Effectivenss of Teachers' Training Programme in Mathematics at Secondary Level

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Abstract

This is a research and experience based article. The research was carried out in Kathmandu district. The major objective of the study was to find the degree of the effectiveness of teachers training in teaching of mathematics in secondary level. This research was mainly carried out on the two null and alternative hypotheses. They were (a) there is no significant difference between the results from trained and untrained teachers, and (b) the result from trained teachers is better than untrained teachers.

The study was both quantitative and qualitative in nature. The T-test was applied to compare the mathematical achievement of the students taught by trained and untrained teachers. In the test, the mean and the Standard Deviation (SD) were calculated and shown diagrammatic reprehensive in the analytical part. One hundred and 28 students and four teachers were selected as sample of the study. The researcher found that the teacher's language and appearance in the classroom, use of board and command over the subject matter were found satisfactory where as the aspects of teachers' preparation and the use of instructional material were found poor in mathematics . Similarly, in the initiation of lesson, sequence of subject matter, students' participation, teacher's activities and conclusion of the lesson were not found satisfactory.

Abbreviations used

Key Words: achievement, public schools, privet schools, trained teacher, untrained teacher, secondary level, effectiveness, investigation.

Introduction

Training can be defined in different ways. Training is a process to impart special skill to a person through practice. Teacher training is a programme in which they are trained to teach their students using scientific techniques and methods. "Training is to prepare or be prepared for a job, activity or sport, by learning skills or by mental or physical exercise." (Cambridge International Dictionary of English, 1995: p1548). It is an occasion of practicing skills and doing exercise. According to Oxford Advanced Learner's Dictionary Training is "process of preparing or being prepared for a sport or job."

Accepting the need and implication of mathematics in daily life, Roger Bacon said: Mathematics is the gate and key of the science. Neglect of mathematics work injury to all knowledge, since he who is ignorant of it cannot know the other sciences or it can not know the other sciences or the things of world. And, what is worse, men who are thus ignorant are unable to perceive their own ignorance and so do not seek a remedy. (Eves, 1983: p.65)

In the context of Nepal, the subject mathematics has been accepted as one of the components of education system since the time of Vedic Period. During the period of Vedas, the sacred writings of the Hindus were composed one of these "treats mathematics". Formerly, mathematics had been included as a subject of instruction in every level with the establishment of Durbar High School in 1854 AD during the Rana regime. Till 1950 AD, the progress of education in Nepal was taking place neither at sufficiently quick take place

nor in a really systematic manner. Since the dawn of democracy in 1951 AD, an awareness of the value of education swept through the country. New schools started to established and school enrolment increased on an unprecedented scale. In 1971 AD, the NESP was introduced with aim of systematic development in the country. The National Educational System Plan (NESP) declared the national, levelwise and classwise objectives and developed new curriculum for every level of schools. The NESP mathematics curriculum (1971 AD) has stated the role of mathematics in every life.

A well grounded understanding of mathematics is essential for everyday life as well as for higher study in the field of science and technology. Students apply mathematical concept, skill, logical reasoning to many different kind of problems not only as student but also as adult. No matter, what occupation student choose in his adult life, a mastery of mathematical concept, skill and processes will certainly increase his efficiency and effectiveness. (Sidhu, 1997). The NESP has also emphasized to make mathematics life oriented. Mathematics has been taught as a compulsory subject in each level of school education system in Nepal. Now, National Centre for Educational Development (NCED) is an apex body for school level in service training. All university has responsibility for pre-service training. According to the School Sector Reform Program (SSRP), the NCED lunched Teacher Professional Development Programme (TPD) some years ago. According to the TPD, every community school teacher is supposed to complete 3 modules of the programme in five-year period. A module consists of three segments. One full course of the TPD consists of three segments : Module I, II and III. One module is of 10-day period. Similarly, the 10-day period of a module has been segmented into 3 parts as: Training Workshop (TW), Self-Study Exercise (SSE) and Instructional Councelling (IC). The TPD is also called teachers' need based training. For the successful implementation of the progamme, the NCED mainly conducts several support programmes like Master Training of Trainer (MTOT), trainer packages development and follow up support, etc. Similarly, other supporting programmes like Trainer of Training (TOT), packages development and follow up support are also conducted by Educational Training Centres (ETC) in regional level and Lead Resource Centre (LRC) in local level. Finally, basic but core programmes like teacher training, need collections, modules development and follow up support programs are implemented by LRCs and RCs.

