

An Exploratory Study on Using the Think-Pair-Share Cooperative Learning Strategy

Andrew P. Kwok¹, Alexandria Lau¹

Diocesan Boys' School Primary Division, 131, Argyle Street, Mongkok, Kowloon, Hong Kong

Abstract: To develop primary students' skills of thinking and promote cooperative learning, the strategy of "Think-Pair-Share", suggested by Lyman [1], was adopted in this exploratory study to enhance the learning effectiveness in solving monthly challenging problems in mathematics. Four classes in Grade 3, 4 and 6 were selected to participate in this study. Students first thought and worked independently about the monthly challenging problems and wrote down their thoughts; then they paired up to talk about their answers and decided the answer that they thought was the best; finally they shared their decisions by presenting to the whole class. Accuracy of students' monthly challenge problem was checked before and after the process of Think-Pair-Share. Lesson observation, questionnaire and group interview were also employed to investigate students' learning processes and identify the factors that impact on the learning effectiveness of applying this strategy. Data analysis suggested that students' learning outcomes improved significantly from this strategy of "Think-Pair-Share". The new cooperative learning grouping and organization provided students opportunity and time for them to think and understand the question. Students paired up to discuss and clarify the problem and solution, and to present and explain the answer to their peers. Students were more actively involved and motivated in the process of problem solving. The cooperative learning promoted by this strategy helped to lower the anxiety of students in solving the difficult mathematics problems, especially of those students with lower level of achievement in mathematics. This study intends to obtain insights into understanding and developing students' learning experiences of using this strategy of "Think-Pair-Share" in a primary school in Hong Kong.

Keywords: Think-Pair-Share, problem solving, cooperative learning, motivation, anxiety.

1. Introduction

This exploratory present study was carried out by teachers at the Diocesan Boys' School Primary Division in Hong Kong in 2012. They applied the Think-Pair-Share cooperative learning strategy to mathematics problem solving for Grade 3, Grade 4 and Grade 6 students. Previously, students were given the Monthly Challenge Questions and they would solve the mathematics problems individually. However, since participation was voluntary, low achieving students found the level of difficulty of the problems beyond their capability and gave up quickly. The high

achieving students worked diligently to find the correct answers for all the problems and were awarded with bookmarks as prizes. The average accuracy rate was not satisfactory: 38% for Grade 3, 32% for Grade 4, and 36% for Grade 6. Therefore, this study intends to explore whether the cooperative learning strategy might motivate students to be more actively involved in the process of problem solving, especially for those low achieving students.

2. Literature Review

"Think-Pair-Share" is a cooperative learning strategy that encourages students to work together to solve problems or answer questions on the assigned topic [1]. According to Lyman [1], the procedure of "Think-Pair-Share" includes the following steps:

Corresponding author: Andrew P. Kwok, MSc., research fields: action research of classroom teaching and learning in mathematics and problem solving. E-mail: kwokandrewphilip@gmail.com.

(1) Think: When dealing with a question, students are given a short period of time to think individually;

(2) Pair: Students are to pair up with a classmate to discuss their thinking and jot down notes of their final conclusion;

(3) Share: Students present and share their decision with the rest of the class.

Although it is a simple and practical technique, it can yield observable and significant enhancement of student learning outcomes [2-3]. A similar study to the present one was carried out in Nu Neng Primary School in Singapore in 2011. The teachers applied the “Think-Pair-Share” cooperative learning strategy in mathematics classes. They concluded that the problem-based learning setting was a promising pedagogic approach that was able to promote positive attitudes (e.g., interest, perseverance and self-confidence) in students’ learning mathematics.

In addition, Oxford [4] suggested that students could adopt affective and social strategies to help them learn more effectively, such as lowering anxiety, encouraging oneself, and cooperating with others. “Think-Pair-Share” can also work as an affective and social strategy as it not only provides time and space for students to work individually on the mathematics problems but also opportunities for them to work together to clarify the questions that they have and identify the best solution, which can motivate students in mathematics learning, lower low achieving students’ anxiety and enhance their mathematics problem solving skills.

3. Research Design

In an attempt to cultivate the students’ interest in solving mathematics problems, the Mathematics Department has been introducing the Monthly Challenging Questions to all students. Students will be given 3 problem-based questions, and hand in their answer sheets when finished. A bookmark will be awarded to those who got all 3 answers correctly. Since the participation is on a voluntary basis, about 70% of

students participated in the activity. In addition, the accuracy rates vary between paralleled classes. Therefore, to encourage all students to be involved in this activity and promote peer learning, the “Think-Pair-Share” strategy suggested by Lyman [1] was adopted to address to following two research questions:

(1) To what extent does “Think-Pair-Share” cooperative learning strategy impact on students’ learning outcomes in Monthly Challenging Questions?

(2) How can low achieving students develop their affective and social strategies in the process of Think-Pair-Share?

Participants were selected according to students’ previous performance in this activity (see Table 1).

Table 1 The Accuracy percentages of each grade and 4 participating classes.

