Using Journal Writing and Remedial Lessons to Correct Misconceptions in Mathematics

Somying Fongmam
Mathematics Education Program, International College,
Suan Sunandha Rajabnat University,
U-Thong nok Rd., Dusit Bangkok, Thailand
som_ying_za@hotmail.com

ABSTRACT

The purposes of this action research were to investigate the effects of using journal writing and remedial lessons for correcting student misconceptions and to explore student satisfaction towards employing journal writing and remedial lessons. The participants of this study were 45 grade-10 students studying additional mathematics in the second semester of academic year 2014 at Satrinonthaburi School, Nonthaburi, Thailand. The interested topic here was the linear equation system and matrix. Journal writing was used to investigate student misconceptions in the process of thinking and remedial lessons were applied to correct misconceptions. Experimental results show that misconceptions mostly occurred in three subtopics including the sum of two matrices, the product of a scalar (number) and a matrix, and the product of two matrices. Applying journal writing twice, before and after assigning the corresponding remedial lesson, yielded the results which showed that students could correct misconceptions through the application of the remedial lesson. Further study also showed that students performed better in doing homework and assignments when misconceptions were corrected. The satisfaction level of students towards the instruction using the proposed methodology is at high level (4.47 out of 5.00).

Keyword: Journal Writing, Remedial Lessons, Misconceptions in Mathematics, Student Satisfaction

1. Introduction

Mathematics is a wide-range subject with many aspects. Many people understand that mathematics is an intellectual discipline dealing with abstractions, logical arguments, deduction and calculation. In Thailand, the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) stated that mathematics plays an important role in the development of the human mind (logical and systematic thinking). Mathematics also serves as a tool for prediction, planning, problem solving, and decision-making in daily life. It is necessary for learning of science, technology, and other disciplines (Ministry of Education, 2008).

One problem that leads to the difficulty in learning mathematics is the misconceptions. This may results from previous inadequate learning and old teaching styles. Misconceptions in mathematics lead to several problems. This will obstruct the learning of related topics and subjects, and prevents students from achieving the expected learning outcomes. Many research aimed to solve student misconceptions in mathematics using various techniques such as tutorial sessions, self-discovery learning, individualized lessons, lessons with cartoons, cooperative learning, group activities, and journal writing.

Yeo (2001) examined the effects of using journal writing in mathematics classroom as a tool to assess students' learning. The conclusion of this research stated that journal writing could be an effective tool to understand students' learning in mathematics and a powerful communication between students and the teacher. Drake and Amspaugh (1994) concluded that benefits of using journal writing were in its use as a diagnostic tool as well as a way for teachers to gain insights into their own practices. Journal writing helped teachers to better understand their students' thinking. Relevant data collected from students' journals, when carefully analyzed and interpreted, could help teachers become more reflective in their practice.

In practical session, student misconceptions in mathematics were found during the instruction of grade-10 mathematics in the 2nd semester, academic year 2014, Satrinontaburi School, Nonthaburi, Thailand in the *Linear Equation System and Matrix* topic. From previously stated techniques, the researcher found that journal writing in mathematics could clarify and reflect student understandings. This could be used to diagnose students' process of thinking to find steps that lead to the misconceptions. A remedial lesson is also

an efficient tool which helps students to correct misconceptions in mathematics. A conceptual framework of the proposed methodology is illustrated in Figure 1.

2. Research Objectives

This research aimed to study the effects of using journal writing and remedial lessons on student achievement in mathematics and to study the student satisfaction in learning through journal writing and remedial lessons.

3. Research Methodology

3.1 Participants

Participants of this study were 45 students in grade 10 who were studying additional mathematics in the 2nd semester of the academic year 2014 at Satrinonthaburi School.