In the background given above, this study has made an attempt to investigate the effectiveness of teachers training program in mathematics at secondary level on the basis of students achievements and to explore the teaching strategies followed by trained and untrained teacher in mathematics.

Chart 1
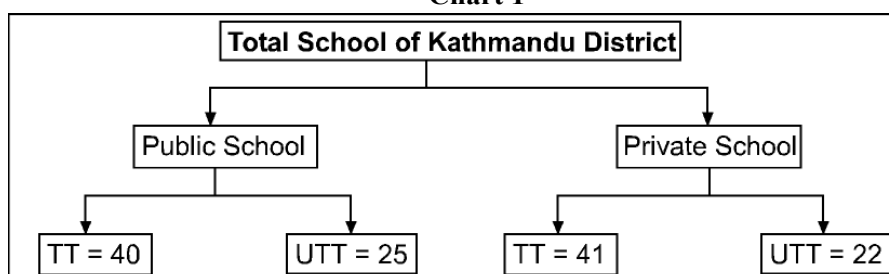
Where, TT = Trained Teacher and Untrained T = Untrained Teacher.
The present study entitled "Effectiveness of teachers training program in mathematics

at secondary level" was quantitative as well as qualitative in nature. It was designed to examine the effectiveness of the teacher training programme at mathematics in secondary level. The present research has been conducted in the eastern side of Kathmandu district. For quantitative data, researcher has been selected the result of grade ten students from four schools. Among them two involved trained teachers and other two involved untrained teachers. A short description has made in strategies and process adopted by teachers at the time of teaching in class room. Data has been collected statically from the second term examination record of class ten students of the year 2068 B.S.

Analysis and interpretation of data

Data were tabulated and analyzed using mean variance and one tailed t-test at the 5%level of significance.

Table 1
Distribution of Mean Scores and Standard Deviation

SN	Group	Result	Total no. of students	Mean	S.D.
1	Public school (A)	Trained teacher	40	54.80	19.09
2	Private school (B)	Trained teacher	41	65.01	11.02
3	Public school (C)	Untrained teacher	25	49.84	18.14
4	Private school (D)	Untrained teacher	22	37.68	8.03

The data were analyzed among the following group and bar-graph also drawn to show the comparative study.

1. Comparison of mean scores and standard deviation between public school trained and public school untrained teacher.

2. Comparison of mean scores and standard deviation between privet school trained and privet school untrained teacher.

The comparison of mean scores between public school trained and public school untrained teacher and privet school trained and privet school untrained teacher have been presented in table in Table 2, and 3 respectively.

Table 2
Comparison between public trained and public untrained teacher

Groups	No. of students	Mean	S.D.	t-value	Level of Significance one tailed at 5%
Public Trained (A)	40	54.80	19.09		
Public Untrained (C)	25	49.84	18.14	1.71	

One-tailed t-test; $t_{0.05,42}$ =1.645

In the Table 3, above the summary statistics of the achievement scores of the two groups' public trained and public untrained are presented. The table also presents the mean and the standard deviation of both groups with their t-value in the sample No. 40 and 25. The mean score obtained from public trained was 54.80 and the S.D. 19.09. Similarly the means scores obtained from public untrained was 49.84 and the S.D. is 18.14. In the table, we can see that the mean score of public trained was higher than the mean score of public untrained and the S.D. of public trained was also higher than the S.D. of public untrained. From Table 3, t-value (calculated) was 1.71 and t-value (tabulated) was 1.645 at the 5% level of significance and 42 degree of freedom. This shows that t-value (calculated) is greater

than t-value (tabulated). It indicates that there is significance difference between the mean scores of result from trained teacher and the mean score of result from untrained teacher. Hence, the null hypothesis $H_o: \mu_1 = \mu_3$ was rejected and the alternative hypothesis $\mu_1 > \mu_3$ was accepted i.e. the result from trained teacher is better than the result from untrained teacher.

