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CORRELATION BETWEEN THEORETICAL PEDAGOGICAL KNOWLEDGE AND TEACHING PERFORMANCE OF NEWLY RECRUITED TECHNICAL TEACHERS OF WESTERN REGION OF INDIA - A CASE STUDY

Abstract:

The purpose of this research through a case study was to find the correlation between theoretical knowledge about pedagogy and teaching performance of newly recruited and less experienced faculty members of Engineering Colleges and Polytechnics. In India the basic qualification for recruitment of faculty for Engineering and Polytechnic Colleges is post graduation in their respective branch of engineering and mostly they don't have any education or training in pedagogy related aspects of teaching and learning. Therefore, the recruited novice teachers are inducted in the teaching profession by providing them a rigorous training of two weeks induction training programme on pedagogy and educational technology aspects. At the end of two weeks training, each teacher was asked to teach in a simulated teaching setting having a session of 15 minutes duration to demonstrate these teaching skills. Performances of teachers were assessed on different aspects on a five- point rating scale. To ascertain the understanding of teaching-learning process and pedagogy, an assessment test based on 50 multiple-choice questions related to education technology and pedagogy aspects such as domains of learning, learning principles, methods of instruction, student assessment etc were asked. The study was carried out to ascertain the correlation of teacher's performance in their teaching sessions with the response on multiple choice questions. We administered a test of 50 multiple-choice questions to about 80 newly recruited teachers of different engineering disciplines. This paper discusses the correlation between the two kinds of assessments, namely teachers' understanding of the concepts related to effective teaching and their actual teaching performance.

Keywords:

pedagogy, educational technology, simulated teaching, rubric,student assessment

JEL Classification: I23

Introduction

India has become the permanent signatory member of the Washington Accord on 13th June 2014 and hence the focus of technical education system in the country is undergoing a paradigm shift towards quality and excellence (NBA, 2019). In this changed scenario, the competencies and abilities expected of technical teachers' need to be transformed to match the changed need of the stakeholders. This is all the more true as teachers joining the technical education system will be serving the system for the next thirty to forty years and hence this training on pedagogy and educational technology aspects is of utmost importance (AICTE,2018). Pedagogical knowledge is the knowledge about teaching and learning that is not topic-specific, such as knowledge of learning theory, classroom management, and student motivation (Auerbach and Andrews,2018).

Traditionally a teacher of a technical institution does not get any formal exposure to the teaching strategy and methodologies during the formative period in the professional courses pursued by them. So the teacher, at the beginning of their teaching career, starts teaching on the basis of models of teaching experienced by them during the student days and gradually through practice over the years and by trial & error refines teaching methods. At the same time, the classroom environment is fast changing because of the changing landscape of the world at large. There is a need to augment the teacher's ability for effective instructional delivery. Induction Training Programs are very crucial for the teachers of any discipline who wish to continue in this noble profession. Newly recruited teachers joining the technical institutions expected to accept the multi-dimensional roles and responsibilities in the changed teaching-learning environment. Some technical institutions have adopted 'mentoring system', in which each newly recruited teacher on teaching practice are attached to qualified and experienced teachers who work as their mentors (Maphosa and Shumba, Jenny and Shumba, 2007). Radhakrishnan (2009) emphasizes that 'systematically planned and need-based approach' for identification of professional development needs should be a periodic process involving all levels of teachers.

However, National Institute of Technical Teachers' Training and Research (NITTTR) Bhopal, for a long time have been offering training programmes of various durations, ranging from two weeks to four weeks, for orientation of fresh teachers in the technical education system. All India Council for Technical Education (AICTE) recently felt the need for designing a systematic training methodology to provide necessary orientation, within a short duration, to the new entrants to the teaching profession. At the request of AICTE, the NITTTR Bhopal, being pioneers in the field of training of technical teachers, had designed an Induction Training Programme (ITP), of two week duration, for development of the competencies needed by fresh teachers of technical institutions having less than 5 years' experience. The programme was successfully conducted for teachers of various engineering and polytechnic colleges of western region of the country.

