](#) suggests that in a study that seeks to identify the effects of an intervention, conducting an experiment that involves pre and post-tests is the best choice, as data from the tests will enable the researchers to answer their research questions. Similarly, this study conducted pre and post-tests to collect quantitative data to answer research questions one and two. For the qualitative phase, interviews with some guided questions involved ten students. The qualitative data was obtained to answer the third research question, which aims to gather the students' perceptions on the employment of GOs in their reading lessons to inculcate CT.

3.2 Participants

Students from Ningxia Senior High School were selected as the study participants. The school has 69 teaching classes: 22 classes in first grade (1.205 students), 24 classes in grade two (1.278 students), and 23 classes in grade three (1.215 students). Of the 23 grade three classes, twelve consist of students with intermediate-level proficiency. From the 12 classes, two grade three classes were chosen to be involved in the study. One class was assigned as the experimental group, while another was the control group. This research adopted convenience sampling involving subjects who are available to the researcher. The study involved 60 students, aged between 17 and 19 years, who were divided into two intact classes with 30 students in each class. According to the recommended minimum sample size proposed by [Cohen et al. \(2007\)](#), 30 is deemed adequate for statistical analysis. As for the interview, ten students were interviewed, taking into consideration the adequate minimum sample size recommended by [Creswell \(2009\)](#).

3.3 Data Collection Methods

One of the classes was assigned as the experimental group and the other as the control group. These two groups were given a pre-test first. The pre-test allowed the researcher to assess whether the two groups were equivalent before the treatment was given to the experimental group. The pre-test of this study was a designed reading test used to determine their performance in the two CT skills (analyzing and generalization) in English reading and to see if they have equivalent performance. The test consists of two parts. The first part focuses on analyzing skills and contains three passages with eight multiple-choice questions testing the students' analyzing skills. As for the second part of the test, six passages were presented, and eight multiple-choice questions were posed to test generalizing skills. The pre and post-test passages were adapted from English test papers used for Chinese College entrance examinations under the Chinese Educational Department. The post-test consists of similar passages and questions as in the pre-test. However, changes in the passages' arrangements were

made to prevent learners from giving memorized answers from the pre-test. Experts validated the pre and post-tests before being used in the study to ensure the content validity of the constructed tests measure the constructs to be tested (Gerbing & Anderson, 1988).

Afterward, the treatment was given to the experimental group only. The treatment in this study was two pairs of designed GOs (Hierarchy Diagram and Big Question Map; Main Idea - Detail Map and Topic- Main Concept Map). These maps were utilized to promote CT skills in the reading class instruction. Twelve lessons were conducted with the experimental group, each for about 45 minutes. For the 12 lessons, six lessons focused on analyzing skills, and another six lessons on generalizing skills.

For the analyzing instruction, several steps were conducted. First, students need to get familiar with the structure and functions of each graphic organizer with their teacher's explanation. They need to know the meaning of 'analyzing', which normally means breaking down something into parts and trying to understand each part's function and relationship. They must analyze the keywords from the title, first, and last paragraph and try to get the passage's main idea. They can also grasp key information from the passage and put them together for a general outline of the whole story. They need to divide the passage into different parts according to the functions. Then, they can analyze the language features and sentence structures. Based on their understanding, they can draw maps, showing their performance in identifying the key elements and the inner relationship and function of each part, paragraph, or sentence.

As for the generalizing lessons, students will get to know the structure and function of each map. They also need to comprehend the term 'generalizing' to get the points of view, arguments, and conclusions based on parts of the given information. In the lesson, they need to identify the topic according to the clues shown in the passage. They also need to get the sub-topic and find the details supporting it. In addition, they need to judge the source of the passage based on the writing style and other information. Then, they need to practice drawing maps in pairs or groups and then discuss together and present their maps to other groups.