Grade 3	Grade 4	Grade 6
3J/ 3S	4M	6D
38%	32%	36%
23%	24%	10%

As indicated in Table 1, the accuracy rates of the selected classes, 3J, 3S, 4M and 6D, were lower than the average accuracy rates in their own grade. The accuracy rates are 23% of 38%, 24% of 32%, and 10% of 36% respectively.

The study lasted from February to June 2012. Classroom learning processes and outcomes of students in the experimental group were observed and recorded. Monthly Challenge Questions scores between the experimental group and the control group

were compared to monitor learning effectiveness. About 110 students in the experimental group completed questionnaire survey (see Appendix 1) and 12 pairs of students were given group interviews. The questions were grouped to investigate factors of motivation, academic learning time, self-confidence, interaction, and feedback on learning. The ratings and responses were analyzed to find out possible underlying reasons and processes that contributed to the changes.

4. Findings

The analysis of collected data indicated that there has been significant improvement in students' learning attitudes and learning outcomes with Think-Pair-Share cooperative learning. The experimental groups had higher percentages of getting all correct in mathematics problem solving in Monthly Challenge Questions (see Table 2).

Table 2 showed that all participating classes consistently achieved higher accuracy rates than the average rates of their own grades. It seemed that using the strategy of "Think-Pair-Share" could help students to improve their performance in the monthly challenging problems.

According to students' responses to survey questions, the strategy made the activity more interesting to students and students were more motivated to learn, with mean scores 3.3 for Item 3 and 11 (see Table 3). It also succeeded in promoting students' cooperative learning and positive attitudes in the process of "Think-Pair-Share", as the mean scores reached 3.6 for Item 12, and 3.5 for Item 17 (see Table 3). Students found that the strategy got them involved in the learning process and benefited from it, with mean scores 3.4 for Item 13 and 15.

Table 2 Accuracy rates.

All correct	February	March	April
3J, 3S	59.3%	62.5%	30.0%
Other Grade 3 classes	(29.8%)	(51.9%)	(15.4%)
4M	46.7%	60.7%	56.7%
Other Grade 4 classes	(37.9%)	(24.0%)	(12.0%)
6D	96.3%	77.8%	88.9%
Other Grade 6 classes	(52.9%)	(64.0%)	(57.0%)

Table 3 Motivation.

	Question	3J	3S	4M	6D	Mean score
3	I enjoy doing Monthly Challenging Questions more than before.	92	83	99	84	3.3
11	This Think-Pair-Share approach makes solving the Monthly Challenging Questions more interesting and challenging.	84	82	110	88	3.3
12	I enjoyed working with my friends to solve the Monthly Challenging Questions.	91	90	112	97	3.6
13	I like the new grouping and Think-Share-Pair approach as I learn better.	93	82	108	90	3.4
15	The challenge of solving Monthly Challenging Questions task kept me going and thinking.	86	90	104	92	3.4
17	Solving problems with a group of friends made the Monthly Challenging Questions more interesting.	87	88	108	98	3.5

Table 4 Self-confidence.

	Question	3J	3S	4M	6D	Mean score
2	I have confidence that I can achieve better results by doing the Monthly Challenging through TPS.	89	86	105	93	3.6
8	I found out my mistakes during the discussion session with my group members and I am sure I can correct it.	83	91	12	96	3.5
18	I feel more confident at solving difficult mathematics problems now than before.	86	84	110	79	3.3

Table 5 Lowering anxiety.

	Question	3J	3S	4M	6D	Mean score
1	I was not afraid of sharing my answers to my partner when doing the Monthly Challenging Questions.	91	90	114	99	3.6
2	I was not afraid of sharing my answers in front of class.	96	84	106	86	3.7
4	I like sharing my ideas with my partner.	92	86	109	98	3.5
6	I enjoy hearing my classmates presentations which are different from mine.	93	85	105	98	3.5

Such cooperation helped students to increase self-confidence. For example, the mean score was up to 3.6 for Item 2, 3.5 for Item 8 and 3.3 for Item 18 (see Table 4).

From scores of Table 5, it seemed that the strategy of “Think-Pair-Share” could lower students’ anxiety of sharing their own thoughts (3.6 for Item 1) and speaking in front of the class (3.7 for Item 2). This could possibly due to the fact that the process helped students become more confident with their answers to the problems after discussing with peers. They enjoyed learning together with their peers. For example, mean scores were 3.5 and 3.4 out of 4 for Item 4 and 6.

Analysis of the transcripts of students’ responses revealed that they enjoyed having the opportunity to interact and collaborate with their partners. The discussions made them spend more time on thinking and understanding the problem. The feedback helped them find out and correct their mistakes. The mutual

support and cooperation fostered team spirit and group dynamics to tackle the problems.

Extracts from student interviews:

“We can discuss the questions so it is more fun.”

“The sharing part is most helpful. It helps me understand.”

“You can team up with the other guy and give each other ideas if you don’t understand.”

“If I am wrong, he will tell me where and why I did wrong.”

“The more capable student should be paired with the less able one. If the weaker one does not know, the stronger one can help.”

