

An Assessment of the Mathematics Training Series

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Abstract— This study assessed the impact of the Mathematics Training Series conducted by the Mathematics and Allied Disciplines Department. It determined the profile of the respondents in terms of age, sex, level of education being taught, and academic rank; their pretest and posttest scores; their performance evaluation by their immediate supervisors before and after the training; the extent of utilization of the knowledge, skills, and technology gained; and the immediate and long-term benefits gained from the training. It also determined whether there exist a difference between the means of pretest and posttest scores of the respondents and their performance evaluation by their immediate supervisors before and after the training. The study employed the descriptive research method using questionnaire as the main data-gathering instrument. Results of the analyses revealed that the respondents enhanced their competencies in terms of mathematical knowledge, skills and use of technology in the mathematics teaching-learning process. The knowledge, skills, and technology learned from the training are often used by the respondents. Moreover, they became more productive and efficient and have earned the respect of their supervisors. Further, there is a significant difference between the means of the respondents' pretest and posttest scores and their performance evaluation by their immediate supervisors before and after the training. Thus, the Mathematics Training Series is effective in enhancing the respondents' skills and knowledge, and their job performance. The study recommended the continuous conduct of the Mathematics Training Series and be offered to wider group of basic education Mathematics teachers.

Index Terms— Extension Program, Immediate Benefits, Long-term Benefits, Mathematical Competencies, Mathematics Training Series, Monitoring and Evaluation, Performance Evaluation

1 INTRODUCTION

EXTENSION is one of the four major functions of higher education institutions in the Philippines. In line with the thrust to mobilize knowledge and technology towards enhancing productivity, generating employment and reducing poverty, higher education institutions have been actively conducting research and extension programs and projects which include the transfer and/or application of technology and knowledge that contribute to the attainment of the country's development goals.

The Don Mariano Marcos Memorial State University (DMMMSU) is grounded in its commitment to fulfill its functions as to instruction, research, and extension, and to continue recognizing the vital role of extension service and community involvement in the life of the university. With its primary purpose of becoming an instrumental and a vital partner in achieving total development of the communities, the university - through its University Extension Office (UEO), together with its implementing units - is determined to strengthen its relationship with the community through mutual cooperation and support of well-defined, meaningful and responsive community extension programs and services [1].

The UEO aims for the effective verification and dissemination of appropriate technologies and information which are responsive to the needs and priorities of its clientele; hence, creating a distinct identity for the university as capable partner in achieving total development of the community. To achieve this purpose, emphasis were directed towards the accomplishment of extension programs and other related endeavors which focus on relevant concerns in education, agriculture, agro forestry, fisheries, industry, health and nutrition, local government, trades and socio-economic which are needed-based and client-based.

The College of Arts and Sciences (CAS), one of the competent colleges of the DMMMSU - South La Union Campus (SLUC), takes lead in developing empowered and self-reliant communities where people are able to transform themselves from passive objects of development into molders of their own development. The CAS provides technical, educational, social, and health services to outside agencies and communities which fosters a culture of service among its administrators, faculty, alumni and other stakeholders [2].

The college's commitment in becoming a potential tool to improve the lives of the community people is reflected in its objectives: (a) provide students with a general knowledge of the behavioral, mathematical, and natural sciences for greater awareness and responsiveness to the demands of environment, (b) instill the desire to discover and preserve the national heritage and identity, and broaden the scope of knowledge through research, (c) develop an analytical mind capable of evaluating and making sound judgment, and integrating sci-

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entific knowledge, (d) participate in the government's efforts to uplift community through its research and extension activities.

Meanwhile, the Mathematics and Allied Disciplines Department which offers the degree Bachelor of Science in Mathematics is one of the four departments of the CAS that gears towards providing students with the most advanced level of instruction and professional skills to become competent and effective problems solvers to the society it serves. As a manifestation of its commitment to the community, the BS Mathematics program endeavors to strengthen the student's capability to conduct research in mathematics and extension activities.

The Mathematics and Allied Disciplines Department (MADD), being dedicated to producing a community with mathematical prowess, recognize its critical and significant roles in imparting its expertise in mathematics to different age groups in the community. This gave rise to the formulation of extension projects of the department that target the empowerment of community people and equipping them with the appropriate mathematical knowledge, skills and attitude, therefore making them self-reliant and productive citizens. It also involves the application of existing and new knowledge and technology in mathematics that aid in the improvement of the quality of life of the people [2].

