Enhance elementary school students to learn mathematics: Case of the use of mother tongue-base language (MTBL) students

L G Maminta1*, J V Mendoza2*, and C Yuenyong3
1Department of Education, Iligan City East Central School, Iligan City, Lanao Del Norte 9200, Philippines
2Integrated Developmental School, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines
3Faculty of Education, Khon Kaen University, Khon Kaen, Thailand
*Corresponding author’s e-mail address: buding062000@gmail.com; josievic.mendoza@g.msuiit.edu.ph

Abstract. The study of using Mother Tongue-Based Language (MTBL) in remediation on Least Learned Competencies in Elementary Mathematics to two sections in Grade VI at Tambo Central School was carried out. Both groups were exposed to team-assisted individualized remediation. The data needed for this study were obtained through 30-item achievement test and seventeen (17) Learning Materials constructed by the researcher which were construct-validated and evaluated by mathematics experts. Identified competencies of the materials were based on the National Achievement Test result and in the K to 12 Curriculum on Rational Numbers. The findings of the study revealed that the use of MTBL in team-assisted individualized remediation evidently improved the performance of the respondents in the three competencies on fractions namely comprehension of fractions; multiplication of fractions and its applications; and division of fractions and its applications.

1. Introduction
Mathematics is essential in many fields of endeavor and is one of the keys to the advancement of modern world. It is observed that in the elementary level, it appears as the least appreciated and liked subject. Many teachers have observed that majority of the pupils found difficulties in learning this subject. The pupils’ difficulties may be caused by lack of interest and adverse attitudes in mathematics [1], [2].

One of the factors identified by some researchers is the teaching methodology or approach being implemented by the teachers. It is in this context, that remediation with the employment of MTBL is seen to make mathematics more meaningful and enriching to the pupil [1].

This study determined the effect of Using Mother Tongue-Based Language in Team-Assisted Individualized Remediation on Least Learned Competencies in Elementary Mathematics among Grade VI pupils of a public elementary school situated east of Iligan City. More specifically, this study sought to answer the following questions: (1.) What is the performance of the respondents during the remediation?; (2.) What is the performance of the respondents on Comprehension of Fractions, Operation on Fractions and its applications before and after remediation?; (3.) Is there a significant difference in the performance of the respondents in the pretest and post test scores?; (4.) Does MTBL enhance the use of TAIR in improving the respondents’ competencies on fractions?; (5) What are the
least learned competencies after remediation for the: (a.) MTBL Group and (b.) Non-MTBL Group [2], [3], [4], [5].

2. Methodology

2.1 Design

The paradigm of the study is presented in Figure 1. The Use of Mother Tongue-Based Language in Team-Assisted Individualized Remediation is based on the pupils’ knowledge on how to comprehend fractions, do the operations on fractions and its application. After the pretest, the Team-Assisted Individualized Remediation was implemented.

This kind of remediation served as an intervention to improve the pupils’ achievement specifically in comprehension of fractions, operations on fractions and its application and hoped to help establish the high performance of the pupils in the National Achievement Test (NAT).

2.2. Procedure

The respondents in both sections were exposed to team-assisted individualized remediation (TAIR). However, only section Loyalty as the experimental group used the Mother Tongue-Based Language (MTBL). The control group section (Sincerity) was closely supervised by the researcher to ensure that only the English language is used during the group discussions.

Seventy-six (76) pupils with a grade below 80% in mathematics comprising the middle sections of the grade six level, who are officially enrolled at Tambo Central School for the academic year 2016-2017, were the respondents of the research study. The distributions of the respondents were classified by sections with 38 pupils, respectively. The respondents in each section were grouped into five (5) considering its proximity. The grouping was done after the pretest.

This study is a quasi-experimental research investigating the effect of Mother Tongue-Based Language (MTBL) in teaching concepts and skills on rational numbers using the same teaching technique in remediation. The remediation was done after the regular class hours. The experimental group used the mother tongue language which is the Visayan to discuss the missed items in the answered learning materials while the control group used the English language. Before the start of every remediation, each respondent was given an activity sheet to be answered individually for fifteen (15) minutes. After fifteen minutes, the pupils formed into groups upon the instruction of the researcher and checking of answers were done. Afterwards, the activity sheets are returned to the owner and group discussion follows facilitated by the teacher and assisted by a group leader which encourages a member to ask questions. If the group disagrees on a certain concept, the group consults

