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THE EFFECTS OF INCORPORATING MIND MAPPING WITH PICTURE-BOOK READING INSTRUCTION ON THE READING COMPREHENSION ABILITY OF 1ST GRADE ELEMENTARY SCHOOL STUDENTS

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Abstract. This research applied the rules and steps of Mind Mapping incorporated with picture-book teaching materials to design a picture-book reading instruction program which is suitable for the first-grade elementary students. This research was conducted under the nonequivalent pretest-posttest control group design, sampling from two first grade classes in an elementary school in Taipei City. One class was assigned as the experimental group, and the other was assigned as the control group. The experiment teaching period was 24 periods, 2 periods a week for 12 weeks. The experimental group received the incorporating Mind Mapping with picture-book reading instruction, while the control group received the regular picture-book reading instruction. Before the study was officially conducted, the experimental group learned Mind Mapping skills for one semester. They also received two Mind Mapping classes as review in the beginning of the next semester. The research tools used were “Reading Comprehension Test” by Miss Li-Chi Lee; “Picture-Book Reading Comprehension Test” designed by the researcher, and “Questionnaire on Mind Mapping Instruction Feedback”. The data of this research were analyzed by one-way ANCOVA and percentage frequency. The qualitative data such as students’ worksheets, and teaching introspections were integrated to provide an evidence for research results. The major findings of this research were summarized as follows: 1. Incorporating Mind Mapping with picture-book reading instruction could raise the students’ reading comprehension ability. 2. Students in the experimental group had excellent and positive responses to the incorporating Mind Mapping with picture-book reading instruction.

INTRODUCTION

Combining mind-mapping rules and procedures with picture books, this study designed a set of “mind-mapping and picture-book-reading teaching plans” suitable for first-grade students and analyzed its effectiveness in improving the reading comprehension ability of these students (Huang, 2008).

In recent years, increasingly more teachers have applied graphic organizers as auxiliary tools for teaching. Teachers use the graphic organizers to present visualization and showing knowledge method. They also promote active learning and enable learners to identify known and unknown information (Tang, 2007). Mind mapping is a type of graphic organization that involves using lines, colors, words, numbers, symbols, images, keywords, and hierarchical classifications to present radiant thinking.

Children’ reading ability progresses as their cognitive development. Therefore, compared with 12-year-old children, 8-year-old children are more unfamiliar with the structure of articles, reading targets, and reading comprehension strategies (Myers & Paris, 1978). Chall (1983) distinguished reading stages to “Learning to read” and “Reading to learn.” The physical

characteristics of students in first through third grade must be considered when reading tools are developed for such students. Junior-grade students generally prefer pictures and colors that stimulate their imagination during learning. Therefore, mind mapping, which emphasizes colors, pictures, symbols, and imagination, can be applied as a strategy for developing the reading comprehension ability of junior-grade students (Tong, 2011).

Picture books are composed of pictures and words. Furthermore, the content of most picture books is compiled according to the psychological characteristics, reading comprehension, and linguistic ability of children. Therefore, picture books are crucial in teaching Chinese to junior-grade students (Lin, 2000), (Lin, 2006).

Combining picture books and mind-mapping learning enables students to learn to read through visual graphic organization. Determining whether this combination improves reading comprehension in junior-grade students was the main focus of this study.

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LITERATURE REVIEW

Mind mapping was created and popularized by Tony Buzan in the early 1970s. Buzan considered radiant thinking to be divergent and to fit with the human brain mode of thinking. Radiant thinking involves arranging concepts on paper through illustration and using each concept as a center from which more concepts can be projected. This process can be repeated infinitely and is the core of mind mapping, which can be applied to all aspects of daily life to promote learning and clarify thoughts. The functions of mind mapping, empirical studies related to mind mapping as well as reading comprehension, and educational value of picture books are discussed as follows.

Functions of Mind Mapping

Mind mapping systematizes concepts through vertical and lateral thinking. Each line that is added to keywords stimulates thinking and emotions. Illustrating key points enhances students' ability to retain content (Sun, 2014). The main functions of mind mapping are as follows (Sun, 2002):

Analysis

Mind mapping can be used to divide complex and unclear concepts into parts, thus simplifying analysis and enhancing learning.

Memory

Mind mapping may entail using the long-term memory of the right cerebral hemisphere as well as the induction and reorganization capability of the left cerebral hemisphere. Similar to information stored in the memory of a computer, information memorized through mind mapping can be recalled easily.

