Exploring the Effectiveness of Science Training Program on the Performance of Science Teachers at Secondary School Level of Khyber Pakhtunkhwa

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Abstract

*The study was carried out to check the role of training need, training content, teacher performance, instructional strategies and training assessment on training effectiveness. The research study utilized mixed method approach. A total of **710** science teachers from all the seven divisions and 26 districts of Khyber Pakhtunkhwa were trained, therefore all the **710** science teachers of the Secondary/ higher secondary Schools in all districts of Khyber Pakhtunkhwa constitute the population of this research study. The study was restricted to **248** science teachers as stated in the table given by Krejcie (Krejcie & Morgan 1970). SSTs are categorized as SST (General) and SST (Science); SST (science) is further classified in two categories namely SST (Mathematics- Physics) and SST (Biology-Chemistry). Training was conducted by PITE in 2016, with the assistance of DFID and ASI for both the science categories i.e. SST (Mathematics-Physics) and SST (Biology-Chemistry). These science teachers were selected randomly out of the defined population for the study using simple random sampling. The questionnaire was applied to gather data from the participants in the post training areas. For data collection five point's Likert scale questionnaire was used. The primary data was gathered with the help of questionnaire developed for secondary school teachers. The effectiveness of the training was judged from various angles. Findings of the study revealed that training is having positive effect on the performance of teachers in terms of improved knowledge and practical skills about latest instructional and assessment strategies. 88% respondents were found to be satisfied with the training program and agreed that a trained teacher ensures holistic development of the students. The training program was found to have developed knowledge and practical skills as well as aesthetics sense in the teachers and trained them to use low cost materials and AV aids to achieve SLOs. However, the study found dissatisfaction among the respondents about the follow up of the training, the selection of venues and selection criteria of the teachers.*

Keywords: PITE, science training, Effectiveness, Instructional performance

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Introduction

Education is the key to holistic development of an individual and a pathway to success. It is well established fact that existing advancement in the field of science and technology can be truly attributed to present educational development as mentioned by Bregman & Muhammad, (1998). All the educationists have consensus upon the matter that education is the key indicator to determine the position of a particular country among other nations of the world. A country with better education system and research environment will have high ranking and will definitely lead the world. Development of individuals is being considered as of prime significance in a developed society. Education is needed not only in personal capacity, but also in national capacity.

The relationship of science education with personal, social cultural, economic and utilitarian growth has been well documented (Driver et al.1996, Millar 1996, Jankins 1997).

Present day is the era of rapid changing world as we are witnessing advancement in science, technology, culture and education. The needs of the societies and world have rapidly changed. These rapid changes also affected the curriculum and teaching learning styles and specially science education. The role of the teacher is more challenging than ever, so no more stereotyped teaching method is acceptable. The shape of the traditional classroom has changed over the last two decades. Many electronic gadgets have come into play in modern education system. Keeping pace with changing needs of the society, educators are supposed to be equipped with the new practices and tools to prepare his students for future needs. A nation's worth is evaluated by the quality of its teacher as stated by John Dewey (1996).

The science teachers now witness more challenges like handling over-crowed classroom, limited time issues, less practical knowhow issues and space issues for group work etc. Poon, Tan and Tan (2009) suggest that the curriculum, instruments and methodology must be arranged to incorporate additional hands-on activities to encourage practice.

Robertson, (2007) suggests that teachers can employ a number of approaches of science teaching, inquiry methodology can present learners with 'hands on experience' and to provide learners sufficient content knowledge, the teacher can reinstate direct approach in selected areas.

All these trends demand for the periodic trainings session for teachers working in the field. According to Antonio et al (2003), training has numerous benefits to an organization in terms of economic, social and personal levels. Jeeyon (2005) states that the prime objective of the

training is to develop the staff member's awareness and expertise as well as to better job performance and outcomes in the respective field.

