國小新住民學生採交互教學法閱讀策略提升數學文字題解題能力[1]

Using Reciprocal Teaching as a Meta-Cognitive Reading Strategy to Enhance Solving Abilities on Math-Word Problems for Newly Immigrant Students [1]

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本研究旨在探討藉由實施交互教學法閱讀策略，瞭解其對國小新住民學童數學文字題解題能力之效果。研究方法為準實驗教學實驗；研究對象為台灣中部某一所偏遠小學 44 位四年級學生，其中 16 位為新住民學童；研究小組成員之一曾擔任該校教師。本研究採取自編「閱讀理解測驗」及「步驟四則運算數學文字題測驗」為工具；受試學生分成二組，一組進行交互教學法閱讀教學、一組則進行傳統講述法教學；經由四個月的教學後進行閱讀測驗和數學加減乘除文字題後測；量化資料藉由 ANOVA 統計進行分析；另外藉由質性訪談探討增進新住民學童數學文字題解題能力之可能策略。本研究獲致下列結論：1. 交互教學法閱讀策有助於新住民學童提升閱讀能力及學習興趣；2. 運用交互教學法閱讀策略指導新住民四年級學生閱讀文本，並未能顯著提升其數學文字解題能力；3. 新住民學生在數學文字題上最大的困難為「問題轉譯」或推理式的理解與重新表述的能力。

關鍵詞：閱讀策略、交互教學法、新住民子女、數學文字題解題

The purpose of this study is to investigate whether using a reciprocal teaching as a meta-cognitive reading strategy could promote the reading comprehension and mathematical abilities of the fourth-grade newly immigrant students. A total of 44 subjects participated in this study. Among them, 16 newly immigrant students were chosen as the experimental group. The experiment group was administered with reciprocal teaching, while the control group was instructed with traditional lecturing. This teaching experiment lasted four months. The MCRS curriculum was arranged for a 16-week track with a 40-minute teaching per week design. Both groups were tested upon their reading comprehension ability and math-word problems' solving ability before and after the experiment. Two self-administered instruments titled "Reading Comprehension Test" and "Two-step Arithmetic Word Problems Math Test" was used for gathering the research data. The ANOVA method was used for the quantitative data analysis. Qualitative data including observation records and personal interviews were collected as cross validation for study results. The results of this study are as follows: After using a reciprocal teaching as a meta-cognitive reading strategy, (1) newly immigrant students in the experimental group significantly improved their achievements in reading; however, this teaching strategy did not improve their performance on math word problems; (2) students of different backgrounds improved their reading achievement; however, this teaching strategy did not significantly improve the newly immigrant students' performance on math word problems. (3) The study results suggest the major difficulty that the fourth-grade newly immigrant students encountered on math-word problems is inferential comprehension and representation.

Keywords: reading strategy, reciprocal teaching, newly immigrant student, math word problem

I.Introduction

Mathematics is an asset that is crucial to humankind. It is necessary for science, technology, and ideological development. Polya (1945) suggested that humans solve various problems by using mathematical concepts; math has become basic knowledge necessary for the workplace and in personal life. Hence, each country has included math in its national education, demonstrating the importance of math to civic literacy.

We first learn to read and then learn through reading, suggesting that reading is the foundation of learning. Reading can be very helpful for learning, and it is an indispensable ability for lifelong learning.

Nowadays, Taiwanese society is experiencing rapid demographic changes. In response to current social demands, the Taiwanese government has processed many international marriages, especially those of Southeastern Asian countries. According to statistical data from the Taiwanese Ministry of Education (2017), the number of newly

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immigrant students has increased rapidly; from 60,000 in 2005, 149,000 in 2010, 134,000 in 2015, to 120,000 in 2016. So far, newly immigrant students have accounted for about six percent of all elementary and junior high school students. Therefore, the learning and adaptation problems of newly immigrant students cannot be overlooked.