Creativity

Mind mapping allows for unlimited creativity in problem-solving because it involves using the right cerebral hemisphere, which controls color and graphical perception as well as imagination, and the left hemisphere, which controls quantization and logic.

Communication

Because mind mapping entails applying all mental skills, the rationality of the left cerebral hemisphere and perception of the right cerebral hemisphere can be developed in balance through mind mapping. It is conducive to interpersonal communication.

The purpose of using mind mapping in reading comprehension is to assist readers in organizing crucial information and combining related concepts with knowledge representation. Through strategies such as key words, main branches and sub-branches, symbols, colors, and pictures, converting concepts into images build readers' knowledge and motivate readers to learn. Mind-mapping notes can be constructed using scripts or graphics. Phraseology and logical thinking need not be emphasized for mind mapping. Hence, mind mapping may be more effective for

junior-grade students if they are not required to write during mind mapping and their preferred images are used during the mind-mapping process.

Empirical Studies on Mind Mapping in Reading Comprehension

After reading the article, reader's thinking was produced through graphics. In other words, understanding content through graphics and systematically connecting content is beneficial to reader comprehension (Duke & Pearson, 2002). Dhindsa, Makarimi-Kasimc and Anderson (2011) recruited six classes (ages 13 to 15) to compare the efficacy of Constructivist-Visual Mind Map Teaching Approach (CMA) and traditional teaching approach (TTA). The results demonstrated that students who received CMA had wider cognition structures as well as more organizational themes and productive thoughts which were associated with one another. Therefore, we suggest that teachers use CMA. In cognitive structures, CMA has more advantages than those of traditional outline methods. In Wang (2008), mind-mapping instruction was effective for second-grade students regarding Chinese reading comprehension. According the interviews, the participants showed positive attitudes toward mind mapping. These findings support those of Huang, Liang and Chiu (2013). Diamond and Lee (2011) used 24 first-grade students as participants to evaluate mind mapping. The findings illustrated that mind mapping promoted spontaneous learning in these students, and the students' learning progressed substantially. However, in Cheng's (2008) study on mind mapping in second-grade students, the learning of the experimental group was not significantly superior to that of the control group. Huang (2009) reached conclusions similar to those of Cheng (2008) on mind mapping in first-grade students. Moreover, Lu (2014) researched third-grade students and showed that mind-mapping instruction resulted in no significant variation in the learning of the experimental and control groups. However, the participants in the experimental group preferred mind mapping over traditional instruction (Chen, 2007).

Relationship between Picture Books and Reading Comprehension

Picture books are teaching media commonly used in elementary school teaching. Additionally, picture books are crucial to children's development. They not only stimulate children's imagination but also promote cognition, values, living attitudes, aesthetic feeling development (Su, 1987; Liang, 1990). Some researchers have proposed that picture books are advantageous for teaching children because they are easy to read, include many writing styles, have extensive themes, and contain visual art (Henry & Simpson, 2001; Huang, 2006; Liang, 1990). Picture books can encourage children to improve their Chinese. Power and Hubbard (1996) asserted that when adults read books to children, children not only hear the adults' voices but also

internalize the language structure and stories of books. Listening to adults read high-quality literature may encourage children to imitate appropriate language use and create their own stories (Gambrell, Morrow, Neuman & Pressley, 1999).

Many studies have shown that picture-book instruction can increase reading comprehension ability. Chiu and Chan (2009) found that picture-book instruction instantly enhanced the learning of children with learning disabilities based on a test of reading comprehension, and the effects were maintained at a follow-up. Huang et al. (2013) applied picture-book instruction to explore the effectiveness of promoting language ability in students with learning disabilities. The results demonstrated that the students progressed in oral fluency and reading ability after the intervention. Additionally, regarding student motivation and attitudes toward reading, studies (Chen, 2005; Huang, 2006) have