According to researchers, the trainings increase intellectual aptitude of the learners, reduce the level of anxiety and promotes self-efficacy (Colquitt et al, 2000). Kazmi et al (2011) regard training as catalyst which broaden vision, redefines role and significant change in a teacher's personal knowledge base and skill set. The training program which enables teachers to master content areas is suited for teacher's effectiveness as explained by Ngala and Odebero (2010).

Vermunt (2014) is of the view that superior class teacher's learning influences student learning results. In-service training helps teachers to be competent enough in building their capacity and improve their level of productivity (Issahaku, Ahmed & Bewa-Erinibe 2014).

For this purpose, PITE conducted training need arrestment (TNA) to investigate the real needs of the science teachers of the secondary classes at the higher secondary and high schools. It explored the areas of the Chemistry, Physics and Biology; found difficult by the teachers and students. It also aimed at finding out the challenges the teachers face in integrating the practical work with the class room teaching.

After that a Training Program for Science Teachers has been initiated by the PITE for Secondary School level (Science teachers) in all the districts of Khyber Pakhtunkhwa in phase wise manner. The main objectives of this training were to equip science teachers with knowledge of National Curriculum 2006, share National professional standards (NPS) for teacher in Pakistan with them along with the subjective training of Physical and Natural sciences regarding methodology and contents. Based on assessment data, material in the form of Modules was developed and refined. A number of relevant videos were downloaded from the internet and subject wise CDs were compiled. A list of support material from internet was also developed. It was pilot tested for checking its validity and reliability along with the time needed and resources supplied. The training was delivered through cascade model.

So, this study focused to evaluate the usefulness of training program for secondary school science teachers in their academic performance.

Statement of the problem

Although training was conducted by PITE but no follow up mechanism is available in the department; thus, the effectiveness of training and teachers' performance remains a sign of question. The purpose of the current study was to evaluate the Effectiveness of Science

Training Program by PITE on the Performance of Science Teaches at Secondary School Level in Khyber Pakhtunkhwa.

Objectives of the research

a) To know the perceptions of trained teachers about the Science teachers' training program.
b) To find out the effectiveness of Science teachers' training program on the instructional performance of teachers at secondary level
c) To identify the hurdles faced by Science Teachers during teaching learning process.

Hypotheses tested

1. $H_0$1: There is no positive perception of trained teachers about science teachers' training program offered by PITE.
2. $H_1$1: There is positive perception of trained teachers about science teachers' training program offered by PITE.
3. $H_0$2: There is no significant effect of Science teachers' training program on the instructional performance of teachers.
4. $H_1$2: There is significant effect of Science teachers' training program on the instructional performance of teachers.
5. $H_0$3: The trained teacher faces no hurdles in the teaching learning process in real classroom situation.
6. $H_1$3: The trained teacher faces hurdles in the teaching learning process in real classroom situation.

Research Methodology

Nature of the study

The study is descriptive in nature and mixed method research approach was followed to evaluate the effectiveness of the training.

Population of the study

To develop the instructional capacity of both science categories PITE, with the assistance of DFID and ASI, arranged and conducted a training program Batch-1/2016 in which 710 science teachers out of 900 targeted for phase-I, were trained both from Urban and Rural areas of all the districts of Khyber Pakhtunkhwa. SSTs (science) are further classified in two categories namely SST (Mathematics-Physics) and SST (Biology-Chemistry).

Therefore all the 710 science teachers of the Secondary/ higher secondary Schools in 26 Districts of KP who received the training from PITE represented the population of this research study.

Parameter

S. No	Subject	Total Target set by PITE	Total Trained Teachers
1	Physics- Mathematics	348	288
2	Chemistry- Biology	552	422
Total		900	710

Sample size and Technique

In this study Simple random Sampling Technique was adopted to choose the sample of 248 teachers. This figure is in accordance with Krejcie and Morgan (1970) table and Raosoft sample size calculator.

