

# MONITORING OF A TRAINING PROGRAM ENHANCING THE ALTERNATIVE LEARNING SYSTEM IMPLEMENTERS' MATHEMATICAL AND PROBLEM-SOLVING SKILLS

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## Abstract

This project started in 2019 as a response to the request of the Alternative Learning System (ALS) focal person in the division of Cagayan de Oro City. After that, a needs-analysis instrument was administered to measure the competence of ALS implementers to teach particular math topics in high school. This served as the basis for the 2019 extension project. Due to the training's success and outstanding rating, it was scaled up to the whole DepEd-Region X, covering 14 Division Offices in the year 2020. In this year's training, the flexible learning modality of USTP was adopted using the USTP e-Portal (USTeP) because of the COVID-19 pandemic. The ALS implementers were divided into seven blocks, and each block was trained for one month. A pre-test on selected mathematics topics was conducted before and after the training. Results show a significant increase in the post-test scores of the participants. Hence, this project will continue this year, considering the positive outcome of the previous training.

Keywords: content and pedagogy, problem-solving skills, Alternative Learning System (ALS)

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## 1.0 Introduction

The Department of Mathematics Education (DMEd) of the College of Science and Technology Education (CSTE) of USTP is devoted of enriching the capability and competency of mathematics teachers in the region. One of the measures to achieve this department's goal is through the conduct of community extension projects, which are either research-based or community-needs extension projects. During the past years, DMEd of CSTE has partnered with the Department of Education (DepEd), Cagayan de Oro City Division, as well as the other divisions within Region X, in conducting extension programs aimed at enhancing teachers' content and pedagogical skills in teaching mathematics. As a result of the World Declaration of Education for All (EFA) in 1990, the Philippines designed the Alternative Learning System (ALS), a program that will provide non-formal education to out-of-school children (OSC), out-of-school youth (OSY), illiterate adults and marginalized Filipinos that will address illiteracy and promote continuing education (Guiamalon et al., 2022).

The ALS of DepEd Division of Cagayan de Oro City, under the leadership of Dr. Ray Butch B. Mahinay, requested CSTE through the DMEd to conduct a 5-day training workshop for ALS teachers aimed at improving their mathematics content and pedagogical knowledge in mathematics. This extension project was successfully conducted in May 2019. With the success and positive feedback of this training workshop for ALS mathematics teachers, this project was scaled up to the whole of DepEd-Region X, covering 14 Division Offices in the year 2020. In this year's training, the flexible learning modality of USTP was adopted using the USTP e-Portal (USTeP) because of the COVID-19 pandemic. The USTeP is the official Learning Management System (LMS) of USTP. It is based on Moodle version 2020 3.8.2 and can be accessed through [ustep.ustp.edu.ph](http://ustep.ustp.edu.ph). It is the main program under the USTP Flexible Learning Program (FLP) in response to the current public health, projects, and safety crises and as part of the university's strategic plan to continuously innovate in terms of curriculum delivery. The training of ALS mobile teachers and volunteers centered on the enhancement of their conceptual understanding, pedagogy, and andragogy across the six (6) Learning Strands of the Alternative Learning System (ALS) Curriculum namely; English Communication Skills, Scientific and Critical-Thinking Skills, Mathematical and

Problem-Solving Skills, Life and Career Skills, Understanding the Self and the Society and Digital Citizenship. Considering the success of this training for ALS teachers in Region X, the researchers would like to report the results of this training to the academic community so they can conduct similar training for ALS teachers in other regions.

## 2.0 Methodology

This research study employed a pretest-posttest, one-group research design. In the year 2019 implementation of this project, thirty-five (35) ALS teachers of the DepEd CDO Division are the participants included in this study. The study was conducted in a face-to-face modality by the faculty of the Department of Mathematics Education, teamed up with MS in Teaching Math and Ph.D. in Mathematical Sciences Major in Mathematics students of USTP. The training began with a pretest given on the first day and was immediately followed by the training proper. The training lasted for 5 days, and then a posttest was given right after the training.