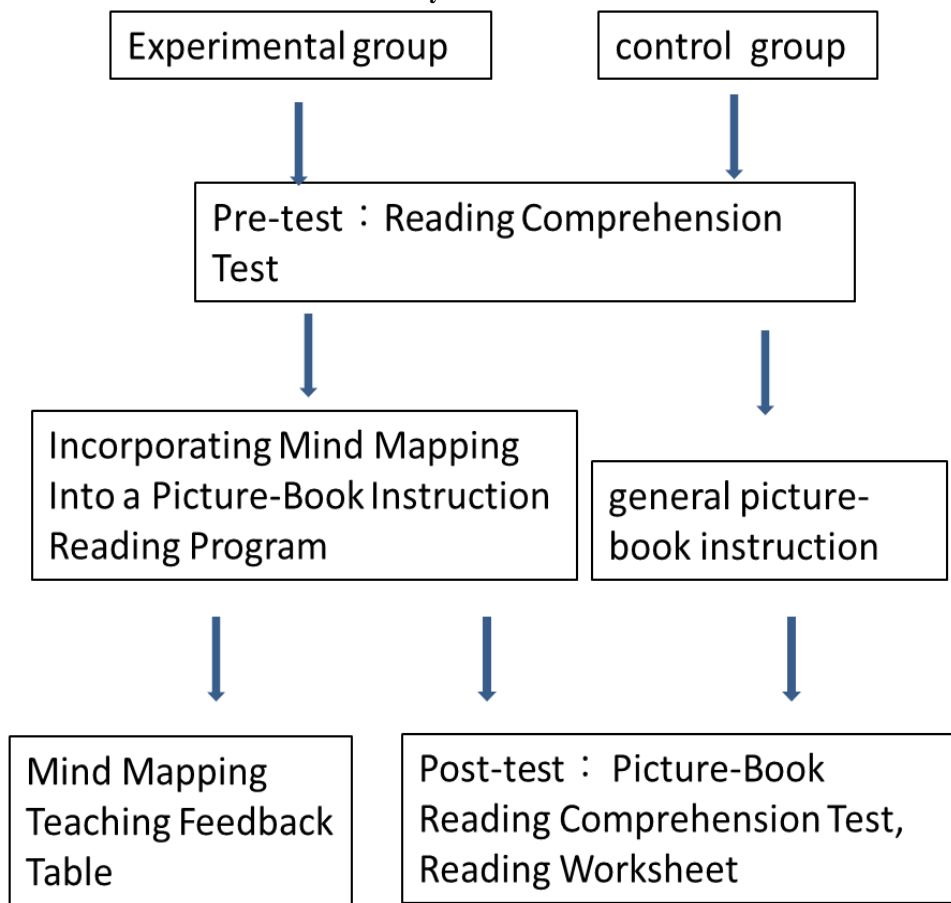
shown that picture-book instruction positively influences student reading attitudes.

RESEARCH MODEL

Study Framework

In this study, mind mapping was incorporated with picture-book teaching materials to design a picture-book reading instruction program that was suitable for first-grade students. Before taking the teaching test, two groups of students took the reading comprehension test prepared by Lee (2007) as a pretest to confirm the reading comprehension of the two objects. During the teaching experiment, after the picture-book unit was completed, two groups of students took the “Picture Book Reading Comprehension Test” which was self-compiled based on the six picture books used in the experiment. The framework of this study is shown in figure1:

FIGURE 1
Study Framework



Study Design

For the school administration and actual teaching situation, this study used a quasi-experiment and was conducted according to a nonequivalent pre-test–post-test control group design, sampling

two first-grade classes at an elementary school in Taipei City. One class was the experimental group, and the other was the control group. The experimental group had 21 students, and mind mapping with picture-book instruction was used in this group for

24 hours over 12 weeks. The control group had 22 students, and general picture-book instruction was also used in this class for 24 hours over 12 weeks.

Participants

The participants were first-grade students at a public elementary school in Taipei. The score distribution in Raven's Progressive Matrices were similar between the experimental and control groups; the average scores were 27.66 and 27.76, respectively. The class ratio of boys to girls, parents' socioeconomic status, and standard of living were substantially the same as the school curriculum. The two classes had college graduate tutors; the male and female teachers in both classes had 9 years of teaching experience; the students in both classes had positive attitudes; and the two classes had similar atmospheres.

Picture Books

In 2009, this study selected the "Little Freshman Reading Program Started Walking" and high-quality school-age children's books as reading materials. For this study, three teachers who had language teaching expertise were invited to teach the first-grade students. The standards of choosing books were based on the seven principles of book selection: physical and mental development of children, interests and needs, winner, instructiveness, predictability, layout, content, and whether illustrations are creative and appropriate. Six books were selected for this study: *The Best Christmas Ever*, *Pumpkin Soup*, *Antony grandfather persimmon tree*, *Swallow Seeds*, *Mottainai Grandma*, and *The Great Love between a Crocodile and a Giraffe*. The experimental and control groups used the same books.