About the Induction Training Program

Purposes

This induction training program aims at developing basic teaching skills at the initial stage among the newly recruited teachers of polytechnics and engineering colleges. These training programmes serve two major purposes. One, teachers develop requisite knowledge, skills and desirable attitudes which enable them to implement outcome-based curriculum to help the students to achieve program educational objectives, program outcomes, course outcomes and other related outcomes to render them work ready for the world of work and to be responsible citizens in the society. perform the roles and responsibilities. Secondly, it will also be a stepping stone to prepare the teachers for their career advancement and assume higher responsibilities expected of them by their institutions effectively.

Learning Outcomes

The induction training programme had the following outcomes

a.   Expound the challenges and issues of Indian technical education system.
b.   Describe the roles and responsibilities of technical teachers.
c.   Formulate sample PEOs, contextualized POs, PSOs, Competency, COs, practical outcomes and other outcomes of identified programme and course.
d.   Formulate learning outcomes at different taxonomy levels of the three domains of learning.
e.   Prepare a list of micro/mini projects for achieving outcomes of courses
f.   Prepare list of activities for organizing guidance, counseling, mentoring and entrepreneurship.
g.   Plan to use instructional strategies/methods and media including technology enabled learning.
h.   Implement session/lesson plans, integrating principles of learning and events of instruction to develop stated outcomes.
i.   Design relevant type of questions to assess the achievement of stated outcomes.

An innovative approach to conduct induction programme :

The training programme was organised and executed in a conducive environment. At the beginning of the programme the teacher trainees were asked to present their expectations, as to what kind and level of teaching skills they expect to be developed. Each trainee was provided a separate sheet and asked to write his/her expectations. In the first and second week of training programme, inputs on various pedagogical themes were given by expert faculty members. After the each input session, trainees were asked to do task individually or in small group.

Jain(1998) in his paper discusses the salient features of the training of trainers programmes conducted by TTTI Bhopal, which was specially designed using the competency based approach to develop identified competencies in the context of present and future requirement of part-time trainers of the Indian cement industries. Some of the training strategies used were input-cum-discussion, assignment in small groups, discussion of case studies, development of relevant instructional media, and presentation of an instructional plan. Similarly, in this induction training

programme a variety of instructional approaches, methods and media were used for developing identified learning outcomes in the trainees. The instructional strategies used during the induction training programme were developed and implemented in the context of real classroom situation to make them more relevant. The use of these training strategies proved an effective method in measuring the various learning outcomes.

During the day before last day of second week of training programme, each trainee prepared fifteen-minute instructional session plan and presented during a teaching practice session. The teaching practice session offers an opportunity to a teacher trainee to develop and execute an instructional session plan in a simulated condition in a training programme. The peers perform the role of students in a simulated classroom situation. The teacher may involve them in the activities s/he has planned in the mock session. The execution of teaching session took place in front of peers and tutors. These individual presentations by the teacher trainees were video-recorded. The purpose of video recording of presentation is to provide an opportunity to see and identify one's own weaknesses. This self-feedback was also supplemented by peer as well as expert feedback which was recorded immediately after the completion of the fifteen-minute individual presentation. To develop the competency of providing feedback to others, a rubric was developed and various important criteria or performance indicators were mentioned. Moreover, faculty members also provided guidance for giving feedback. The need to provide constructive or positive feedback was also emphasized. This whole exercise and experience was termed as 'instructional practice'. This exercise provides the teacher a unique opportunity to realize one's own strengths and weaknesses.

Objectives of the Study

The study aims:

- to ascertain the understanding of pedagogy and educational technology aspects through multiple choice achievement test
- to devise suitable assessment tool for assessing simulated teaching performance of newly recruited and less experienced teachers of Engineering and Polytechnic Colleges
- to determine correlation between the teacher trainee performance in their theoretical pedagogical knowledge achievement test and simulated teaching practice

Research Questions

Based on these objectives, following broad research questions were formulated :

i.   Determine the extent of the learning by teacher trainees in theoretical knowledge about pedagogical aspects and improvement in their teaching performance.

ii. What is the correlation between theoretical pedagogical knowledge of teacher trainees and performance in teaching practice?