Figure 1. Research Paradigm

- Pretest
- Prior knowledge in:
  - Multiplication and Division of fractions.
  - Solving word problems involving multiplication and division of fractions.
- Prior skills

Non-MTBL

MTBL

Team-Assisted Individualized Remediation

- Conceptual Understanding
- Improved performance in posttest
- Improved competencies in comprehension of fractions, operations on fractions and its applications

- Conceptual Understanding
- Improved performance in posttest
- Improved competencies in comprehension of fractions, operations on fractions and its applications
the teacher to settle the conflicting interpretation. Also the group reviewed together to prepare themselves for board work. The board work was done before giving the next activity.

The K to 12 Curriculum became the guide of the researcher in determining the specific topics to be considered in the construction of the learning materials and in the preparation of the Table of Specifications (TOS) required before the achievement test was constructed.

The achievement test is a 30-item multiple choice questions on rational numbers, specifically on comprehension of fractions, multiplication and division of fractions and its application. The collection of data started with the giving of a pretest to the respondents using the researcher–made achievement test a week before the remediation started. The posttest was administered after the three weeks remediation. Both the pretest and the posttest were answered by the respondents for only an hour. The checking and scoring of the achievement test was done by the researcher. Each correct for each item received one point.

The learning material which consists of seventeen (17) activity sheets prepared by the researcher is the other instrument used in this study. These activity sheets were face validated by some elementary mathematics teachers within Iligan City. It was evaluated with an excellent rating using a rubric adapted and revised by the researcher.

3. Findings/Analysis
To determine the difference in the effects of using MTBL in implementing Team-Assisted Individualization Remediation on Least Learned Competencies in Mathematics, the two-tailed t-test is performed so that the results could be seen in either direction making use of degrees of freedom (df) to identify the number of pieces of useful information within the data set at 5% level of significance.

The performance of the respondents after remediation on competencies classified as Comprehension on Fractions was determined after giving the posttest. It revealed that the MTBL group is performing better than the non-MTBL group in all items in the achievement test except on two items. These items are competencies on identifying the reciprocal of a given number and reducing fractions to lowest terms.

The performance of respondents on multiplication of fractions after remediation showed that the number of respondents at MTBL group who answered correctly the items classified as Multiplication of Fractions is more than the number of respondents who answered correctly in the non-MTBL group.

The performance of the respondents after remediation on the items classified as Division of Fractions revealed that there is an equal number of respondents (10) who answered correctly on dividing a whole number by a mixed number. It was observed that pupils have misconceived the term reciprocal which results to incorrect procedure in performing the operation. The pupils have difficulty in identifying the reciprocal of a number. Maybe, the pupils were not able to unlock the meaning of the word reciprocal.

The mean difference, as shown in Table 1, in the pretest and posttest scores of this experimental group (MTBL) is higher by 5.434 as compared to the control group (non-MTBL) with t-value equal to 7.749 and standard error difference of 0.78449 is found to be highly significant. This means that the respondents in the experimental group have better performance during the team-assisted individualized remediation as compared to the control group. In general, the mean difference of the two tests showed that the respondents performed better in the posttest. The result also shows a two-tailed significance of 0.000 which is less than 0.05. This suggests to reject the null hypothesis “there is no significant difference in the performance of the respondents in the pretest and posttest scores”.

The posttest mean score (14.71) of the respondents in the achievement test is greater than the pretest mean score (9.57) by 53.81%.

The pretest mean score (8.37) of the non-MTBL group in the achievement test is less than the posttest score by 2.10.
The posttest mean score (18.95) of the MTBL group in the achievement test is greater than the pretest score (10.76).

The mean difference (1.58) of the pretest and posttest scores of the MTBL group in the competency on Comprehension of Fractions is higher to the mean difference (1.55) of the non-MTBL group by 0.03.

The mean difference (4.66) of the pretest and posttest scores of the MTBL group in the competency on Multiplication of Fractions is much higher to the mean difference (0.66) of the non-MTBL group by 4.00.

The mean difference (1.95) of the pretest and posttest scores of the MTBL group in the competency on Comprehension of Fractions is higher to the mean difference (0.11) of the non-MTBL group by 1.84.