Newly immigrant students' mothers often experience difficulties in adapting themselves to their new lives because they come from different countries and cultures. Furthermore, newly immigrant students have developed limited abilities in (Mandarin Chinese) verbal communication since a young age, due to the influence from their mothers of different backgrounds. Numerous studies have indicated that these mothers profoundly influence their children in learning Chinese language and in reading. The low reading ability of students will hinder their learning in all other subjects. There have been several studies on the use of reading strategies to promote the reading and math abilities of students in general. However, among these studies, only a few use new residents as their research subjects. This study is conducted by a research group, in which two elementary school teachers are included. The researchers aim to generalize the learning characteristics of newly immigrant students by taking advantage of the teaching experiences at their school. Moreover, the researchers investigate whether reading strategies can effectively promote the reading ability of newly immigrant students, and their ability to solve math problems. They hope to offer useful and valuable contributions to the future education of newly immigrant students.

II. Literature Review

2.1 Reading Process and Reciprocal Teaching

Goodman (1967) suggested that reading is the process of a psycholinguistic guessing game. In this process, a reader proactively uses his/her background knowledge and experience to draw inferences from a text and construct meaning.

Gagné et al. (1985) further divided the reading process into four stages: decoding, literal comprehension, inferential comprehension, and comprehension monitoring. Decoding includes two processes: matching and recoding. In the matching process, written words are linked with words stored in memory. In the recoding process, written words are transformed into sounds and meanings. Literal comprehension includes the process of lexical access. For example, when seeing the word "bank," we determine whether it means a financial institution or the area bordering a river from the context of the passage being read. Inferential comprehension refers to the integration of existing information with contextual information. At this stage, any information not specifically mentioned in the text is integrated. Comprehension monitoring indicates setting reading goals, checking goals, and using strategies. This study examines the reading ability of newly immigrant students using Gagné's four stages of the reading process, as his theory is complete. Because of the differences between the Chinese and English languages, and decoding should be taught at an early age, when reading skills are being developed (Clement, 2008). It suggested that decoding

is a less important process for math word problem-solving for the fourth graders. Therefore, in this study, we only adopted the latter three stages, omitting the first stage, decoding for the experiment.

Palincsar and Brown (1984) proposed reciprocal teaching based on Vygotsky's theory of the zone of proximal development. Reciprocal teaching is an activity in which teachers instruct students through dialogue. When students can perform the dialogue, the responsibility is relinquished to them. Reciprocal teaching comprises four strategies: predicting, questioning, summarizing, and clarifying. During the teaching process, a dialogue between teachers and students and thinking aloud are emphasized. Teachers gradually transfer the responsibility for learning to students, to develop their reading monitoring strategies; namely, their metacognitive ability. Several studies have argued that reciprocal teaching can promote student reading ability (Spörer, et al., 2009; Webb, Franke, Ing, Turrou, & Zimmerman, 2017).

2.2 Math Word Problems and the Ability to Solve them

Math word problems involve using words to describe the relationship between concepts and numbers. When solving math word problems, students not only need to be familiar with calculation processes and techniques, but they also need to comprehend the meaning of the text used in math word problems. Thus, students can understand what a problem asks for and solve the problem by using prerequisites provide by the text.

The subjects in this study included fourth-grade newly immigrant students. In response to the cognition of fourth graders toward math word problems, the researchers adopted math word problems required for use in arithmetic operations, including addition, subtraction, multiplication, and division. This study referred to the manner in which Marshall et al. (1987) classified math word problems using four arithmetical operations: A-B-C, A+B-C, A+B+C, (A+B)×C, A-B×C, A×B-C, (A+B)÷C, (A-B)÷C, (A÷B)+C, A÷B÷C, A×B÷C, and A×B×C. The researchers created a test based on the classification of Marshall et al., with four additional types of operations, including: A-B+C, A×B+C, A-(B÷C), and (A÷B)-C.