The texts used for the lessons are based on the texts chosen from the New Senior English for Chinese Students textbook for senior high school students. Some of the titles of the texts are 'Ann's Best Friend', 'Friendship', 'The Road to Modern English', 'Standard English and Dialects', 'The Journey Down the Mekong 1', 'Journey Down the Mekong 2', 'Earthquake' and 'A Night Us Didn't Sleep'. Four texts were used in the lessons to promote analyzing skills while another four texts were chosen to teach generalizing skills. The texts "Ann's Best Friend", 'Friendship', 'The Road to Modern English' and 'Standard English and Dialects' were used for instructions related to analyzing skills, while other texts were used for the lessons on generalizing skills.

The participants were given the usual English reading instructions in the control group. They used the New Senior English textbook for Chinese students and were taught similar topics to the experimental group. A post-test was administered after 12 sessions of teaching the experimental and control group. The last part of the study was a semi-structured interview conducted with the experimental group participants. Ten subjects volunteered to be involved in the interview, and they were accepted as they fulfilled the adequate number of samples for an interview as recommended by Creswell (2009). The interview instrument consists of eight questions to gather the students.

3.4 Data Analysis Method

The S.P.S.S. (Statistical Package for the Social Sciences) was used to analyze the pre and post-test scores. The analyzing method for this quantitative data is a nonparametric test, in which Mann-Whitney U and Wilcoxon Signed Rank tests were used. Descriptive statistics are employed to present the quantitative data. The qualitative data obtained from the interviews with the students were subjected to thematic analysis. These verbal responses were analyzed and sorted out categorically to understand better their perceptions of GOs in developing their CT skills.

4. RESULTS

The results of the study are presented and discussed in this section according to the research questions.

4.1 Findings on the Effects of GOs on Students' CT Skills in English Reading Class

The following sections present the findings on how GOs affect the students' CT skills in their English reading class.

4.1.1 *The scores of the reading comprehension test between the control and the experimental groups in the pre-test*

Mann Whitney U test was used to compare the pre-test scores between the control and the experimental groups. From the data presented in Table 1, the total pre-test score of the control group was 43.33, while the total pre-test score of the experimental group was 42.33, which is slightly lower than the score of the control group. In addition, there was no significant difference in the pre-test scores between the control and experimental groups ($z = -0.438$, $p = 0.661$). Thus, it can be concluded that the students in the control and experimental groups were of the same level regarding their analyzing and generalizing skills in reading comprehension. Therefore, the first null hypothesis was accepted.

Table 1. Pre-test scores of the control and experimental group.

	Group	N	Mean	Std. Deviation	z	p
Total pre-test score	Control	30	43.33	7.58	-0.438	0.661
	Experimental	30	42.33	8.48		

4.1.2 *The scores of the reading comprehension test between the pre-test and the post-test of the experimental group*

The results of the pre-test and the post-test presented in Table 2 show that there was a difference between the mean scores of the pre-test and post-test for the experimental group. The mean score for the pre-test was 42.33, while the score for the post-test was 52.17. There was a difference between the pre-test and post-test when the scores for both tests were compared ($M = 9.84$), indicating an improvement in the

achievement of the experimental group. The statistical results demonstrate a significant difference ($z = -4.532$, $p = 0.0001$). This shows that the scores in the experimental group improved significantly after the intervention. Therefore, the second null hypothesis was rejected.

Table 2. Pre-test and post-test scores of the experimental group.

Group	Mean	N	Std. Deviation	z	p
Total pre-test score	42.33	30	8.48	-4.532	0.0001
Total post-test score	52.17	30	8.48		

4.1.3 *The scores of the reading comprehension test between the pre-test and the post-test of the control group*

The results shown in Table 3 indicate that there was a difference between the mean scores of the pre-test and post-test of the control group. In the pre-test, the mean score was 43.33, and 43.67 in the post-test. The difference between the mean score of the pre-test and the post-test was 0.34. The statistical results demonstrate no significant difference ($z = -0.326$, $p = 0.744$), which shows no significant difference in the results of the reading comprehension test of the control group before and after the lessons. Hence, the third null hypothesis was accepted.