Table 1. Performance of the Respondents in the Achievement Test

| Control Group (Non-MTBL Respondents) | Experimental Group (MTBL Respondents) |
|--------------------------------------|---------------------------------------|
| Section: Sincerity                  | Section: Loyalty                      |
| Pre-test Mean (X)                   | Pre-test Mean (X)                     |
| Post-test Mean (X)                  | Post-test Mean (X)                    |
| Difference                          | Difference                             |
| Mean (X)                            | Mean (X)                               |
| 8.368                               | 10.76                                 |
| 10.47                               | 18.95                                 |
| 2.11                                | 8.18                                  |

X (Mean Pretest-Post) 9.421 X (Mean Pretest-Post) 14.855

Mean Difference (Experimental vs. Control) 6.07895

t-value 7.749

Standard Error Difference 0.78449

Significance 0.00000

Remarks Highly Significant

The computed t-value of the pretest and posttest mean scores of the respondents in the achievement test is 9.81 with 75 degrees of freedom. Hence, there is a significant difference between the pretest and posttest scores of the respondents in the achievement test.

The computed t-value of the pretest and posttest mean scores of the non-MTBL respondents in the achievement test is 4.12 with 37 degrees of freedom. Therefore, there is a significant difference between the pretest and posttest scores of the non-MTBL group in the achievement test.

The computed t-value of the pretest and posttest mean scores of the MTBL respondents in the achievement test is 13.76 with 37 degrees of freedom. Therefore, there is a significant difference between the pretest and posttest scores of the MTBL group respondents in the achievement Posttest.

The computed t-value of the mean difference scores of the non-MTBL and MTBL group in Comprehension of Fractions is 0.06 with 74 degrees of freedom. Therefore, there is a significant difference between mean scores of the MTBL and the non-MTBL groups with respect to Comprehension of Fractions.

The computed t-value of the mean difference scores of the non-MTBL and MTBL group in Multiplication of Fractions is 9.91 with 74 degrees of freedom. Therefore, there is a significant difference between mean scores of the MTBL and the non-MTBL groups with respect to Multiplication of Fractions.
The computed t-value of the mean difference scores of the non-MTBL and MTBL group in Division of Fractions is 5.27 with 74 degrees of freedom. Therefore, there is a significant difference between mean scores of the MTBL and the non-MTBL groups with respect to Division of Fractions.

The five least learned competencies of the non-MTBL and the MTBL groups after remediation are: (a.) Dividing fractions by other fractions, (b) Dividing a whole number by a mixed form, (c) Dividing a mixed number by a mixed number, (d) Dividing a whole number by a fraction and (e) Solving problem involving division of fraction

Based on the findings of this study, the following conclusions have been drawn:

The employment of the team-assisted individualized remediation improved the performance of both the MTBL and non-MTBL groups.

The MTBL group performed better than the non-MTBL group in the three identified mathematics competencies namely: Comprehension of Fractions, Multiplication of Fractions and Division of Fractions.

The use of the mother tongue-based language in remediation enhances the performance of the MTBL group.

Most of the least learned competencies after remediation are topics which involved Division of Fractions.

4. Recommendation

Develop and evaluate instructional and learning materials in elementary mathematics using team-assisted individualized remediation and mother tongue-based language in least learned competencies like division of fractions.

Conduct further studies on Team-Assisted Individualized Remediation versus MTBL using different respondents for two quarters.

Develop a training program to equip teachers with knowledge and skills on how to facilitate the learning process like team-assisted individualized teaching or cooperative learning.

References

[1] DepED Order No. 74, s. 2009. Institutionalizing Mother Tongue-Based Multilingual Education (MLE), pp. 1-5.
[2] NETRC. 2011 National Achievement Test for Grade Six. Certificate of Rating: Institutional Performance Profile.
[3] NETRC. National Achievement Test. Key Programs. July 05, 2011. http://www.deped.gov.ph/about_deped/organization.links.asp?id=16
[4] Slavin, Robert E. (1984a). Team-Assisted Individualization. Cooperative Learning and Individualized Instruction in the Mainstreamed Classroom. Research Project. John Hopkins University.
[5] Slavin, R. E. (1984b) Cooperative Learning: Theory, Research, and Practice, 2nd edition. Englewood Cliffs, NJ: Prentice Hall
[6] Zulaut, Madelere (1994). Three-Year Experiment on Extended Must Teaching in Switzerland: The Different effects Observed in a Group of French Speaking Pupils. Research Seminar Journal.