The different extension programs and projects of the MADD were framed based on the mandates of the university, national and regional development thrusts, current realities and available technologies. Moreover, they were also based on the needs and opportunities of the communities/clienteles. Given these premises, the department to its target clientele is expected to enhance or improve the knowledge, skills, and attitudes that will consequently result to higher productivity, better physical and social environment, better quality of life, sustainable development and better health condition [2].

Since 2008, MADD, being one of the service arms of the college, focused its extension programs on the following: (a) Educational Leadership, Teacher Support and Professional Development, (b) Special, Inclusive, Adult and Education Program, (c) Institutional Development and Capability Building, (d) Entrepreneurial and Livelihood Skills Development, and Environmental Protection, Conversation, and Management.

These extension programs were implemented through the following strategies and approaches: (a) Continuing Education (b) Publication and Communication (c) Field Operation Service.

One of the extension activities under the Educational Leadership, Teacher Support and Professional Development Program which was initiated by the MADD was the Mathematics Training Series. The training series was implemented in January 2014 to May 2014 and was attended by 140 elementary and secondary mathematics teachers in Agoo; and 100% of the faculty members of the department were tapped as trainers

/lecturers during the entire training series. The Mathematics Training Series was conceptualized with the primary aim of enhancing the competencies of mathematics teachers in the elementary and secondary levels through various innovative modes of delivering mathematics instruction.

The following are the themes of the five series of the training: Series 1- Strengthening Mathematical Competence through Learning and Teaching (January 24-26, 2014); Series 2- Optimizing Mathematics Learning through Technology (April 10-12, 2014); Series 3- Assessment Methodologies in the Mathematics Classroom (April 23-25, 2014); Series 4- Mathematics Performance Management and Analysis (May 7-9, 2014); and Series 5 Giving Meaning to Numbers (May 21-23, 2014).

The topics of the Mathematics Training Series were based on the results of the needs assessment conducted to teachers in the Municipality of Agoo. Results of the assessment reveal that the following are the top priority needs: (1) Developing Learning and Learning Other Instructional Materials (57.43%); (2) Implementing Effective Classroom Management Techniques (56.44%); (3) Implementing Literacy Strategies (48.51%); (4) Understanding and Managing Student Behavior (43.56%); (5) Implementing Effective Instructional Strategies and Engage Students (37.62%); (6) Communicating Effectively with Parents, Students, Colleagues and Stakeholders (36.63%); (7) Utilizing Instructional Technology, Strategies, Innovations (35.64%); (8) Applying Differential Instruction (33.66%); (9) Planning/Reflecting of the Effectiveness of Lessons (33.66%); and (10) Addressing Reading and the Other Learning Problems of Students (32.67%).

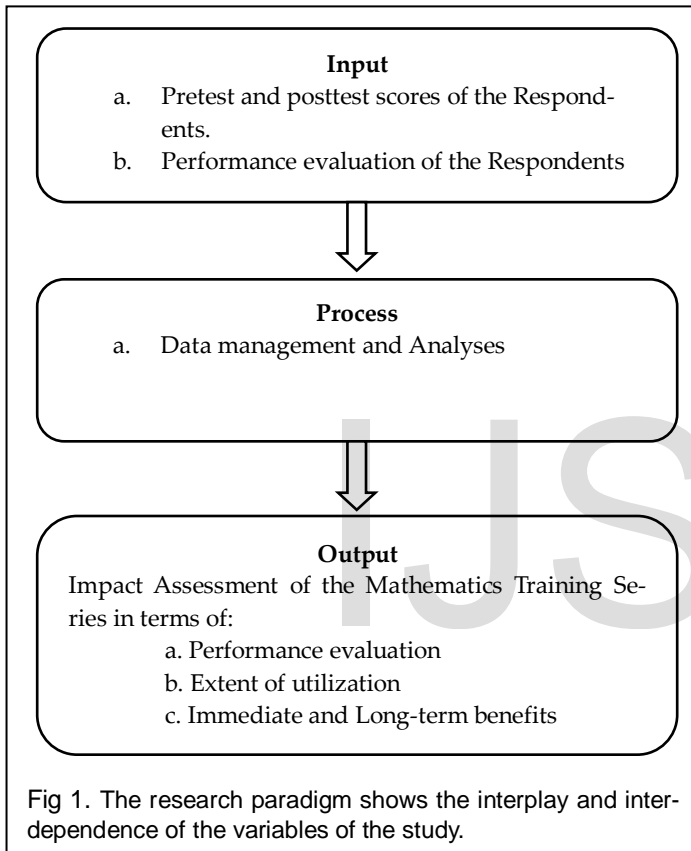
Meanwhile, impact assessment is a process of evaluating the effect of an implemented project or development. Assessing the impact of extension activities implemented by every higher education institution in the country is a relevant stage of the monitoring and evaluation process. In this undertaking, it indicates the effectiveness and relevance of the extension programs implemented to the community people who served as beneficiaries of the programs. Impact assessment may range from assessing the increased in knowledge, skills and attitudes resulted to higher productivity by the beneficiaries, utilization of technology, and other indicators of the effectiveness of the extension programs implemented.