The ability to solve math problems means that the students are able to answer the math questions successfully. Polya, a well-known American mathematician, suggested in his 1945 book "How to Solve It" that the problem-solving process be structured into four stages: understanding the problem, devising a plan, carrying out the plan, and reviewing it. Polya's problem-solving process has become a crucial research basis for later researchers. Other scholars such as Schoenfeld (1985), Garofalo and Lester (1985), and Krulik and Rudnyick (1989) developed a five- or six-stage problem-solving process based on Polya's four-stage process. From the view of cognitive psychology, Mayer (1992) divided the problem solving process into two main phases: problem representation (problem translation and integration) and problem solution (solution planning, monitoring, and execution). Because Mayer's process of solving math problems consists of four stages based on Polya's model, and takes specific math word problems as examples, thereby allowing teachers to conduct analyses, the process is often used as a research model

for empirical research. Hence, this study aims to investigate the learning difficulties of newly immigrant students in math by adopting Mayer's problem-solving process, and by administering a math test created by the researchers, which consists of 16 types of math word problems.

2.3 Relevant Research on Newly Immigrants to Taiwan

Most newly immigrant students' mothers in Taiwan come from Southeast Asian countries such as Indonesia and Vietnam. These mothers often experience difficulties in adapting themselves to a new life and language, because their languages and social cultures are different from those of Taiwan. Taiwanese researchers (Huang & Chen, 2014; Huang, 2007; Kuo, 2014; Lai, 2006) indicated that newly immigrant students are influenced by their mothers in language development, such as in their verbal development, developmental delays in language, reading difficulties, learning disabilities, and low grades in language courses.

Because math word problems include texts, learners need to read and understand texts before solving the problems. Numerous studies have noted that a high correlation presents between reading and math; reading performance can even be used to predict math performance. Furthermore, several studies indicated that a significant difference exists between newly immigrant students and regular students in comprehending the meaning of texts in math word problems (Temur, Kargın, Bayar, & Bayar, 2010; Moore, 1993; Zheng, 2007). This study attempts to promote students' metacognitive ability using reading strategies via reciprocal teaching. Moreover, it aims to investigate whether students improve their comprehension and problem-solving abilities in math after their reading ability has been enhanced.

2.4 Organization

This study first reviewed literature related to reading strategies. Moreover, it adopted the reading strategies of reciprocal teaching, including predicting, questioning, summarizing, and clarifying, to investigate Gagné's four stages of the reading process. In response to the cognitive development of fourth graders, the researchers divided math word problems using four arithmetical operations into 16 types, based on math operator symbols. Lastly, it analyzed the mathematics ability of newly immigrant students using Mayer's process of solving math problems, which is a process commonly used in empirical research.

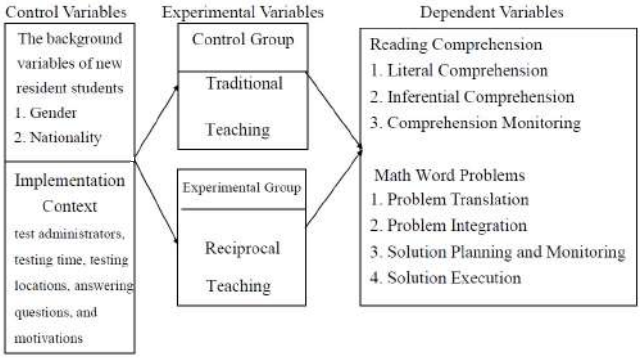
III. Data Collection and Research Procedures

3.1 Research Method and Framework

A quasi-experimental design was implemented in this study. The researchers are the instructors in this experimental instruction. Thus, purposive sampling was used to select two fourth-grade classes of an elementary school in central Taiwan to implement experimental instruction.