Study Tools

The tools of this study were the Incorporating Mind Mapping Into a Picture-Book Instruction Reading Program, a reading comprehension test, a picture-book reading comprehension test, a reading worksheet, a teaching reflection, and a mind-mapping teaching feedback table, which are explained as follows:

Incorporating Mind Mapping Into a Picture-Book Instruction Reading Program Content

The researchers designed the Incorporating Mind Mapping Into a Picture-Book Instruction Reading Program according to the first-year students' language skills and learning levels. The program incorporated the suggestions of mind-mapping teachers, mind-mapping experts, and teachers who had 14 years of experience in teaching the lower grades.

The instructional design can be divided into preparatory activities, developmental activities, and integrated activities:

Preparatory Activities

The topics were related to picture books, and mind mapping was used to motivate students.

Development Activities

After reading picture books, the students and teacher discussed how to build a mind map, including central images and main branches.

Integrated Activities

After building a mind map, students could share ideas with one another.

For example, the book *The Great Love between a Crocodile and a Giraffe* focused on a giraffe and alligator that fall in love and want to live in the same house. However, their difference in size made finding a house that suited both of them difficult. How did they overcome their problems and create happiness for each other? This story uses the giraffe and alligator as metaphors for men and women, and the story is analogous to the relationship between men and women.

In our study, the teacher first invited the experimental group to consider the differences between men and women and recorded student's ideas as a preparatory activity. Every participant wrote three to five ideas, using one card per idea. Team members then classified all the ideas regarding the differences between men and women. According to the results of classification, the members worked together to build the mind map.

Second, the experimental group and their teacher read picture books together. After reading, the experimental group and their teacher built a mind map. Because picture books are not as clear as textbooks, the teacher helped the students understand and discuss the material in the picture books.

The integrated activities were performed last. After the mind-mapping discussion, the teacher gave the reading worksheet to students on which to record their ideas. On the reading worksheet, the central image and some branches were empty, allowing the students to write down key words. The students were then invited to draw pictures of their most crucial ideas to help others to read the mind map clearly and understand the key points. Based on the central image and pictures, each student's mind map was unique.

As shown in Figure 2 (Figure 3 translated), after reading the picture books, the students understood their most crucial differences. The central image represents this by depicting a height difference. The four main branches of the central image illustrate the structure of the story from when the characters first fell in love. These characters had problems but resolved them. With the teacher's instruction, students may choose the key words in picture books filled to the correct position, which shows that the text can be clearly classified to enhance students' understanding. Finally, at the second stage, the students drew a small alligator house and large giraffe house to represent the problem faced by the characters in the story. This mind map showed that the students could fully understand the story.