Because evaluation is an integral part of the procedure involved in assessing the effectiveness or impact of every extension program, this study was conceptualized. The researchers endeavored to determine the impact of the Mathematics Training Series implemented by the Mathematics and Allied Disciplines Department to the performance of the public and private elementary and secondary mathematics teachers who attended the training.

Specifically, this study determined the profile of the respondents in terms of age, sex, level of education being taught, and academic rank; the performance of the respondents in the pretest and posttest; the performance evaluation of

the respondents by their immediate supervisors before and after the training; the extent of utilization of the knowledge/skills/technology that the respondents gained; the immediate and long term benefits they gained from the training; the difference between the means of the pretest and posttest scores of the respondents; and the difference between the performance evaluation of the respondents by their immediate supervisor before and after the training.

The figure below summarizes the process flow implemented by the researchers in conducting this study.



2 METHODOLOGY

2.1 Research Design

The descriptive research method was employed to gather the appropriate information or data to determine the impact of the extension program, particularly the Mathematics Training Series, conducted by the Mathematics and Allied Disciplines Department to the elementary and secondary mathematics teachers in Agoo, La Union.

2.2 Sources of Data

The researchers gathered data from the teachers from the different private and public elementary and secondary schools in Agoo, La Union who participated in the five series of the Mathematics Training Series.

2.3 Instrumentation and Data Collection

The researchers used questionnaire-checklist in gathering the needed data for the study, particularly the profile of the respondents in terms of age, sex, level of education being taught, and position/rank. Moreover, the questionnaire must also gathered from the respondents based on the data on the immediate and long-term benefits of the Mathematics Training Series and the extent of utilization of the knowledge, skills and technology gained from the training.

The pretest and posttest scores of the respondents were taken from the records of the Mathematics and Allied Disciplines Department.

A separate questionnaire was administered to the immediate supervisors of the respondents to determine the performance evaluation of the latter before and after the training.

2.4 Analysis of Data

The profile of the respondents in terms of sex/gender, age, and position/rank were analyzed using frequency counts and percentages.

The weighted mean was utilized to determine the extent of utilization of the knowledge, skills and technology gained from the training.

Also, frequency counts and percentages were used in analyzing the immediate and long-term benefits the respondents gained from the mathematics training series.

The researchers used paired T-test to determine whether there is a significant difference between the performance evaluation of the respondents before and after the training and the means of the respondents' pretest and posttest scores.

3 RESULTS AND DISCUSSION

3.1 Profile of the Respondents

There were more female (70.83%) than male (29.17%) who attended the Mathematics Training Series. Such results may have been caused by the fact that the teaching profession is more preferred by females than males.

About their ages, there were (13.33%) who belongs to the age of 30 below; (19.17%) were at the age of 31-35; (23.33%) at the age of 36-40; and (44.17%) age 41 and above.

The Mathematics Training Series was attended by varied age groups but were dominated by teachers who are more than 40 years old. It can be concluded that professional development and advancement in the teaching profession is a concern of all teachers from all age groups.

As to the level of education being taught, there were (75.83%) teachers from public and private elementary schools; (24.17%) teachers from public and private high schools. It can be deduced that there are more elementary school teachers who attended the training, because there are more elementary schools than high schools in the municipality of Agoo.

In terms of academic rank, (56.67%) of the respondents are Teacher 1; (16.67%) respondents are supervisors, and (26.66%) are teachers with other academic rank. This includes Teacher 2, Teacher 3, Master teachers, Head teachers and rank other than those indicated above.

3.2 Pretest and posttest scores of the respondents

Prior to the conduct of the training, a pretest was administered to the respondents to diagnose their preparedness and knowledge of the topics to be discussed. After the training, a posttest was administered to gauge the knowledge and skills which the respondents learned from the training. The table below presents the respondents' pretest and posttest scores in the Mathematics Training Series.