3.2 Concept Framework

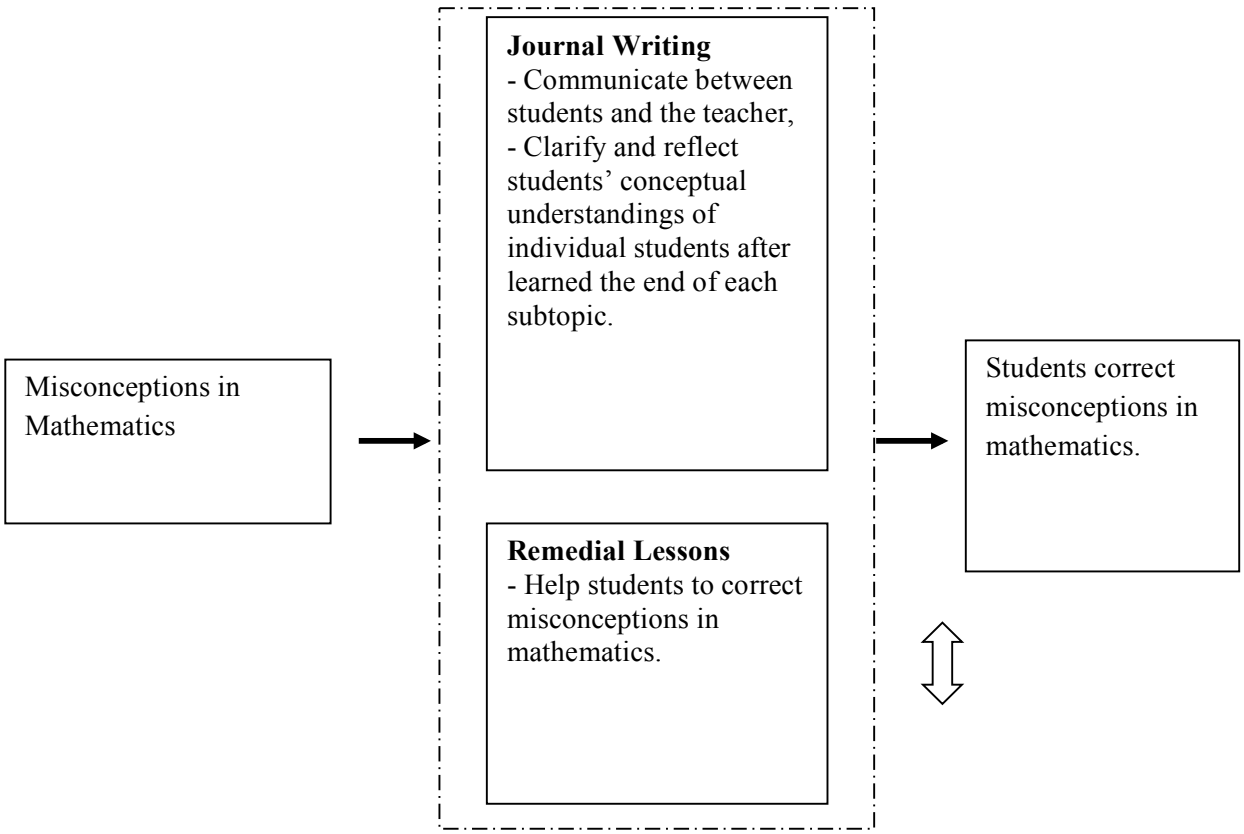

Figure 1
A conceptual framework

3.3 Research Instruments

Instruments used in this research are including of 3 types as follows:

1) A lesson plan consisting 6 subtopics in the *Linear Equation System and Matrix* topic--the sum of two matrices, the product of a scalar (number) and a matrix, the product of two matrices, an inverse matrix, determinant of a matrix, miner and cofactor of a matrix--and has journal writing as a part of the instruction. Journal writing was used for communicate between students and the teacher, and used for clarify and reflect conceptual understandings of individual students after they had learned each subtopic.

2) Remedial lessons used to help the students to correct misconceptions in mathematics.

3) A questionnaire which is measured by 5-point Likert scale. It is consisted of 10 questions covering 2 aspects which are learning activities and benefits from using journal writing and remedial lessons.

3.4 Data Collection

This research was conducted and data was collected following these steps:

1) The researcher taught in the specified topic (and subtopics) as mentioned above. An exercise (or a homework) and a journal writing activity was assigned at the end of each subtopic.

2) The researcher collected data from exercises, homework, and journal writing and analyzed for misconceptions in mathematics for individuals students after they had learned each subtopic. Remedial lessons were assigned for students in which misconceptions had been found, as an additional work.

3) Each remedial lesson had associated quizzes. The scoring was considered as right/wrong (any wrong answer or no answer resulted in 0 point and each correct answer gave one point).

3.5 Data Analysis

The analysis of collected data was done as follows:

1) Misconceptions of students were evaluated from their journal writing in each topic. The data was presented using frequency distribution containing type of misconceptions, number of students, and expected learning outcomes in each subtopic.