Statistic

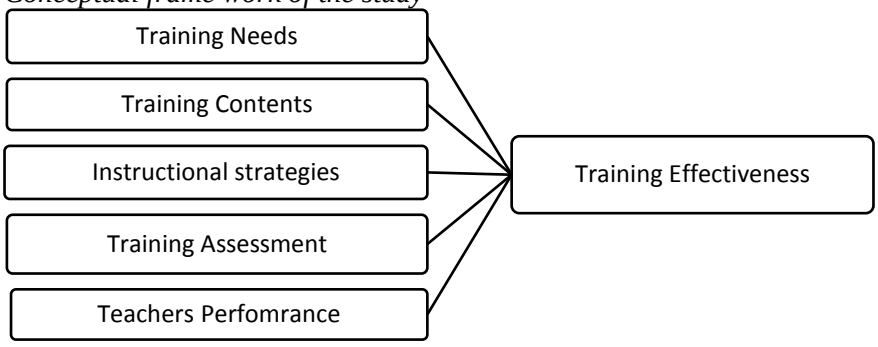
S.No	Subject	Total Trained Teachers by PITE	Sample size selected for Research
1	Physics- Mathematics	288	101
2	Chemistry- Biology	422	147
Total		710	248

Model of Evaluation followed

Research objectives	Kirkpatrick model
Perception	Reaction
Performance	Learning Implementation/ Behavior
Problem faced	Results

Table: Relationship of keywords

Conceptual frame work of the study



Tool used

The researcher used a self-developed structured, duly valid and reliable questionnaire based on 5- Point Likert scale as an instrument for data collection. After pilot study and refining process, this tool was used to gather data from the participants in the post training arena.

Finding of the Data Analysis

For the inferential analysis of the quantitative data, the researcher used factor analysis, regression analysis and ANOVA tests. The results of the inferential analysis for objective- 1 and 2 are discussed below:

Regression analysis:

Table-1: Variable dependency

Model	R	R Square	Adjusted R Square	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
1	.810[a]	.797	.797	.797	2274.911	5	242	.000

The above table is the result of model summary which has been used in the study to check the role of training need, training content, teacher performance, instructional strategies and training assessment on training effectiveness. The rate of R-square or coefficient of determination is .797 which shows that the independent variables have 79 percent effects on the training effectiveness OR training need, training content, teacher performance, instructional strategies and training assessment have 79 percent effects on the training effectiveness. The value of R or correlation coefficient is .810 which suggested that training need, training content, teacher performance, instructional strategies and training assessment and training effectiveness are related about 81 percent. The p-value of model summary is .000 which shows that the chosen model is statistically significant.

Table-2: Significance of Model

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	34.549	5	6.910	227.911	.000[b]
	Residual	.735	242	.003		
	Total	35.284	247			
a. Dependent Variable: training effectiveness						

The table shows the result of ANOVA model which has been used to verify the statistical significance of the model. The table includes the value of F-value which can be use in this regard. The standard of f-value is 4 and the value of the model is 227.91 which is more than standard and confirms that the chosen model is statistically significant.

Table-3: Regression parameter

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.290	.059		-4.943	.000
	Training need	.418	.020	.499	20.624	.000
	Training Content	.051	.029	.038	1.750	.081
	Teacher performance	.799	.030	.735	27.009	.000
	Instructional strategies	1.068	.021	1.043	49.850	.000
	Training assessment	.451	.018	.329	25.604	.000

The table is the result of regression parameter OR coefficient of regression. The objective of the table was to verify per unit change in the training effectiveness owing to training need, training content, teacher performance, instructional strategies and training assessment. The finding of beta and t-value suggested that training need have positive but significant impact on the training effectiveness. The findings also suggested that teacher performance, instructional strategies and training assessment are also having positive and significant while training content is having insignificant impact on the training success.