Due to the COVID-19 restriction, in the year 2020, the study was conducted through flexible distance learning, utilizing the University of Science and Technology eLearning Portal (USTeP), the official learning management system of USTP. The ALS implementers in Region X were divided into 7 blocks and given 4 weeks to complete the training course. Before implementation, preparations were made. A series of meetings with the Project Leader and ALS Region X focal person were conducted. The project leader also coordinated the USTP-Digital Transformation office for the use of the USTeP platform.

The Trainers prepared the table of specifications (TOS), pretest-posttest questionnaire, work text, video lessons, and quizzes. The TOS and multiple-choice pretest-posttest questionnaire were created by the researchers that went through face and content validity. The worktext was created by the Ph.D. in Mathematical Sciences Major in Mathematics Education students, and the video lessons were created by MST Mathematics students. All of these materials were evaluated by DMEd faculty members.

The prepared materials were uploaded and organized in USTeP. The ALS implementers and trainers were given USTeP accounts, and an orientation was also conducted to navigate the platform. Both year 1 and year 2 covered the topics

under Learning Strand 3: Mathematics and Problem-Solving Skills. These topics are listed in Table 1.

Table 1. Topics covered in Year 1 and 2 training

No.	Topics
1	Reading, Writing and Counting Money Values
2	Ranking of Set of Objects Using Ordinal Numbers
3	Reading and Writing Roman Numbers
4	Addition and Subtraction of 2 to 6-digit Whole Numbers
5	Solving One-Step Problem in Addition
6	Solving Daily Problems 2 to 4-Digit Numbers Involving Addition and Subtraction
7	Principle of PMDAS or GMDAS (Parentheses/Group, Multiplication, Division, Addition and Subtraction)
8	Fundamentals of Fractions
9	Fractions in Real Life Problems
10	Fractions in Lowest Terms
11	Additions and Subtractions of Dissimilar Fractions
12	Additions and Subtractions of Similar Fractions
13	Multiplications of Fractions
14	Division of Fractions
15	Application of Fractions and Mixed Numbers in Real Life Problems
16	Factors of a Numbers(Up to 100)
17	Factors of a Numbers(Up to 100)
18	Greatest Common Factors (GCF) Using Listing Methods
19	Greatest Common Factors (GCF) Using Continuous Division Method
20	Least Common Multiples (LCM) Using Listing Method
21	Common Factors of Number Using Divisibility Rules
22	Place of Value and Value of Digits in a Decimal
23	Rounding-Off of Decimals
24	Conversion of Decimals into Fractions
25	Conversion of Fractions into Decimals
26	Additions of Decimals for Routine and Non-Routine Problems Using Appropriate Strategies
27	Subtractions of Decimals for Routine and Non-Routine Problems Using Appropriate Strategies
28	Multiplications of Decimals Up to 2 Decimals Places
29	Division of Decimals Up to 4 Decimals Places
30	Division of Decimals by Whole Number and Another Decimals
31	Terminating and Non-Terminating Decimals
32	Fundamental of Ratios and Proportions
33	Equivalent Ratios and Value in Fractions
34	Simplifying Ratio to its Lowest Term
35	Application of Direct Proportion
36	Application of Inverse Proportion
37	Application of Partitive Proportion

During the implementation, the ALS implementers were given access to the study materials only during their schedule. The course begins by answering the pretest before the participants can access the study materials posted in USTeP, which are downloadable so they can access them offline. The video lessons were also downloadable, but they can be accessed through the YouTube platform. The 4-week training course comprises four quizzes and two synchronous classes with their assigned instructors per block. At the end of the training course, the participants were given posttest.