Table 3
Comparison between private trained and private untrained

Groups	No. of students	Mean	S.D.	t-value	Level of Significance one tailed at 5%
Private Trained (B)	41	65.01	11.02	11.29	
Private Untrained (D)	22	37.68	8.03		

One-tailed t-test; $t_{0.05,42} = 1.645$

In the above Table 4 given above the summary statistics of the achievement scores of the two groups privet trained and privet untrained teachers are presented. The table also present the mean standard deviation of the both groups with their t-value in the sample No. 41 and 22. The mean score obtained from privet trained teacher was 65.01and the S.D. was 11.02. Similarly, the means scores obtained from privet untrained teachers was 37.68 and the S.D. is 8.03. Here, we can see that the mean score of private trained teacher was higher than the mean score of private untrained and the S.D. of privet untrained was also higher than the S.D of privet trained.

From the Table 4, t-value (calculated) was 11.29 and t-value (tabulated) was 1.645 at the 5% level of significance and 42 degree of freedom. This shows that t-value (calculated) is greater than t-value (tabulated). It indicates that there is significance difference between the mean scores of result from teacher involved in teacher training program and the mean score of result from teacher who did not participated in teacher training program. Hence, the null hypothesis $H_o: \mu_2 = \mu_4$ was rejected and the alternative hypothesis $\mu_2 > \mu_4$ was accepted. i.e. the result from trained teacher is better than the result from untrained teacher.

Findings, recommendation and future direction
a. **Comparison between trained and untrained mathematics teacher**
The present study found that the teacher training programme in mathematics at secondary level mostly effective but not sufficient. On the other hand, trained secondary level mathematics teachers had positive attitude than untrained mathematics teachers.

b. **Teacher preparedness**
The study showed that some trained teacher depended upon the mentally prepared lessons because they were smart enough to plan the classroom activities in written form. On the other hand, teachers, who were not rained, could not have better plan about the lesson. They were also not able to perform better in the teaching of mathematics at secondary level. It was also seen that their classes were less practicable. So, the lesson plan and its implementation should be compulsory developed and implemented in future.

c. **Use of teaching materials**
Most of the schools are using teaching materials like textbook, teachers guide, teaching aids and other instructional aids. Teaching materials prepared for the average suburban child do not meet the need of a vast number of secondary children. In the context of present study, both trained teachers had knowledge about teaching materials and seen that they

rarely use those materials but on the other hand, untrained teacher also had the little idea about different teaching materials but they did not use any kind of material, mostly they used lecture method in the explaining section. So, this types of lecture method should be replaced with practical and child-centered methods.

d. Teaching process

Secondary level mathematics teachers expected to use different methods of teaching while teaching different topics of mathematics. Both trained and untrained teachers used lecture method. Sometimes, the teachers used more than one teaching method in the same class and more of the untrained teachers believed traditional teaching methods. So, Child friendly and child friendly methodology should use to replace the traditional approach in their teaching learning process.

e. Child learning practice

Learning in our rural secondary schools takes place mostly thought rote learning and memorization, but thinking to learn through problem solving and creative activity is not yet in practice. Most of the children in the secondary classroom spend their time in non-learning activities because of the distraction caused by poor physical facilities, absence of teachers and lack of proper enthusiasm. So, the child learning process should be based on child-friendly. Similarly, by maintaining the regularity of the teachers in mathematics classes, assignment of project work and other practical work according to the curriculum should also be given.

f. Homework assigned

Homework is one of the several instructional factors which should be taken into account which is substantial. The practice of doing homework leads the students to have better result. It is only possible when teacher encourages his/her students for practicing lesson/exercise. In this regard, this field observation showed that most of the children were not found so sincere about their homework, although the trained teacher had assigned home-works. It was also found that the main reason of not doing homework was due to the teacher's negligence of correction, as the response given by the students. Similarly, it was also seen that the most of the works were carried out by the teachers themselves.

g. Teaching activities of teachers in classroom

Most of the secondary teachers were not found satisfactorily aware of aims and instructional method of teaching in secondary level. The use of knowledge and skills acquired from the training were found reflected in the range of teaching activities of teachers in the classroom. Student motivation, variety in teaching methods, use of educational materials, interaction between teachers and students, teachers mobility in the classroom presentation style of instruction, students efficiency, student discipline and student evaluation etc reflected by trained teacher were found much better than untrained teacher.