Table 3. Pre-test and post-test scores of the control group.

Group	Mean	N	Std. Deviation	z	p
Total pre-test score	43.33	30	7.58098	-0.326	0.744
Total post-test score	43.67	30	7.42007		

4.1.4 *The reading comprehension test scores between the control and experimental group in the post-test*

Based on the results presented in Table 4, the post-test mean score for the control group was 43.67, while the post-test mean score for the experimental group was 52.17. The data indicate that the mean score in the experimental group was higher than the control group by a difference of 8.5. Moreover, the statistical results of the Whitney U test demonstrate a significant difference ($z = -3.762$, $p = 0.0001$). The results show that the experimental group performed significantly better than the control group in the post-test, providing evidence that GOs support the development of CT skills among the participants in the experimental group. Based on the findings, the fourth null hypothesis was rejected.

Table 4. Post-test scores of the control and experimental group.

	Group	N	Mean	Std. Deviation	z	p
Total post-test score	Control	30	43.67	7.42	-3.762	0.0001
	Experimental	30	52.17	8.48		

4.2 Findings on How GOs Affect Students' CT Skills in English Reading Classes

The findings about how GOs impact students' CT skills in their English reading class are presented in the following section.

4.2.1 The scores of analyzing skills in the experimental group between the pre-test and the post-test

A Wilcoxon Signed Rank test was used to analyze the pre-test and post-test scores of the experimental group. The results presented in Table 5 indicate that there was a difference in the mean scores between the pre-test and post-test of the experimental group in the aspect of analyzing skills. The mean score for the pre-test was 20.33, and that of the post-test was 23.83, with an increase of 3.5. The statistical analysis shows a significant difference ($z = -3.447$, $p = 0.001$). The students' scores in the experimental group increased significantly after the treatment, indicating that the GOs were used to support the development of analyzing skills in reading comprehension classes. Thus, the fifth null hypothesis was rejected.

Table 5. Pre-test and post-test scores of the experimental group in analyzing skills.

Group	Mean	N	Std. Deviation	z	p
Analyzing-pre	20.33	30	6.149	-3.447	0.001
Analyzing-post	23.83	30	5.972		

4.2.2 The scores of generalization skills in the experimental group between the pre-test and the post-test?

Table 6 demonstrates the results of the pre-test and post-test of the experimental group, focusing on generalization skills. The results of the test indicate that there was a difference between the mean scores of the pre-test and post-test. The experimental group obtained a mean score of 28.33 in the post-test compared to a 22.00 mean score in the pre-test. The mean score difference between the pre-test and post-test was 6.33. The statistical analysis result also indicates a significant difference ($z = -4.744$, $p = 0.0001$). The GOs were effective in promoting generalization skills among the participants in the experimental group. Hence, the sixth null hypothesis was rejected.

Table 6. Pre-test and post-test scores of the experimental group in generalization skills.

Group	Mean	N	Std. Deviation	z	p
Generalization-pre	22.00	30	5.813	-4.744	0.0001
Generalization-post	28.33	30	6.065		

4.3 Findings on the Students' Perceptions of GOs in Promoting CT Skills

Data from the interview suggests that most students (8 out of 10) agreed that using GOs allowed them to analyze better and generalize what they have read. Data analysis from the interviews generated seven common themes, as presented in Table 7, which can be divided into two categories. They are themes related to the participants' views about GOs and themes suggesting their benefits in supporting critical thinking skills in reading lessons. The themes of stimulating lessons, ease of comprehension, and more focused reading are related to the effects of GOs on the participants' reading lessons. In terms of critical thinking, the themes of increased awareness about CT skills and ease of application of critical thinking skills were generated, suggesting the benefits of GOs in promoting critical thinking skills.

Table 7. Common themes identified from semi-structured interviews.

No	Themes
1	stimulating lesson
2	ease comprehension
3	more focused reading
4	increased awareness about CT skills
5	ease application of CT skills

The following extracts from the interviews support the participants' views that the lessons using GOs are stimulating.