Part B of the questionnaire consisted of the open-ended questions; the responses of the teachers were reduced to themes to extract problems faced by the teachers in real classroom environment, managerial problems and other departmental problems. The result of objective- 3 is discussed below:

Results

i. Teachers are not having any cyclic or periodic training as suggested by National Education Policy document 2009. Only limited areas are focused in trainings while policy suggests a range of topics and areas concerning training field.

ii. There was lack of clear vision and scope of the departments as both PITE and DCTE are offering pre as well as in-service trainings simultaneously. Their roles are not clearly defined. This finding is based on the fact that mathematics subject training for science teachers was done by DCTE and now PITE is offering other science subjects.

iii. It was reported that the lack of coordination and communication exists between the main stakeholders that includes PITE, RITEs, DCTE, DEOs' offices and Directorate E&SE, this situation not only hinders the smooth process but also results in resource wastage.

iv. While collecting data, it was observed that the ratio of trainings and frequency is low as compared to number of teachers working in the department.

v. Linkage with the real-life situations, solutions needed by society, market needs and quality circle are not focused at any stage from need assessment and planning level to final evaluation stage.

vi. It was reflected from the respondents' views that a number of discrepancies are present in the system. Reference based nomination culture reduces the dream of merit based human resource development.

vii. It was found that no proper follow-up and feedback system exists on ground, which reduces the impact of training to a large extent. The effectiveness cannot be gauged without proper evaluation process.

viii. The questionnaire shows unhappiness of respondents over the selection of venues, schedule, training timings as well as spontaneous nomination.

On the foundations of findings, the researcher suggests the subsequent steps to be taken for the improvement in efficiency and effectiveness of teachers.

Conclusion

The following conclusions were derived from the inferential statists discussed above and research findings:

1. The factor analysis, regression and ANOVA tests applied to tables suggests that there is strong positive perception of trained teachers about science teachers' training program offered by PITE, thus null hypothesis **$H_0$1** was rejected and alternate hypothesis $H_1$1was accepted.
2. The factor analysis, regression and ANOVA tests applied to tables suggests that there is significant effect of Science teachers' training program on the instructional performance of teachers., thus null hypothesis **$H_0$2** was rejected and alternate hypothesis $H_1$2 was accepted.

3. Part B of the questionnaire consisted of the open ended questions; These responses shows a number of hurdles which hinders the effective deliver of new methodologies and used of smart gadgets in real classroom environment; so keeping in view the above findings, the null hypothesis $H_0$3: The trained teacher faces no hurdles in the teaching learning process in real classroom situation is rejected and **$H_1$3** is accepted.

Recommendations

i. It is hereby recommended that action plan and implementation framework may be developed for implementation at provincial level. Every teacher must go through one compulsory refresher course in three years period.

ii. The scope of the institutions may be clearly defined by the department as conflicts wastes resources. PITE and DCTE should bridge the gap between their approaches and training programs.

iii. Lack of coordination can be reduced to a large extent by making annual plans and annual calendars of trainings schedules, making it public through their official websites and media in advance, so that all the stakeholders make in time arrangements without any hassle and conflict. Training timings and venues should be properly selected as per andragogical needs. Appropriate funds must be allocated to trainings for more frequent and regular services throughout the year.

iv. To cope with the low frequency of the trainings, it is recommended that modern trends and technology should be used.

v. At cluster level, groups of subject teachers should meet on monthly basis to discuss hard areas. At departmental level, blended learning methodologies should be promoted. Training institutes should be fully equipped with modern gadgets. E-learning, video conferencing, online learning should be promoted at departmental level. At provincial level, online learning portal should be developed where teachers can make an online account and enroll to share their experiences and problems. Software and smart phone applications should be made for teachers in user friendly manner.

vi. Teachers should be provided with smart tablets and modern electronic gadgets. Schools should be equipped with smart boards and internet facilities with online libraries access. Teachers' promotion should be linked with online tests in the respective

subjects. Subject based research activities should also be the part of teachers' assignments.

vii. A special check unit like independent monitoring unit (IMU) is recommended for follow-up activities and to check the impact of trainings on grounds.

viii. The training success is mostly related to the evaluation of training and this can be done only when the model of training has been undertaken and the activities involved in the training.

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