### 3.0 Results and Discussion

Table 2 below shows the mean, standard deviation, and paired t-test summary between the pretest and posttest scores in mathematics for year 1 of implementation. It can be seen in the table that the mean score in the pretest is 19.69 out of 36 and the standard deviation (SD) is 4.57, which indicates that the scores are widely dispersed; the lowest score is one (1) while the highest is 26. On the other hand, the posttest mean score increased to 28.34, more than 75% of the perfect score. Also, the post-test's standard deviation is lower than the pretest's SD (3.60 vs. 4.57). This means that the scores in the posttest are less dispersed than those in the pretest. The lowest score is 17, and the highest is 34.

Furthermore, using an alpha level of 105, a paired sample t-test shows that the mean of the paired difference, 8.65, is statistically significant  $t(34)=10.52, p<.001$ , which means that the posttest score (M=28.34, SD=3.60) is significantly higher than the pretest score (M=19.69, SD=4.57). The effect size is medium,  $r=.31$ .

Table 2. Descriptive Statistics and paired t test summary between pre-test and post-test scores in mathematics, year 1 (2019) implementation.

Scores	N	Mean	SD	Mean Difference	t	df	p	Effect size (r)
Pretest	35	19.69	4.57					
				-8.65	-10.52	34	<.001	.31
Posttest	35	28.34	3.60					

Table 3 shows the mean and standard deviation and the comparison of the pre-test and post-test scores of the participants in the ALS training. The participants obtained a pre-test mean score of 26.62 and were improved examining their post-test scores, obtaining a mean score of 29.31. The standard deviation of the pre-test mean score of 6.47 was slightly higher than their post-test score of 6.25, which indicates that their pre-test scores were a little dispersed compared to their post-test scores.

In order to determine if the increase in the post-test scores of the participants was significant, a paired t-test was performed. The result of the analysis shows that the increase in their scores was statistically significant as  $t(103)=-4.97, p<.001$  which indicates that the post-test scores (M=29.31, SD=6.25) were significantly higher than their pre-test scores (M=26.62, SD=6.47). The effect size is  $r=.62$  which indicates a large effect. This implies that the participants' mathematics content improved significantly as a result of their participation in the ALS training. Hence, it can be inferred that the ALS training was effective in improving ALS teachers' mathematics and problem-solving skills.

Table 3. Descriptive Statistics and paired t test summary between pre-test and posttest scores in mathematics, year 2 (2020) implementation.

Scores	N	Mean	SD	Mean Difference	t	df	p	Effect size (r)
Pretest	104	26.62	6.47					
Posttest	104	29.31	6.25	-2.70	-4.97	103	<.001	.62

Perfect score: 36

This study found that prior to the training, in years 1 and 2, the participants had limited knowledge of the topics. This is because the mandated hiring requirement is very low. The qualifications of ALS volunteers are that they are college graduates, preferably in education, LET passers, and not currently employed as regular public school teachers (DepEd Order No. 59, 2016). With these hiring requirements, there is a high chance that the ALS volunteers teaching mathematics are not majoring in mathematics. In fact, the majority of ALS volunteers in Cagayan de Oro City are graduates of the Bachelor of Elementary Education, and most of them are generalists, according to Tan (2019).

After the training, there is a significant increase in the post-test scores in both year 1 and year 2. This manifests an effect of the training program implemented on the teachers' content knowledge. Enriching a teacher's mastery of a subject matter's content will eventually influence students' performance, for teachers have substantial impacts on their student's academic achievements (Darling-Hammond, 2006; Lomibao, 2016). A teacher who has mastery of the subject matter is able to plan and teach the lesson well. He or she is able to highlight the major points of the lesson and clarify misconceptions (Kamamia *et al.*, 2014). Wenglinsky (2001, as cited by Lomibao, 2016) particularly stressed that high-quality professional development focusing on higher-order thinking skills and diversity issues does appear to strongly influence classroom practice. Hence, the extension program designed for the ALS teachers appropriately addressed the existing issue of the teachers' content knowledge.

#### 4.0 Conclusion

In conclusion, the mathematics and problem-solving skills of ALS implementers improved after the training. The researchers recommend further providing training to ALS implementers to improve their competence in teaching mathematics.

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