It can be seen from the table that the respondents achieved higher scores in the posttest in all the series of the training as compared to their pretest scores. The respondents posted the highest mean difference of their pretest and posttest scores in Series 1 equivalent to 3.43697. On the other hand, the lowest difference of the means of the pretest and posttest scores was recorded in Series 2 under the group of Grades 3-4 teachers.

In general, because the mean differences are all positive, it can be deduced that the respondents improved their performance in the posttest after the training. This implies that the respondents' mathematical competencies were further developed in terms of knowledge and skills. Consequently, it can be referred that the Mathematics Training Series is effective in refining the competencies of the teachers in terms of conceptual knowledge and skills.

TABLE 1
PRETEST AND POSTTEST SCORES OF THE RESPONDENTS

Series	Mean		Mean Difference
	Pretest Scores	Posttest Scores	
Series 1	11.5983	14.9914	3.43697
Series 2 (Grade 1-3)	12.0000	13.0009	1.09091
Series 2(Grades 4-6)	13.2500	16.5714	3.32146
Series 2(High School)	10.0769	13.3846	3.30769
Series 3(Grades 1-3)	11.3443	13.6066	2.26230
Series 3(Grades 4-6)	12.9524	16.3333	3.38095
Series 3(High School)	9.5652	12.9565	3.39130
Series 4	12.1587	14.6984	2.53968
Series 5	11.5556	14.3968	2.84127

3.3 Performance Evaluation of the Respondents by their Immediate Supervisors

Table 2 shows the performance evaluation of the respondents by their immediate supervisors before and after the training.

It is reflected on the table that 6 out of the 14 performance indicators exceeded expectation by the respondents before the training. The highest weighted mean is leadership which is equivalent to 3.90. This was followed by responsiveness and quality of work with weighted mean equivalent to 3.8 and 3.7, respectively. From the 8 performance indicators which were rated as meet expectations, the lowest weighted mean was recorded in the indicator pertaining to the respondents' knowledge of their work which is equivalent to 3.2. Generally, the performance evaluation of the respondents before the training was described as "meet expectations" as reflected in its weighted mean of 3.4.

TABLE 2
PERFORMANCE EVALUATION OF THE RESPONDENTS BY THEIR IMMEDIATE SUPERVISOR

Indicators	Before the Training		After the Training	
	WM	VD	WM	VD
Administration	3.2	ME	3.8	EE
Knowledge of Work	3.1	ME	3.9	EE
Communication	3.2	ME	3.9	EE
Interpersonal Relationship	3.2	ME	3.9	EE
Responsibility and Commitment	3.5	ME	3.8	EE
Human Resource Management	3.5	ME	3.7	EE
Decision Making	3.2	ME	3.8	EE
Independent Action	3.2	ME	3.6	EE
Job Knowledge	3.4	ME	3.7	EE
Quality of Work	3.7	EE	3.8	EE
Leadership	3.9	EE	4.1	EE
Managing Change and Improvement	3.5	EE	3.8	EE
Initiative/Creativity	3.4	ME	4.0	EE
Responsiveness	3.8	EE	3.9	EE
Average	3.4	ME	3.8	EE

Legend:

- 1.00-1.49 Unsatisfactory (U)
- 1.50-2.49 Below Expectations (BE)
- 2.50-3.49 Meet Expectations (ME)
- 3.50-4.49 Exceed Expectations (EE)
- 4.50-5.00 Outstanding (O)
- WM – Weighted Mean
- VD – Verbal Description

The table also shows that after the training, all the 14 performance indicators were rated exceeded expectations by the respondents, with weighted mean ranging from 3.9 to 4.1. The leadership indicator still posits the highest weighted mean of 4.1 after the training. This is followed by the indicators referring to initiative/creativity and knowledge of work with weighted means equivalent to 4.0 and 3.9, respectively.

These findings indicate that the respondents enhanced their efficiency in accomplishing work assignment, establishing challenging goals, delegating and coordinating task, promoting innovation and team effort, and directing works flow in assigned areas to meet the goals. Moreover, the respondents seek out new assignments, propose improve work methods and find new and better ways of doing things.

In general, the performance of the respondents after the training as evaluated by their immediate supervisors is described as "exceed expectations" with a weighted mean of 3.8. This finding clearly emphasizes that the Mathematics Training Series are deemed relevant in assisting the respondents attain competence and success in their teaching profession and excellent work performance evaluation.