- (1) These sessions are quite different from our usual classes. I feel they are very interesting to learn. I heard CT before but did not know what it was. It is my first time to know and learn about GOs. (P1-stimulating lesson)
- (2) It was a great idea to use it during the English reading classes. Our teacher divided us into groups to discuss using the maps in our reading. I think we had much fun. (P2-stimulating lesson)
- (3) For me, this is new knowledge. I think they are full of fun. They are quite different from our usual classes. (P4-stimulating lesson)

Furthermore, the following are excerpts related to the participants' feedback that GOs ease their comprehension of the reading texts presented in the lessons.

- (4) These GOs helped to digest those passages so that I could acquire the fundamental facts of these passages. (P9-ease comprehension)
- (5) It helped me to understand the points in the passage. (P4-ease comprehension)
- (6) I could more easily find the key information from the text. (P6-ease comprehension)
- (7) These GOs helped to digest those passages so that I could acquire the fundamental facts of these passages. (P9-ease comprehension)

The participants also reported that they felt their reading was more focused when they used the GOs in the activities related to reading comprehension.

- (8) I found it easier for me to get the main ideas of the passages and catch their key points. (P3-more focused reading)
- (9) They were just like a framework of reading material. We only needed to find the "bones" of it, which means the key information or keywords. Take the big question map, for example, it gave me six keywords as a guide. Following these keywords, I could spot the key information quickly. (P6-more focused reading)
- (10) I feel more confident to get the keywords of the passage and to grasp the structure of a passage. I have become more conscious about getting the main idea of a passage or paragraph and finding the supporting details. (P8-more focused reading)
- (11) I found my thinking was more focused and logical when I used these organizers to analyze and generalize. (P9-more focused reading)

The following excerpts present the participants' views on how using GOs increased their awareness about using CT skills in reading.

- (12) I started to pay more attention to my thinking processes. (P3- awareness about using CT skills)
- (13) And I think we must learn more CT skills and GOs to put our thinking to a higher level. (P4- awareness about using CT skills)
- (14) The GOs worked well to help us think about analyzing and generalizing. (P9- awareness about using CT skills)

Finally, the following excerpts suggest that the participants felt the GOs eased the application of CT skills.

- (16) From my point of view, analyzing is a very abstract skill, which I felt was hard to master at one time. These sessions showed clearly the usage of analyzing. When we analyze, we tend to break things into parts, which helps greatly when we try to know the whole thing. (P4- application of CT skills)
- (17) The Hierarchy Diagram map let me divide the passage logically so that I can further analyze the passage at a paragraph level. (P5- application of CT skills)
- (18) Take the hierarchy diagram, for example, I find it quite informative and of great value in argumentative writing. In argumentative writing, usually, there is a topic, which is supported by several sub-topics. The sub-topics are also supported by details, respectively. The hierarchy diagram is a very effective presentation of this structure. It can guide us to analyze and generalize the topic, sub-topic, and supporting details of a passage. (P7- application of CT skills)

5. DISCUSSION

The study has five main findings. First, both groups are homogeneous, with no significant difference between the mean scores. It implies that the difference is the result of different interventions. The second finding conveys that students' CT in the experimental group has significantly improved after the intervention. The third finding is that the pre-test and post-test results in the control group show no significant difference. It provides empirical evidence that the traditional classroom instruction used in the control group had no positive effects in fostering CT skills, particularly for reading comprehension. The fourth finding is that the post-test scores in the experimental group were significantly higher than those in the control group. This provides evidence that the use of GO has a more positive influence on students' critical reading performance. The fifth finding is that after the intervention, the analyzing and generalizing skills of the experimental group improved significantly.