This study implemented instructions for reading strategy through reciprocal teaching, using the sample questions released by the Progress in International Reading Literacy

Study (PIRLS) in 2006. The instructions were implemented to promote the meta-cognitive ability of fourth-grade newly immigrant students, and to further examine whether the instructions have improved their reading comprehension ability and their ability to solve math problems. To achieve the research objectives, this study established a theoretical foundation through a literature review, created tests, and implemented experimental instruction. Furthermore, it analyzed the research results using appropriate statistical methods supplemented with qualitative interviews to draw conclusions and suggestions. The research framework of this study is listed as Figure 1:



↑ Figure 1. The research framework for this study

3.2 Research Subjects

The subjects of this study consisted of two fourth-grade classes of an elementary school in central Taiwan. One class was the experimental group; the other was the control group. A total of 44 subjects participated in this study. Among them, 16 newly immigrant students were chosen as the experimental group. There were 22 students in each class, among which 8 students were new residents.

3.3 Research Design and Method

The MCRS (Meta-Cognitive Reading Strategy) experimental group is administered with meta-cognitive reading strategy, while the control group is instructed with traditional lecturing. This teaching experiment lasted four months. The MCRS curriculum was arranged for a 16-week track with a 40-minute teaching per week design. Both groups were tested upon their reading comprehension ability and math-word problems' solving ability before and after the experiment.

The research tools included a reading comprehension test, a two-step test consisting of math word problems using four arithmetical operations, and semi-structured in-depth interviews. The test consisting of math word problems was developed based on Taiwanese curriculum guidelines. These math word problems were categorized into four levels according to Mayer's problem-solving process. This math test contained 16 different types of word problems based on operator symbols. Each type of problem was composed of five subordinate questions.

Since we need to fulfill the curriculum progress of a 4th graders' teaching, the reading comprehension test was also developed based on the Taiwanese curriculum guidelines. It contained a total of 36 questions divided into three sections: literal comprehension, inferential comprehension, and comprehension monitoring. And, during the instruction experiment, we chose the PIRLS sample questions. These two curricula meaning were confirmed as correlated and matching to each other by the experts during instrument validity examination.

The above reading and math tests and interview questions were examined by three experts with abundant experience in studying newly immigrant students and in

teaching elementary reading and math. This was done to establish expert validity and to make revisions. Moreover, before formal tests were administered, pretests were given to eight fourth graders to analyze item difficulty and discrimination, to revise and remove questions of too high or low difficulty or discrimination. The item difficulty of the reading and math tests were 0.75 and 0.61, respectively. The item discrimination of both tests was above 0.3. The internal consistency reliability of the reading and math tests were 0.89 and 0.90, respectively, meaning that they both had high reliability.

An interview outline was made in four sections. A face-to-face interview with newly immigrant students with poor performance in reading and math primarily focused on solving math word problems. The content of the interview contained three sections regarding difficulties in reading, difficulties in solving math word problems, and teaching methods. After the interview, the researchers conducted a comprehensive analysis of the results by discussing them with teachers/ educators specialized in primary school math instruction, serving as verification through triangulation. Consolidated data was used to compare to relevant literature to increase the reliability and validity of this study.

After pretests were given to both classes, the experimental group received a 16-week track with a 40-minute reciprocal teaching. This teaching was done with the researchers serving as the instructors, and continued for 4 months (16 weeks). Meanwhile, the control group received traditional didactic instruction for 16 weeks. Posttests were given to both groups after the completion of the instructions to conduct statistical analyses. Finally, the researchers had face-to-face interviews with newly immigrant students to gain a better understanding of their difficulties in solving math word problems, and to compare the results with quantitative data.

IV. Results

4.1 Analysis of the Effectiveness of Reading Strategies Taught Through Reciprocal Teaching on Promoting Student Reading Comprehension

Statistical data of the pre- and post-tests of reading comprehension created by the researchers showed that after being given experimental treatment, the experimental group scored higher on the post-test (Mean = 41.55; Standard Deviation = 10.53) than on the pre-test (Mean = 34.18; Standard Deviation = 9.97). The control group also had higher scores on the post-test (Mean = 35.91; Standard Deviation = 14.77) than on the pre-test (Mean = 33.73; Standard Deviation = 15.08). The difference between the pre- and post-test scores was larger for the experimental group than for the control group.