3.4 Extent of Utilization of the Knowledge, Skills, and Technology Gained from the Training

Table 3 indicates the results of the analyses on the extent of utilization of the knowledge, skills, and technology which the

respondents gained and learned from the Mathematics Training Series.

It can be noted from table 3 that Series 2 posted the highest evaluation rating by the respondents in terms of the extent of utilization of the knowledge, skills and technology they learned from the training as mirrored by its weighted mean of 3.84.

TABLE 3
 EXTENT OF UTILIZATION OF THE KNOWLEDGE/SKILLS/TECHNOLOGY GAINED FROM THE TRAINING

Training Series	Extent of Utilization	
	WM	Description
Series 1	3.67	Often Used
Series 2	3.84	Often Used
Series 3	3.28	Sometimes Used
Series 4	3.46	Sometimes Used
Series 5	3.35	Sometimes Used
Average	3.52	Often Used

Legend:

- 1.00-1.49 Never Used
- 1.50-2.49 Seldom Used
- 2.50-3.49 Sometimes Used
- 3.50-4.49 Often Used
- 4.50-5.00 Frequently Used

Such result implies that the relevant concepts and mathematical skills related to the topic Optimizing Mathematics Learning through Technology are often used and often applied by the respondents in their mathematics classes. The computer-aided technology in mathematics like the Algebraator, Infinite Algebra, and Infinite Geometry learned from the said series provided the respondents with a technology-based, accurate and fast way of generating test items and performing operations involving real numbers, algebraic expressions, solving word problems, and others.

On the other hand, the respondents also often use their relevant learning from Series 1 with a weighted mean of 3.67. The topics included Mathematical investigation, problem-solving approach to teaching mathematics, and the different strategies in the management of learning.

Further results of the evaluation revealed that the knowledge and skills that the respondents gained and acquired from the said training series were rated highly applicable in their profession, with a weighted mean of 4.1. Most of the teaching strategies discussed during the training series are now used and implemented by the teacher-trainees. Moreover, the technologies in mathematics that they have learned are now integrated in the delivery of instruction.

Generally, the respondents often use the skills, knowledge, and technology that they have learned from the Mathematics Trainings Series as shown in the average weighted mean of 3.52. These findings indicate that the topics selected by the faculty members of the Mathematics and Allied Discipline Department were relevant to the teaching profession. Further, the result is a reflection of the department's assessment of the needs of the respondents prior to the conduct of the training.

3.5 Immediate Benefits Gained from the Training

The results of the data-gathering revealed that 97 respondents or (23.04%) claimed that they gained knowledge/skills applicable to their work as teachers. Moreover, (19.01%) of the respondents agreed that they became more confident in performing their work and they became more efficient and productive. Only 3 or (0.71%) of the respondents claimed that they did not gain anything from the training.

The findings verify that the Mathematics Training Series facilitated the participants in gaining important knowledge and skills which are relevant to their teaching profession. Moreover, they had improved their confidence in teaching mathematics because of the strategies, skills, and technologies they have learned from the training. Consequently, they improved when it comes to teaching competencies and they became more productive at work as a result of the technologies in mathematics that they have learned and acquired that helped them maximize the use of their instructional time.

3.6 Long-term Benefits Gained from the Training

Through the Mathematics Training Series, most of the participants gained the respect of their peers and improved their teaching competencies, efficiency and productivity. They also led the initiation of innovation in the quality of mathematics teaching in their respective schools. Aside from these, most of the respondents were given important roles and were given promotion or critical designation to assume as a consequence of their improved skills and competencies.

3.7 Difference between the Means of the Pretest and Posttest Scores of the Respondents

Table 4 below shows the results of the tests of difference between the pretest and posttest means of the respondents' scores in all the five series of the training.

From the table, it can be noticed that the p-values of all the groups of respondents in all the five series of the training are lower than the 0.05 p-value. It can be concluded then that the means of the scores of the respondents in the pretest and posttest are significantly different. Thus, the respondents gained significant increase in terms of knowledge, skills and competencies through the Mathematics Training Series.