Based on the above findings, three major conclusions can be drawn. First, GOs in the experimental group positively impact students' critical reading performance. Second, the GOs in the experimental group have a more positive influence on students' critical reading performance than the conventional instruction. Last, implementing GOs contributes to the development of students' analyzing and generalization skills in the English reading class of the experimental group. The results echoed findings from past studies that highlighted the improvement in students' critical thinking skills using GOs (Brady et al., 2021; Kurniaman et al., 2018; Samba et al., 2020). Studies have indicated that GOs assist learners in organizing their thoughts and ideas, which are key in analyzing and generalizing reading texts (Kurniaman et al., 2018; Odiri, 2015).

Apart from the quantitative findings of pre-test and post-test, qualitative findings support the positive effects of implementing GOs in promoting analyzing and generalization skills in English language reading classes. Most students reported that the sessions using GOs were different, new, fun, engaging, and helpful in their English language learning compared to the traditional methods. It was their first time getting exposure to GOs in reading classes. They thought the sessions were interesting. Using maps to read English was unique and stimulating. They thought these instructions were informative and creative. Previous studies held similar perspectives (Hazaymeh & Alomery, 2022; Kurniaman et al., 2018; Samba et al., 2020; Zaini et al., 2010).

Most students highlighted that teaching using GOs has two major benefits to their reading comprehension process. The benefits are that (1) the practice has made them see the rationale of using GOs and (2) it enabled them to use the GOs taught in the reading context. They mentioned that the key characteristics of GOs made reading lessons more interesting and the text more comprehensible; information was easily recalled, main ideas could easily be identified, and the sequence and relationships of information could be understood. These characteristics were also reported in using GOs in reading classes (Moya & Tobar, 2017; Salleh & Halim, 2019). The findings support the notion in schema theory whereby the GOs get students to link new concepts to their previous knowledge. The findings also relate to Cognitive load theory whereby the visual organizers increase understanding of reading texts as it facilitates logical thinking. Besides that, most participants thought this new experience created awareness about CT skills. They also realized the importance of cultivating CT skills, which they had not previously paid attention to (Hazaymeh & Alomery, 2022; Kurniawan et al., 2018; Samba et al., 2020). They learned skills of analyzing and generalization and how to apply these skills to their reading process. Most students agreed that using GOs allowed them to analyze and generalize better. They thought GOs helped them grasp the most important information by revealing the structure of a passage and by guiding them to think logically. These conceptions were confirmed by considerably related studies (Hazaymeh & Alomery, 2022; Pang, 2013; Praveen & Rajan, 2013; Sari et al., 2019).

The students also mentioned that mastering CT skills is essential to comprehend reading texts. All respondents agreed that it is important to master these CT skills, such as analyzing and generalizing in English reading. All of the students could learn more about CT and GOs. They hope to master more CT skills to improve their reading and exam performance.

6. CONCLUSION

This research highlights the critical role of GOs in promoting CT skills in China's English language reading classes. The results of the study suggest several implications in teaching reading using GOs and promoting analyzing and generalization skills among English language learners, particularly in an EFL context.

The first implication is the impact on materials used in teaching. The research findings show that using GOs supports senior high school students' CT skills development. Their CT in reading improved, and the students learned to use it in different reading contexts. Therefore, this positive finding should encourage teachers to use GOs in English language classes to develop their learners' CT skills. Teachers and pre-service teachers need to vary their teaching approaches and present their instructions using different tools to promote interest among learners. The second implication relates to the pedagogical aspect whereby teaching reading can be more effective using GOs. It is proven effective because not only did the student's CT scores in reading improve, but they also felt more motivated to learn as they found that the maps assisted them in organizing, analyzing, and generalizing the content. Furthermore, from the interview findings, most of them held a positive attitude toward these instruction sessions. They actively used these new skills in their future reading and hoped to learn more about using GOs and CT skills.

This study has enriched the existing literature on strategies to promote students' CT in an EFL context. Although many researchers have stressed the need to cultivate CT skills in senior high schools' English reading, empirical studies are still very limited, especially in evaluating the efficiency of a specific reading strategy to develop students' CTS, particularly in China. Future researchers are encouraged to look at more CT skills such as inferring, classifying, problem-solving, and other GOs in English reading. Future studies can also be conducted with bigger sample sizes and different data collection methods. In addition, researchers can compare the use of GOs with other approaches to improve students' CT skills, such as group discussion, storytelling, speeches, and cooperative learning.