A paired-sample t-test was conducted to analyze the differences in reading scores between the pre- and post-tests for both the experimental and control groups. The test result showed that the difference between the means was negative, suggesting that post-test scores were higher than pre-test scores for both groups. Both the experimental ($t = -4.31$; $p < .001$) and control ($t = -4.45$; $p < .001$) groups reached a significant level. This result indicated that both groups demonstrated significant improvements from the pre- to post-tests due to teaching.

A one-way ANOVA was conducted to

analyze the pre- and post-test scores of both the experimental and control groups to investigate whether a significant difference occurred between reciprocal and didactic teaching in terms of promoting student learning effectiveness. The researchers conducted a test of homogeneity of the regression coefficients for the post-tests of both groups. As can be seen in Table 4.3, the analysis result produced an F value of 3.87 and a p-value of .056, showing that the regression did not reach a significant level. This result showed that the slope of the regression line of both groups could be treated as identical. This implied that the correlation between the pre- and post-test scores remained the same under each level of independent variables. This corresponds with the hypothesis of homogeneity among covariant regression coefficients, which permitted the researchers to continue with an analysis of covariance (or ANCOVA).

A one-way ANCOVA of the reading comprehension test was conducted for the experimental and control groups. After excluding the influence of the mean of the pre-test on that of the post-test, the analysis result produced an F value for the post-test of 8.90 and p-value of < .05, reaching a level of significance. Through a post hoc comparison, the researchers discovered that reciprocal teaching was better than didactic teaching (M1 = 41.34 > M2 = 36.11). This result showed that there was a significant difference between these two methods in terms of teaching effectiveness. A significant difference existed between the experimental and control groups in learning effectiveness due to the different methods used for teaching reading strategies.

4.2 Analysis of the Effectiveness of Reading Strategies Taught Through Reciprocal Teaching on Promoting Student Performance on Math Word Problems

A paired-sample t-test was conducted to analyze the differences in math scores between the pre- and post-tests for both the experimental and control groups, to compare their learning effectiveness. The test results showed that the difference between means was negative, suggesting that the post-test scores were higher than the pre-test scores for both groups. The experimental group (t = -2.26; p < .05) reached a significant level, while the control group (t = -1.24; p >.05) did not. This result indicated that the experimental group demonstrated significant improvements in the post-test over the pre-test due to reciprocal teaching.

↓Table 1.
Paired-sample t-test of the math ability of the experimental and control groups

		Mean	Standard Deviation	*t-value*
Experimental Group	Math Pretest Math Posttest	-6.05	12.55	-2.26*
Control Group	Math Pretest Math Posttest	-2.14	8.11	-1.24

*$p < .05$

After excluding the difference between the experimental and control groups, the test result showed that reciprocal teaching significantly promoted students' reading comprehension ability. The experimental manipulations of reciprocal teaching also significantly enhanced students' ability to solve math word problems.

4.3 Correlation between Student Reading Ability and Ability to Solve Math Word Problems

There was a significant correlation between reading and math scores for both

new resident and regular students. A positive correlation existed between the post-test scores of the reading comprehension test and those of the math test. In other words, students who attained high scores in reading also scored highly in math, and vice versa.

↓Table 2.
Analysis of the correlations of the pre- and post-test scores between math and reading

		Reading Pretest	Reading Posttest	Math Pretest	Math Posttest
New Resident Students	Reading Pretest	1	.84**	.48	.34
	Reading Posttest	.84**	1	.76**	.67**
	Math Pretest	.48	.76**	1	.95**
	Math Posttest	.34	.67**	.95**	1
Regular Students	Reading Pretest	1	.95**	.64**	.50**
	Reading Posttest	.95**	1	.59**	.45*
	Math Pretest	.64**	.59**	1	.84**
	Math Posttest	.50**	.45*	.87**	1

** Correlation is significant at the 0.01 level (two-tailed).
* Correlation is significant at the 0.05 level (two-tailed).