TABLE 4
 TEST OF DIFFERENCE BETWEEN THE MEANS OF THE PRETEST AND POSTTEST SCORES OF THE RESPONDENTS

Immediate Benefits	Mean Difference	t-value	p-value
Series 1	3.43697	10.589	0.000*
Series 2 (Grade 1-3)	1.09091	2.238	0.036*
Series 2(Grade 4-6)	3.32146	5.362	0.000*
Series 2 (HS)	3.30769	3.998	0.002*
Series 3 (Grade 1-3)	2.26230	7.852	0.000*
Series 3 (Grade 4-6)	3.38095	7.554	0.000*
Series 3 (HS)	3.39130	6.041	0.000*
Series 4	2.53968	6.604	0.000*
Series 5	2.84127	12.239	0.000*

Legend: *significant at 0.05 level of significance.

It can be recalled that the mean differences of the pretest and posttest scores of the respondents are all positive. The respondents gained higher scores in the posttest as compared to the results of the pretest. This reflects that the respondents improved their performance in the posttest after the training. The findings confirm that the Mathematics Training Series helped the participants gain competence in teaching mathematics through various innovative modalities like the problem-solving approach. Moreover they improved their skills in establishing mathematical investigation, proof and proving, assessment methodologies in the mathematics classroom, and data management and analysis. Thus, the Mathematics Training Series is considered as one effective means of improving the teaching skills and competencies of mathematics teachers.

3.8 Difference between the Performance Evaluation of the Respondents by their Immediate Supervisors

Table 5 highlights the results of the test of difference between the performance evaluations by their immediate supervisor.

The mean of the respondents' performance evaluation by their immediate supervisors increased from 3.4143 before the training to 3.8357 after the training series. It can be noted also from the table that the p-value of 0.000 is lower than the level of significance of 0.05. It can be concluded that the performance evaluation of the respondents before and after the training is significantly different. Thus, the Mathematics Training Series is effective in improving the competencies of the teachers in terms of conceptual knowledge, skills, and use of technology in the delivery of instruction in mathematics.

TABLE 5
 TEST OF DIFFERENCE BETWEEN THE PERFORMANCE EVALUATION BY THE RESPONDENTS' IMMEDIATE SUPERVISORS

Training Series	Mean	Mean Difference	t-value	p-value
Before the Training	3.4143			
After the Training	3.8357	0.42143	6.593	0.000*

Legend: *significant at 0.05 level of significance.

4 CONCLUSION

Based on the findings of the study, the researchers concluded that majority of the respondents are female, middle aged, elementary level teachers and holding Teacher 1 position. The Mathematics Training Series helped the respondents improved their mathematical knowledge and skills. It also aided the respondents in enhancing their competencies in terms of administration, knowledge of work and responsiveness. The knowledge, skills, and technology learned from the Mathematics Training Series are useful to the respondents. Moreover, the Mathematics Training Series was beneficial to the respondents in terms of gaining relevant knowledge and skills, and in developing confidence and efficiency at work. Further, it enabled the respondents in attaining the respect of their supervisors and in gaining important function and responsibility at work. Generally, the Mathematics Training Series is effective in enhancing the knowledge, skills, and job performance in mathematics of the respondents.

5 RECOMMENDATION

Based on the findings, the following were recommended:

1. Mathematics teachers of all age levels are encouraged to attend trainings, seminars, workshops and other that are related to their field.
2. Mathematics teachers may constantly aim at improving their knowledge and skills by attending seminars, trainings, and workshops in mathematics education.
3. Mathematics teachers may constantly aim for the development of their competency in terms of leadership and responsiveness. Organizers of training, seminars, workshops, and conference in mathematics are also encouraged to conduct an analysis of the needs of the target audience to ensure that the trainings are relevant in enhancing the knowledge and job performance of the audience.
4. In the conduct of training, seminars, and conferences in mathematics, the need and interest of the target group audience may be considered.
5. The Mathematics and Allied Disciplines Department and other Mathematics Organizations are also encouraged to continuously organize and conduct relevant trainings, seminars, and workshops in mathematics.
6. The Mathematics and Allied Disciplines Department and other Mathematics Organizations are encouraged to organize more trainings and seminars that target the improvement of mathematics teachers' competencies and overall job performance.
7. The Mathematics and Allied Disciplines Department may extend the Mathematics Training Series to other groups of Mathematics Teachers in the province and in the region which is deemed effective in enhancing knowledge, skills, and job performance of the mathematics teachers.
8. The Mathematics and Allied Disciplines Department are encouraged to continuously deliver relevant services for various professionals in the community through seminars, conference and trainings.
9. Similar study may be conducted to validate the results of their study. Researchers may evaluate other aspects of the Mathematics Training Series to further verify its relevance and effectiveness.

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