FIGURE 2
Student Outstanding Works

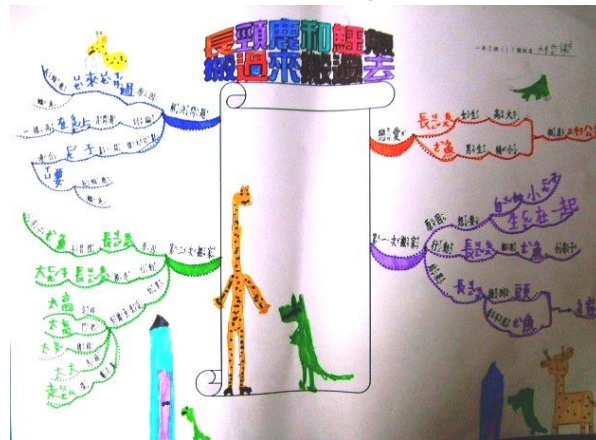
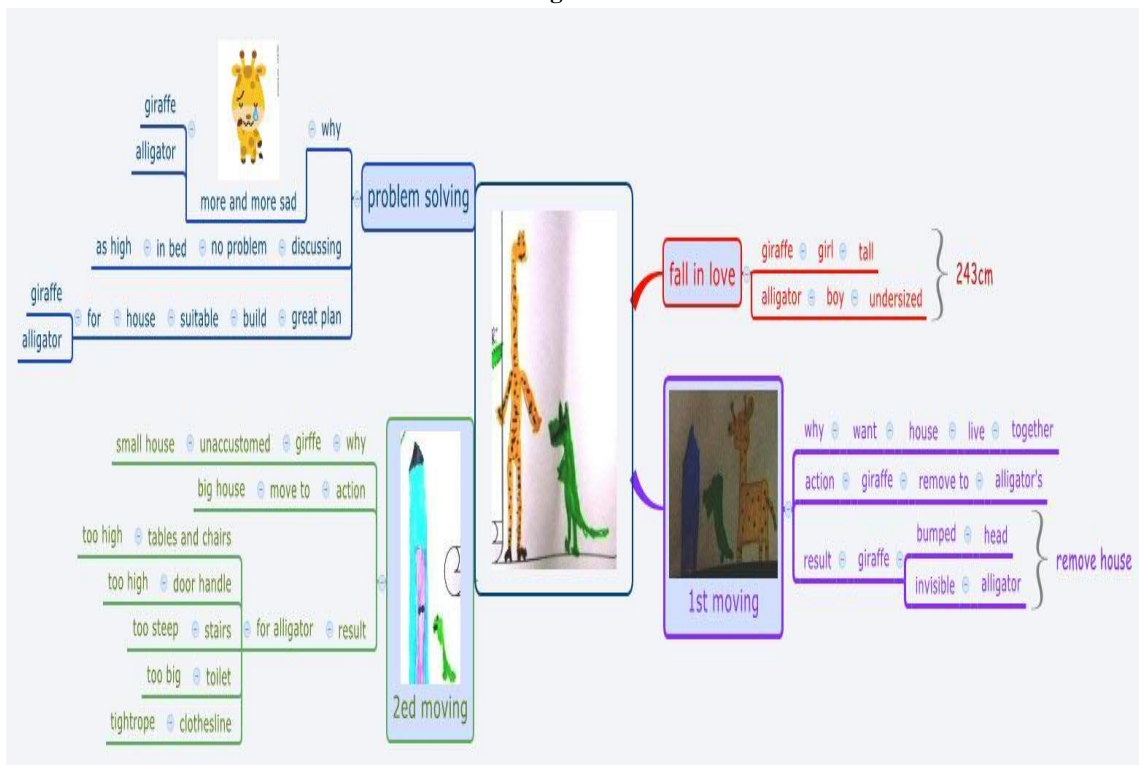


FIGURE 3
Student Outstanding Works Translated



Reading Comprehension Test

The reading comprehension test used in our study was authorized by Lee (2002), and it is suitable for junior-grade students to explore whether students understand the explicit and implicit content of a story.

Picture-Book Reading Comprehension Test

Our research was based on the reading comprehension models of “literal comprehension,” “inferential comprehension–integration,” and “inferential comprehension–summarization”.

Reading Worksheet

After the experimental and control group were instructed, the reading worksheet was completed by the students for assessing changes in their reading comprehension ability.

Teaching Reflection

The researcher recorded the teaching process, including such aspects as teaching reflection, teaching experience, the difficulties encountered in teaching mind mapping, instructional findings, and student feedback, which can be used to revise the

Incorporating Mind Mapping Into a Picture-Book Instruction Reading Program in the future. The teacher collected all the records as a reference.

Mind Mapping Teaching Feedback Table

The purpose of the mind-mapping teaching feedback table was to understand the experimental group's perceptions of mind

mapping as a basis for improving the teaching program in the future.

DATA ANALYSIS AND DISCUSSION

Reading Comprehension Test

Information regarding the reading comprehension pretest was as follows:

TABLE 1
Descriptive Statistics Result about Reading Comprehension Pre-Test

Test	Experimental group (n=21)		Control group (n=22)	
	M	SD	M	SD
Reading Comprehension Test	8.57	3.38	8.55	3.14

The reading comprehension ability of the two groups was the same based on the pretest.

TABLE 2
Homogeneity of Variance of Two Groups

Picture Book	SS	df	MS	F	p
The Best Christmas Ever	.007	1	.007	.003	.96
	101.08	39	2.59		
Swallow Seeds	.72	1	.72	.47	.50
	59.81	39	1.53		
MOTTAINAI GRANDMA	3.32	1	3.32	3.12	.09
	40.49	39	1.07		
The Great Love between a Crocodile And a Giraffe	1.81	1	1.81	1.10	.30
	60.67	38	1.64		
Antony grandfather persimmon tree	.30	1	.30	.18	.68
	61.23	37	1.66		
PUMPKIN SOUP	1.98	1	1.98	1.25	.27
	60.01	38	1.58		

Table 2 shows that the experimental and control groups in the regression coefficient homogeneity test subtests, less than significant, indicating no interaction before the two tests, which is

consistent with the group homogeneity of variance assumption. Therefore, we proceeded to ANCOVA.