REFERENCES

- Albakri, I. S. M. A., Ismail, N., Hartono, R., Tahir, M. H. M., Abdullah, M. S. H., Sarudin, A., & Zulkepli, N. (2021). Mentoring practice during practicum: The perspectives of Malaysian pre-service English language teachers. *Studies in English Language and Education*, 8(2), 642-655. <https://doi.org/10.24815/siele.v8i2.19282>
- Arase, A., Kamarudin, N., & Hassan, A. (2016). The development of students' capabilities in Higher Order Thinking Skill (HOTS) through science education. *Jurnal Pemikir Pendidikan*, 7(1), 1-18.
- Bao, X. (2019). Critical thinking and critical reading: A sound pedagogical paring. *International Journal of Continuing Engineering Education and Life Long Learning*, 29(1-2), 129-147. <https://dx.doi.org/10.1504/IJCEELL.2019.099258>
- Boykin, A., Evmenova, A. S., Regan, K., & Mastropieri, M. (2019). The impact of a computer-based graphic organizer with embedded self-regulated learning strategies on the argumentative writing of students in inclusive cross-curricular settings. *Computers and Education*, 137, 78-90. <https://doi.org/10.1016/j.compedu.2019.03.008>
- Brady, K. K., Evmenova, A. S., Regan, K. S., Ainsworth, M. K., & Gafurov, B. S. (2021). Using a technology-based graphic organizer to improve the planning and persuasive paragraph writing by adolescents with disabilities and writing difficulties. *The Journal of Special Education*, 55(4), 222-233. 00224669211008256. <https://doi.org/10.1177/00224669211008256>
- Chandran, V. N., Albakri, I. S. M. A., Shukor, S. S., Ismail, N., Tahir, M. H. M., Mokhtar, M. M., & Zulkepli, N. (2022). Malaysian English language novice teachers' challenges and support during initial years of teaching. *Studies in English Language and Education*, 9(2), 443-461. <https://doi.org/10.24815/siele.v9i2.22974>
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). Routledge.
- Colliot, T., & Jamet, É. (2021). Improving students' learning by providing a graphic organizer after a multimedia document. *British Journal of Educational Technology*, 52(1), 252-265. <https://doi.org/10.1111/bjet.12980>
- Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches*. Sage Publication.