5. Discussions

Conventionally, the elements in the learning process through the Think-Pair-Share strategy were thought to be a progressive and linear process, depicting a definite start-point and end-point. The process in Lyman’s Model Think-Pair-Share is illustrated in Fig. 1:

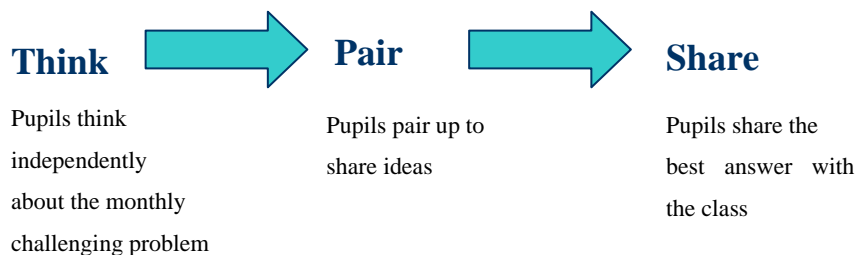


Fig. 1 Think-Pair-Share strategy.

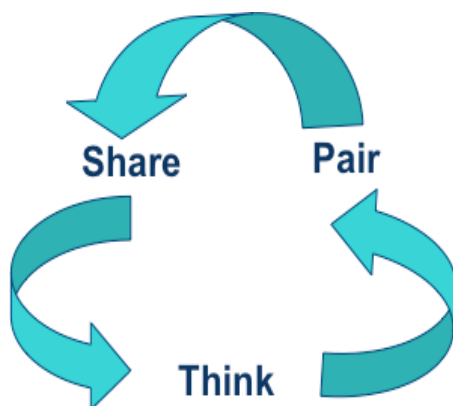


Fig. 2 Three elements.

From this study, the researchers suggested a refined model with the three elements in the learning strategy interacting continuously in a looped feedback process, which gave students greater learning effectiveness. The three elements in the cycle could work continuously in a non-stop manner and interact in the whole process of “Think-Pair-Share”. It increased social interactions and affect as well as enhanced cognition with the cooperative learning strategy. The positive attributes helped students solve mathematics problems more effectively. The Refined Model is illustrated by Fig. 2.

6. Conclusion

This exploratory study examined the use of ‘Think-Pair-Share’ strategy in the activity of monthly challenging questions of a school in Hong Kong. It was

found that students worked collaboratively in understanding the questions, sharing their ideas and formulating a solution to solve the mathematics problems more effectively. They had more positive affect and enhanced cognitive thinking, and as a consequence, better learning outcomes and success rates. The improvements in their success of solving mathematics problems in Monthly Challenge Questions were explained by increased interactions, corrective feedback, heightened motivation, and enhanced self-confidence. The cooperative learning strategy of “Think-Pair-Share” fostered a classroom learning environment with better affect among student groups. There were increased interactions and feedback, the emotional support and group dynamics between the learning partners. The groups had higher intrinsic and achievement motivation to attain the goal

and present the solution to the class. The strategy also enhanced the cognitive learning process. The learners had more academic learning time spent in discussion, enhanced their thinking process from peer's corrective feedback and self-reflection for deeper and more thorough understanding.

7. Limitations

Since this study was only small-scaled and lasted only five months, it was limited by time and resource constraints. Nevertheless, it sheds lights on how cooperative learning can be adapted to be effective teaching practice for mathematics problem solving with enhanced learning effectiveness. It will be interesting for future large-scale and long-term studies to investigate factors in pedagogy, students grouping, classroom organization and school settings that can help students learning in mathematics more collaboratively and effectively.

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Appendix 1: Questionnaire

	Questions
1	The accuracy of doing the questions is raised.
2	My participation on doing the Monthly Challenging Questions is bigger.
3	I enjoy doing Monthly Challenging Questions more than before.
4	I like sharing my ideas with my partner.
5	I hope that I can do the Monthly Challenging Questions under this circumstance.
6	I enjoy hearing my classmates' presentations which are different from mine.
7	I hope that our regular Math lessons can be conducted in this approach.
8	I found out my mistakes during the discussion session with my group members.
9	We found out our mistakes during the sharing session with our class in front of the class.
10	I would prefer using the approach of Think-Pair-Share in solving word problems than doing by myself.
11	This Think-Pair-Share approach makes solving the Monthly Challenging Questions more interesting and challenging.
12	I enjoyed working with my friends to solve the Monthly Challenging Questions.
13	I like the new grouping and Think-Share-Pair approach as I learn better.
14	The problems were hard but I did not give up because my partner supports me and help me understand my mistakes.
15	The challenge of solving Monthly Challenging Questions. task kept me going and thinking.
16	I was focused on finding the solutions to the Monthly Challenging Questions.
17	Solving problems with a group of friends made the Monthly Challenging Questions more interesting.
18	I feel more confident at solving difficult mathematics problems now than before.
19	I was not afraid of working in groups to solve Monthly Challenging Questions.
20	I had greater understanding in Monthly Challenging Questions through the TPS approach because of help from friends.