TABLE 3
Descriptive Statistics Result about Reading Comprehension POST Test

Test	Experimental group (n=21)		Control group (n=22)	
	M	SD	M	SD
The Best Christmas Ever	4.95	1.08	3.36	1.53
Swallow Seeds	4.71	1.59	3.77	1.45
MOTTAINAI GRANDMA	6.10	1.12	4.82	1.26
The Great Love between a Crocodile And a Giraffe	5.58	1.39	3.95	1.50
Antony grandfather persimmon tree	5.65	1.50	4.71	1.83
PUMPKIN SOUP	5.76	.94	3.95	1.53

TABLE 4
Analysis of Variance ANOVA

Picture Book		SS	df	MS	F	p
The Best Christmas Ever	between	26.97	1	26.97	10.67**	.002
	within	101.09	40	2.53		
	total	878.00	43			
Swallow Seeds	between	9.38	1	9.38	6.20*	.017
	within	60.53	40	1.51		
	total	874.00	43	1.53		
MOTTAINAI GRANDMA	between	17.19	1	17.19	15.31***	.000
	within	43.81	39	1.12		
	total	1312.00	42			
The Great Love between a Crocodile And a Giraffe	between	25.93	1	25.93	15.77***	.000
	within	62.48	38	1.64		
	total	1017.00	41			
Antony grandfather persimmon tree	between	9.02	1	9.02	5.57*	.024
	within	61.53	38	1.62		
	total	1199.00	41			
PUMPKIN SOUP	between	34.67	1	34.67	21.81***	.000
	within	61.99	39	1.59		
	total	1090.00	42			

Tables 3 and 4 show that the experimental group scored significantly higher on the tests, demonstrating that the Incorporating Mind Mapping Into a Picture-Book Instruction Reading Program can effectively improve the reading comprehension skills of first-grade students. This finding was consistent with that of Chuang (2008), who observed that mind mapping combined with summary teaching improved organizational skills in fourth-grade students. Furthermore, Huang et al. (2013) found that, after receiving mind-mapping teaching, children taking "reading comprehension difficulties screening tests" scored higher on posttests than on pretests.

Teaching Reflection

The generalized findings from using the Incorporating Mind Mapping into Picture-Book Instruction Reading Program were recorded in the teaching journal and are as follows:

- Identifying mind-mapping keywords was difficult.
- Because junior-grade students are weak in deductive reasoning, inductive reasoning, and analogical reasoning in low grade students, identifying mind-mapping keywords was difficult.
- The teaching process was overly time-consuming.
- The disadvantage of building mind maps was the extensive time required to construct them. Possible reasons for

students' not yet proficient in mind-mapping policy, particularly in the more biased logical thinking.

CONCLUSION

The purpose of this study was to explore the effects of mind mapping with picture-book reading on first-grade students' reading comprehension ability. The results of this study can be used as a reference for future educators.

According to the "reading comprehension test" and "picture-book reading comprehension test" results in this study, mind mapping with picture-book reading enhanced the first-grader's reading comprehension ability.

- On the picture-book reading comprehension test, the experimental group, who favored mind mapping with picture-book reading over traditional teaching methods, showed superior reading comprehension to that of the control group.
- Students in the experimental group had positive views toward teaching through mind mapping with picture-book reading.

- Based on the feedback of the experimental group after the experimental teaching, most students had positive attitudes toward teaching through mind mapping with picture-book reading. Furthermore, they believed that mind mapping enabled them to comprehend stories more effectively and improve their critical thinking skills. They hoped that mind mapping would be applied regularly in the future.

Based on the teacher's reflection, for junior-grade students, mind mapping improved student reading comprehension ability and the motivation to learn as well as team learning and students' appreciation for one another's work. Mind mapping can assist students in identifying keywords and comprehending text but is time-consuming.

Mind mapping teaching strategies can improve student reading comprehension and cause them to think progressively, if mind mapping is performed effectively by teachers. Mind mapping, which combines images and keywords, uses small amounts of text and illustrations to reduce students' reading load. Therefore, mind mapping increases reading comprehension ability and the motivation to learn.

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