h. Interest, motivation and attitude

Mathematics teachers generally have positive attitude toward training because they think positive attitude is important in teaching learning process. But the mathematics trainings are not satisfactorily developing fully interest, motivation and positive attitude toward mathematics. So, the training should develop interest, motivation and positive attitude towards training. For this, training should be need-based, research and project based, computer and technology based, involving games, puzzle, etc. Similarly, it should be

daily life orientated, historical, addressing the ethnic society, 21th century's mathematics, applied, practical, based and addressing of crosscutting issues. In other area, the ministry of education and their related organization can develop and implement the training curriculum based on some newly developed approach to teaching like Value-based Education (VBE), *Yoga, Dhyan,* meditation, life cycle management, positive thinking, creativeness, spiritual development etc.

i. **Policy and implementation level**

The training conducted by NCED, ETCs and LRCs/RCs is semi practical based. The NCED had no mathematics lab in the past. From the fiscal year 2070/071 BS, the NCED has been establishing mathematics and science lab. The ETCs have general science lab and some mathematics related materials but not frequently used. So, the NCED needs a national level mathematics lab with the collaboration with other educational bodies and institutions like CDC, HSEB, DOE, OCE, universities etc. Some national and international agencies like Japan International collaboration Agency (JICA), AIT (Asian Institute of technology (AIT), international mathematics organizations, etc can be other potential organizations to work in collaboration in this field. All the ETCs and the LRCs/RCs need well equipped mathematics lab, because they conduct the training programmes in local level. Not only this, all the schools also need mathematics corner in the class and a separate mathematics lab for all the classes. Such programme of establishment of math corner and the lab can be implemented through the NCED collaboratively with national and centre level organization like CDC, OCE, DOE and other related national and international professional and donor organizations. In future, NCED, ETCs, LRCs/RCs as well as the schools are suggested to establish a separate mathematics lab to make mathematics easy, interesting and practical. Similarly, subject-wise lab can also be established as prescribed by curriculum.

j. **Curriculum and evaluation**

According to the national curriculum, the evaluation system is fully paper-pencil based in mathematics subjects from Grade 1 to 12. So, the bodies like Curriculum Development centre (CDC), Higher secondary Board (HSCB) and universities must include internal assessment 20 to 50% with project work, materials development, ethnic mathematics, historical mathematics and their research, applied mathematics, etc. For examples historical mathematics like *Ghadi, Pala, Bipala,* use of traditional Nepali calendar (*Patro*), Sever (work of land measurement), making materials, mathematical arts and crafts, historical and modern mathematical patterns and measurements (muthi, mana, pathi, ana, ropani, biga,etc) can also be appropriate content areas.

Conclusion

The effectiveness of teachers' training program is a matter of the extent of transformation of training skill in the classroom instruction. It mainly depends up on the positive attitude of the teacher. If the teachers have good and positive attitude they can bring variety to the teaching by incorporating several concepts of mathematics like Value-based Education (VBE), *Yoga, Dhyan,* meditation, life cycle management, positive thinking, creativeness, spiritual development etc. Then only, the teaching of mathematics can be made need-based, research and project based, computer and technology based. Similarly, the act of teaching mathematics in school should be daily life orientated, historical, addressing the ethnic society, 21th century's mathematics, applied, practical, based and addressing of crosscutting issues. For doing all these, only the teachers are not alone, but also the government body like

Ministry of Education and other implementing bodies are also seeking the potential area to support the mathematics teachers by launching several teacher development programmes and material construction, development and distribution programmes through the system. Main thing is to have positive attitude and desire to learn in the teachers.

[ADB: Asian Development Bank, BPED: Basic and Primary Education Project, CERID: Research Centre for Educational Innovation and Development, CERD: Centre for research Education and Development, FGD: Focus Group Discussion, ICS: Institute of Community Service, MOES: Ministry of Education and Sports, NESP: National Educational System Plan, ODA: Overseas Development Administration, SEDP: Secondary Education Development Project, TTP: Teacher Training Programme, ETC: Educational Training Centre. SSRP: School Sector Reform Program, TPD: Teacher Professional Development Program, MTOT: Master Training of Trainer, TOT: Trainer of Training, LRC: Lead Resource Centre (LRC), RC: Resource Centre.]

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