To gain a better understanding of the correlation between the attributes of reading and those of math, the researchers compared the pre-test scores of new residents with each dimension of reading and math. The results showed that the dimensions of literal and inferential comprehension were highly correlated with all attributes of math. The comprehension monitoring of reading was highly correlated with “solution planning and monitoring,” and “solution execution.”

4.4 Difference between Newly Immigrant Students and Regular Students in Reading and Math Learning Performance

The pre- and post-test scores of reading comprehension of both new resident and regular students showed that newly immigrant students performed worse than regular students in the experimental group. The post-test scores of both new resident and regular students were improved after the experimental instructions were implemented.

A paired-sample t-test was conducted for the pre- and post-test scores of reading comprehension for both the experimental and control groups to analyze the learning effectiveness of new resident and general students in the experimental group. The difference between means was negative, suggesting that the post-test scores were higher than the pre-test scores. A t-test was conducted to examine the pre- and post-test scores of newly immigrant students ($t = -3.34$; $p < .05$) and those of regular students ($t = -4.48$; $p < .001$) in the experimental group. The test result showed that both new resident and regular students reached a significant level on the pre- and post-tests of the reading comprehension test. Namely, experimental instruction helped students in the experimental group promote their reading ability, regardless of background.

The researchers conducted an analysis of the independent sample t test for each vector of the pre-test of the reading comprehension test. The analytical results showed that of all dimensions of reading comprehension, literal comprehension and comprehension monitoring dimensions reached a significant level of .05. This result implied that newly immigrant students performed worse than regular students on the reading comprehension test, especially in literal and inferential comprehension. However, their reading scores still improved due to reciprocal teaching.

A paired-sample t-test was conducted for the pre- and post-test scores of the math test for both new resident and regular students to analyze the learning effectiveness of the experimental group. The difference between means was negative, suggesting that the post-test scores were higher than the pre-test scores. A t-test was implemented to examine the pre- and post-test scores of newly immigrant students ($t = -1.21$; $p > .05$) and those of regular students ($t = -1.86$; p

> .05) in the experimental group. The test results showed that a level of significance was not reached between the scores of both new resident and regular students. Namely, experimental instructions did not help students in the experimental group improve on math post-test scores, regardless of background.

The researchers conducted an analysis of the independent sample t-test for each vector of the math pre-test, to further examine the differences between new resident and regular students in terms of math performance. The analysis results showed that there was a significant difference between new resident and regular students in the pre-test scores and in all dimensions of the math test; including problem translation, problem integration, solution planning and monitoring, and solution execution.

Newly immigrant students had significantly lower performance than regular students in reading; especially in literal and inferential comprehension. Experimental instructions helped both new resident and regular students improve their reading performance. Newly immigrant students had significantly lower performance than regular students in math. After analyzing each dimension, the researchers discovered that significant differences existed between new resident and regular students in all dimensions of the math test (problem translation, problem integration, solution planning and monitoring, and solution execution). However, experimental instruction did not help any of the students improve their math performance. Hence, semi-structured in-depth interviews were conducted to strengthen and verify quantitative data.

4.5 Analysis of the Interviews with Newly Immigrant Students

During an interview, newly immigrant students showed a strong interest in reciprocal teaching, and suggested that this teaching method was more interesting to them. The reading strategies enabled them to think in more different directions. The researchers had interviews with the teachers of newly immigrant students regarding students' difficulties in reading. The face-to-face interview results were as follows.

"When reading an article, due to an insufficient vocabulary, there were many words that newly immigrant students were not familiar with. They encountered unknown words more often than regular students did. Thus, they had difficulty understanding the text, because they did not know the meaning of crucial and general words and phrases." (110323)

"Teachers asked students to write down answers to open-ended questions while implementing reciprocal teaching. Newly immigrant students often answered questions with Chinese phonetic symbols, wrong words, or homophones. They were very confused about the phonetic sounds, including "eng"(ㄥ), "en"(ㄣ), "ang"(ㄤ), and "an" (ㄢ)."