2) Corrected misconceptions were analyzed by comparing number of students in which misconceptions were found before and after assigning remedial lessons.

3) Evaluation of the student satisfaction was done using mean and standard deviation through the satisfaction questionnaire with 5-point Likert scale.

4. Results

Analysis of the first subtopic journal writings revealed the result as displayed in Table 1. The overall of the study revealed that misconceptions were most found in the following subtopics; the sum of two matrices, the product of a scalar (number) and a matrix, and the product of two matrices. Without solving these misconceptions students in the list would not have earned several expected outcomes specified in the course curriculum. By assigning a remedial lesson to each student in the list in which misconceptions were found, misconceptions seemed to be corrected as the test results gave the decreasing number of students who had misconceptions, as shown in Table 2. The evaluation of student satisfaction after applying journal writing and remedial lessons as a part of the instruction yielded the average result at 4.47 out of 5.00 which is at “High” level, as shown in Table 3.

Table 1

Misconceptions in mathematics in the linear equation system topic before applying remedial lessons

Type of misconceptions	Number of students	Expected learning outcomes
Fundamental concepts and equation solving	11	Methodologies, formulas, rules, definitions, and properties
Mistakes in calculation	5	Calculation
Total number of students = 45		

Table 2

Misconceptions in mathematics in the linear equation system topic after applying remedial lessons

Type of misconceptions	Number of students	Expected learning outcomes
Fundamental concepts and equation solving	4	Methodologies, formulas, rules, definitions, and properties
Mistakes in calculation	2	Calculation
Total number of students = 45		

The evaluation of student satisfaction after applying journal writing and remedial lessons as a part of the instruction yielded the “High” result at 4.47 out of 5.00, Moreover, the results show that 57.78 % of

students tended on "strongly agree", 35.33 % of students tended on "agree", 5.56 % were "neutral", and another 1.33 % were "disagree", as shown in Table 3.

Table 3
Student satisfaction

No.	Statements	Levels of satisfaction shown as percentages					Mean
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
1	The activity helps student get the correct mathematical concepts	51.11	37.78	11.11	-	-	4.4
2	The activity leads student to the correct way of learning	64.45	33.33	2.22	-	-	4.62
3	The activity improves student thinking process through the writing	48.89	46.67	4.44	-	-	4.44

Table 3
Student satisfaction (Continued)

No.	Statements	Levels of satisfaction shown as percentages					Mean
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
4	The remedial lesson is corresponding to course contents	82.22	17.78	-	-	-	4.82
5	Description in the lesson is easy to follow	60	33.33	6.67	-	-	4.53
6	The remedial lesson well describes thinking process	66.66	26.67	6.67	-	-	4.6
7	The lesson has good wording which is easy to understand	51.11	46.67	2.22	-	-	4.49
8	The remedial lesson is appropriate for student ability	42.22	42.22	11.11	4.44	-	4.13
9	Student can self-evaluate during the lesson	46.67	42.22	6.67	4.44	-	4.22
10	Knowledge obtained from the lesson can be applied to other subjects, day life, and future work	64.45	26.67	4.44	4.44	-	4.42
The average of all statements shown as		57.78	35.33	5.56	1.33	-	
The average of mean							4.47

5. Conclusion

This action research in teaching mathematics investigated the effects of using journal writing and remedial lessons for correcting student misconceptions in mathematics and to explore student satisfaction towards employing journal writing and remedial lessons. According to the experimental results show that student misconceptions in mathematic can be found and analyzed using journal writing and misconceptions could be corrected by assigning remedial lessons. Students most agree that the remedial lesson is corresponding to course contents. They also agree that the activity leads student to the correct way of learning

and the remedial lesson well describes thinking process. Further study also shows that students performed better in doing homework and assignments after being instructed using journal writing and remedial lessons.

References

Borasi, R. (1989). Journal writing and mathematics instruction. *Educational Studies in Mathematic*.

Drake, B. J. (1994). Whaiting Reveals in Mathematics. *Focos on Learning Ploblems in Mathematics*.

Ministry of Education. (2008). *Core Curriculum of Basic Education* . Bangkok: Agricultural Cooperative Federation of Thailand Limited.

Yeo, S. M. (2001). Unpublished Master's Degree Dissertation, Nanyang Technoogical University. *Using journal writing as an alternative assessment in junior college mathematics classroms*.