- Creswell, J. W. (2009). Editorial: Mapping the field of mixed methods research. *Journal of Mixed Methods Research*, 3(2), 95-108. <https://doi.org/10.1177/1558689808330883>
- Dong, Z. (2018). *Implementing a task-based approach in Chinese high school oral English teaching* [Master's thesis, University of Wisconsin]. Minds@UW. <http://digital.library.wisc.edu/1793/78568>
- Facione, P. A. (2010). *Critical thinking: What it is and why it counts*. Measured Reasons LLC.
- Fitriani, H., Asy'ari, M., Zubaidah, S., & Mahanal, S. (2019). Exploring the prospective teachers' critical thinking and critical analysis skills. *Jurnal Pendidikan IPA Indonesia*, 8(3), 379-390. <https://doi.org/10.15294/jpii.v8i3.19434>
- Geisinger, K. F. (2016). 21st century skills: What are they and how do we assess them? *Applied Measurement in Education*, 29(4), 245-249. <https://doi.org/10.1080/08957347.2016.1209207>
- Gerbing, D. W., & Anderson, J. C. (1988). An updated paradigm for scale development Incorporating unidimensionality and its assessment. *Journal of Marketing Research*, 25(2), 186-192. <https://doi.org/10.2307/3172650>
- Guastello, E. F., Beasley, T. M., & Sinatra, R. C. (2000). Concept mapping effects on science content comprehension of low-achieving inner-city seventh graders. *Remedial and Special Education*, 21(6), 356-364. <https://doi.org/10.1177/074193250002100605>
- Guo, M. (2013). Developing critical thinking in English class: Culture-based knowledge and skills. *Theory & Practice in Language Studies*, 3(3), 503-507. <https://doi.org/10.4304/tpls.3.3.503-507>
- Hazaymeh, W. A., & Alomery, M. K. (2022). The effectiveness of visual mind mapping strategy for improving English language learners' critical thinking skills and reading ability. *European Journal of Educational Research*, 11(1), 141-150. <https://doi.org/10.12973/eu-jer.11.1.141>
- Heidarifard, M. (2014). The effect of graphic organizers on L2 learners' reading comprehension. *Journal of American Science*, 10(3s), 62-72.
- Huang, Y. (2019). Establishing critical thinking course for high school students in China: A literature review in pedagogy field. *Proceedings of the International Conference on Education*, 5(1), 59-66. <https://doi.org/10.17501/24246700.2019.5107>
- Ismail, N., Albakri, I. S. M. A, Ismail, N., & Hussin, S. (2014). Pre-Service teachers' reflection on the use of self-developed English language teaching materials for ESL students. *The International Journal of Pedagogy and Curriculum*, 20(4), 35-51. <https://doi.org/10.18848/2327-7963/CGP/v20i04/48977>
- Ismail, N., Elias, S., Albakri, I. S. M. A, Muthusamy, I., & Perumal, D. (2010). Exploring ESL students' apprehension level and attitude towards academic writing. *The International Journal of Learning*, 17(6), 475-483. <https://doi.org/10.18848/1447-9494/CGP/v17i06/45609>
- Kirscher, P. A. (2002). Cognitive load theory: Implications of cognitive load theory on the design of learning. *Learning and Instruction*, 12(1), 1-10. [https://doi.org/10.1016/S0959-4752\(01\)00014-7](https://doi.org/10.1016/S0959-4752(01)00014-7)

- Kurniaman, O., & Charlina. (2019). *Pembelajaran membaca dengan graphic organizer di sekolah dasar* [Reading lesson with graphic organizer in elementary school]. Universitas Riau Press.
- Kurniaman, O., & Zufriady, Z. (2019). The effectiveness of teaching materials for graphic organizers in reading in elementary school students. *Journal of Educational Sciences*, 3(1), 48-62.
- Kurniaman, O., Zufriady, Z., Mulyani, E. A., & Simulyasih, N. (2018). Reading comprehension skill using graphic organizer for elementary school students. *Journal of Teaching and Learning in Elementary Education*, 1(2), 75-80. <http://dx.doi.org/10.33578/jtlee.v1i2.5876>
- Moya, N. P. G., & Tobar, M. C. S. (2017). Formative evaluation and formative feedback: An effective practice to promote student learning in higher education. *Revista Publicando*, 4(12(1)), 321-333.
- Nan, C. (2018). Implications of interrelationship among four language skills for high school English teaching. *Journal of Language Teaching and Research*, 9(2), 418-423. <http://dx.doi.org/10.17507/jltr.0902.26>
- Odiri, O. E. (2015). Relationship of study habits with mathematics achievement. *Journal of Education and Practice*, 6(10), 168-170.
- Omar, A., & Albakri, I. S. M. A. (2016). Thinking maps to promote critical thinking through the teaching of literature in the ESL context. *IJELTAL: Indonesian Journal of English Language Teaching and Applied Linguistics*, 1(1), 23-35. <https://doi.org/10.21093/ijeltal.v1i1.6>
- Omar, A., & Kussin, J. (2017). Language learning strategies customary: Learners and teachers' approach and notion. *The Asian Journal of English Language and Pedagogy*, 5, 1-10. <https://doi.org/10.37134/ajelp.vol5.1.2017>
- Pang, Y. (2013). Graphic organizers and other visual strategies to improve young ELLs' reading comprehension. *New England Reading Association Journal*, 48(2), 52-58.
- Prasangani, K. S. N. (2019). L2 learners' expected ideal English as a Second Language (ESL) teacher. *The Asian Journal of English Language and Pedagogy*, 7(2), 10-17. <https://doi.org/10.37134/ajelp.vol7.2.2.2019>
- Praveen, S. D., & Rajan, P. (2013). Using graphic organizers to improve reading comprehension skills for the middle school ESL students. *English language teaching*, 6(2), 155-170. <https://doi.org/10.5539/elt.v6n2p155>
- Salleh, H. R. M., & Halim, H. A. (2019). Promoting HOTS through thinking maps. *International Journal of Education*, 4(26), 104-112.
- Samba, R., Achor, E. E., Bash, A., & Iortim, S. (2020). Fostering students' critical thinking and achievement in basic science using graphic organizer and experiential learning strategies with feedback. *Science Education International*, 31(2), 220-225. <https://doi.org/10.33828/sei.v31.i2.12>
- Santiago, H. C. (2011). Visual mapping to enhance learning and critical thinking skills. *Optometric Education*, 36(3), 125-139.
- Sari, N. K., Drajadi, N. A., & Rochsantiningasih, D. (2019). Promoting students' reading comprehension using graphic organizer: A classroom action research. *International Journal of Language Teaching and Education*, 3(2), 118-129. <https://doi.org/10.22437/ijolte.v3i2.7394>
- Sarudin, A., Redzwan, H. F. M., Albakri, I. S. M. A., & Osman, Z. (2019). Using the cognitive research trust scale to assess the implementation of the elements of