These phenomena were identical to the results of quantitative data, showing that newly immigrant students had difficulty in literal and inferential comprehension. After undergoing reciprocal teaching, newly immigrant students did not perform better on the math test. Relevant interviews were conducted with newly immigrant students to

examine this phenomenon. The researchers discovered that the students' meta-cognitive ability to use reading strategies was promoted because of reciprocal teaching. Nevertheless, students mainly had problems understanding math terms and representations used in math questions. During interviews, though students could read words used in math questions such as "how many dozen," "more than," "less than," and "how many times," they could not associate word descriptions with math concepts. They failed to find the relationship between two numbers after reading questions, and to discover a mathematical representation. Thus, they had difficulty understanding math questions, so they wrote enumerations to show mathematical representations using four arithmetic operators randomly. Students would discover that their answers were wrong only when the number was too big or small for calculation. Some of them did not even notice there were some mistakes in their calculations. This phenomenon was identical to the result of the interview with homeroom teachers.

"After teaching for a long period of time, I discovered that newly immigrant students were not different from regular students in learning math calculations and concepts. However, they had difficulty solving math word problems because they did not understand some words and phrases, such as "one-and-a-half-days" or "times." Newly immigrant students experienced difficulties in solving math problems because they could not understand the meaning of math questions due to inadequate reading ability." (110518T1)"

During the interviews, teachers asked students to distinguish the relationship between numbers in math problems after providing guidelines. Some students were able to answer the teachers' questions. However, when teachers asked students to write enumerations, students failed to use the correct calculations and arithmetical operators. Students would discover that their answers were wrong only when numbers were too big or small for calculation. Some of them did not even notice that their calculations were wrong. This phenomenon was identical to the observations of the homeroom teacher. Representation, rather than reading comprehension, is the biggest problem for newly immigrant students in learning math word problems. Therefore, reciprocal teaching failed to effectively promote the performance of newly immigrant students on math word problems.

V. Discussion

The analyses of this study show that reciprocal teaching is better than didactic teaching in promoting students' reading comprehension abilities. Reciprocal teaching is also significantly effective in enhancing students' ability to solve math word problems.

Regarding the correlation between reading and math, the dimensions of inferential and literal comprehension were highly correlated with all dimensions of math. However, the comprehension monitoring dimension of reading had a high correlation with the solution planning and monitoring, and solution execution dimensions of math. Thus, reading and math influenced each other.

Newly immigrant students performed

worse than regular students on both the reading and math tests. There was a significant difference between new resident and regular students in the dimensions of inferential and literal comprehension of reading, and in all dimensions of math abilities. However, implementing experimental instruction through reciprocal teaching did not significantly promote the reading and math abilities of newly immigrant students. To further investigate this result, the researchers conducted semi-structured interviews with newly immigrant students and interviewed their homeroom teachers. They discovered that although reciprocal teaching could promote the reading ability of newly immigrant students while answering math word problems, their major difficulties were mathematical terms and representation. Hence, though reciprocal teaching could promote students' reading comprehension ability, it was less helpful for enhancing their research results showed that although newly immigrant students are in a weaker position than regular students, reciprocal teaching could boost their reading comprehension ability. When solving math word problems, the understanding of mathematical terms and representations is more important than understanding the meaning of the text. Consequently, this study intends to raise more attention toward the problems of newly immigrant students in learning reading and math. Furthermore, this study suggests that educators can make good use of reading strategies verified by empirical research, and emphasizes representation in math teaching, thus enabling students, especially, the newly immigrant students to learn more effectively. In addition, further research is needed to investigate the types of representation strategies that can be used to promote newly immigrant students' math ability.

VI. Conclusions

The parents of newly immigrant students come from other countries. Thus, their different cultural backgrounds have resulted in learning difficulties for their children. Especially in Taiwan, newly immigrant students' mothers come from countries that are less developed. They are unable to provide their children with sufficient educational and cultural tools required for adaptation to the Taiwanese education system.

The researchers conducted teaching experiments on classes in which one-third of the students were new residents, and presented first-hand research data. The

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