- higher-order thinking skills in Malay language teaching and learning. *International Journal of Recent Technology and Engineering*, 8(2S2), 392-398. <https://doi.org/10.35940/ijrte.b1064.0782s219>
- Tahir, M. H. M., Albakri, I. S. M. A., Adnan, A. H. M., & Karim, R. A. (2020). The effects of explicit vocabulary instructions on secondary ESL students' vocabulary learning. *3L: The Southeast Asian Journal of English Language Studies*, 26(2), 158-172. <https://dx.doi.org/10.17576/3L-2020-2602-12>
- Tahir, M. H. M., Shah, D. S. M., Shaq, M. S. Y., Albakri, I. S. M. A., & Adnan, A. H. M. (2021). Explicit vocabulary instruction: Effects of vocabulary learning on form two ESL learners. *Studies in English Language and Education*, 8(3), 1227-1247. <https://doi.org/10.24815/siele.v8i3.19539>.
- Vacek, J. E. (2009). Using a conceptual approach with concept mapping to promote critical thinking. *Journal of Nursing Education*, 48(1), 45-48. <https://doi.org/10.3928/01484834-20090101-11>
- Widdowson, H. G. (1983). *Learning purpose and language use*. Oxford University Press.
- Yang, Y. T. C., & Wu, W. C. I. (2012). Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study. *Computers & Education*, 59(2), 339-352. <https://doi.org/10.1016/j.compedu.2011.12.012>
- Zaini, S. H., Mokhtar, S. Z., & Nawawi, M. (2010). The effect of graphic organizer on students' learning in school. *Malaysian Journal of Educational Technology*, 10(1), 17-23.
- Zhang, L., & Kim, S. (2018). Critical thinking cultivation in Chinese college English classes. *English Language Teaching*, 11(8), 159-164. <https://doi.org/10.5539/elt.v11n8p159>
- Zhao, C., Pandian, A., & Singh, M. K. M. (2016). Instructional strategies for developing critical thinking in EFL classrooms. *English Language Teaching*, 9(10), 14-21. <http://dx.doi.org/10.5539/elt.v9n10p14>
- Zhou, J., Jiang, Y., & Yao, Y. (2015). The investigation on critical thinking ability in EFL reading class. *English Language Teaching*, 8(1), 83-94. <https://doi.org/10.5539/elt.v8n1p83>