Methodology

Sample:

For the present study a sample of 80 teacher trainees was selected from three identified Induction training programme that is ITP1, ITP2, and ITP3. These two weeks induction training programmes were conducted during the last six months (i.e. from October, 2018 to March, 2019). Out of these three Induction training programmes, two induction programmes were conducted at NITTTR Bhopal, Madhya Pradesh and one induction programme was conducted at NITTTR Regional Centre, Ahmedabad, Gujarat. The number of teacher trainees participated in these programmes is shown in Figure 1.

The population of the study comprises of technical teachers of various engineering disciplines having experience of 1-5 years of service and basic qualification is post graduation in their respective branch of engineering. The age range of the teachers varies between 27 to 30 years.

Figure 1: Number of teacher trainees in three different induction programmes
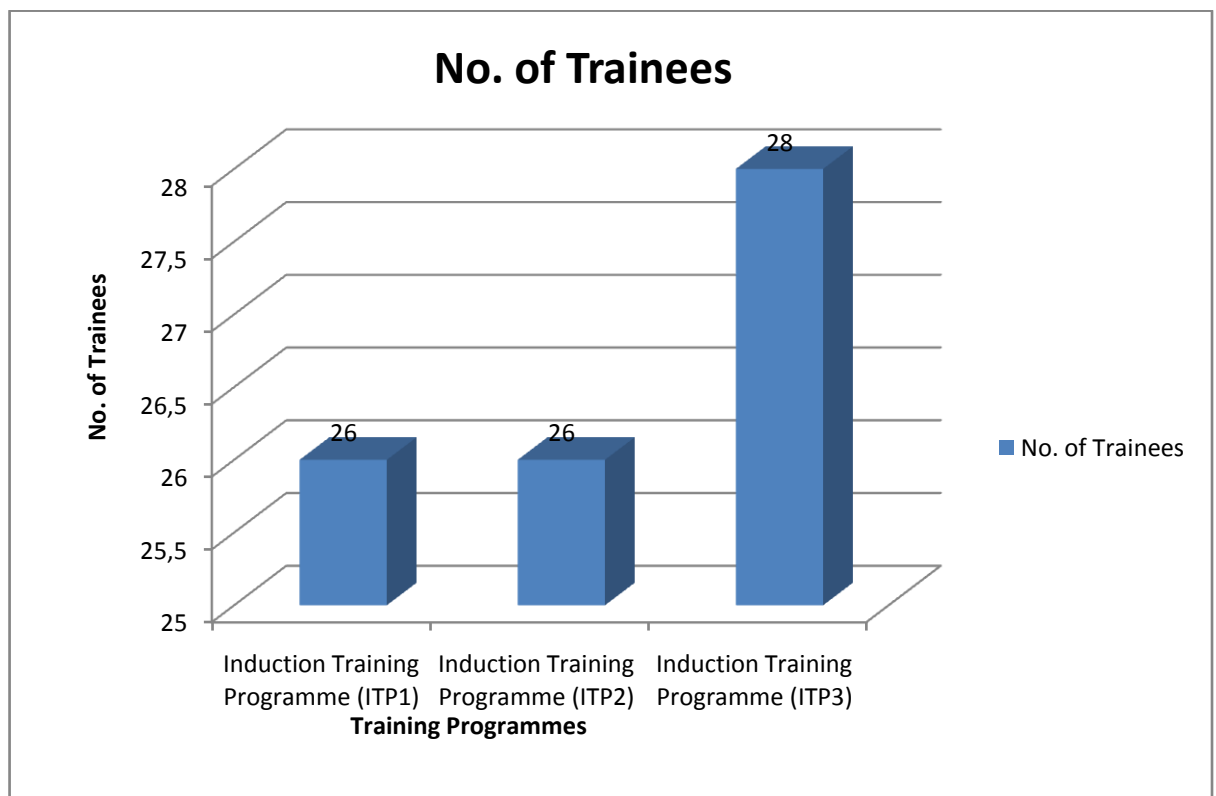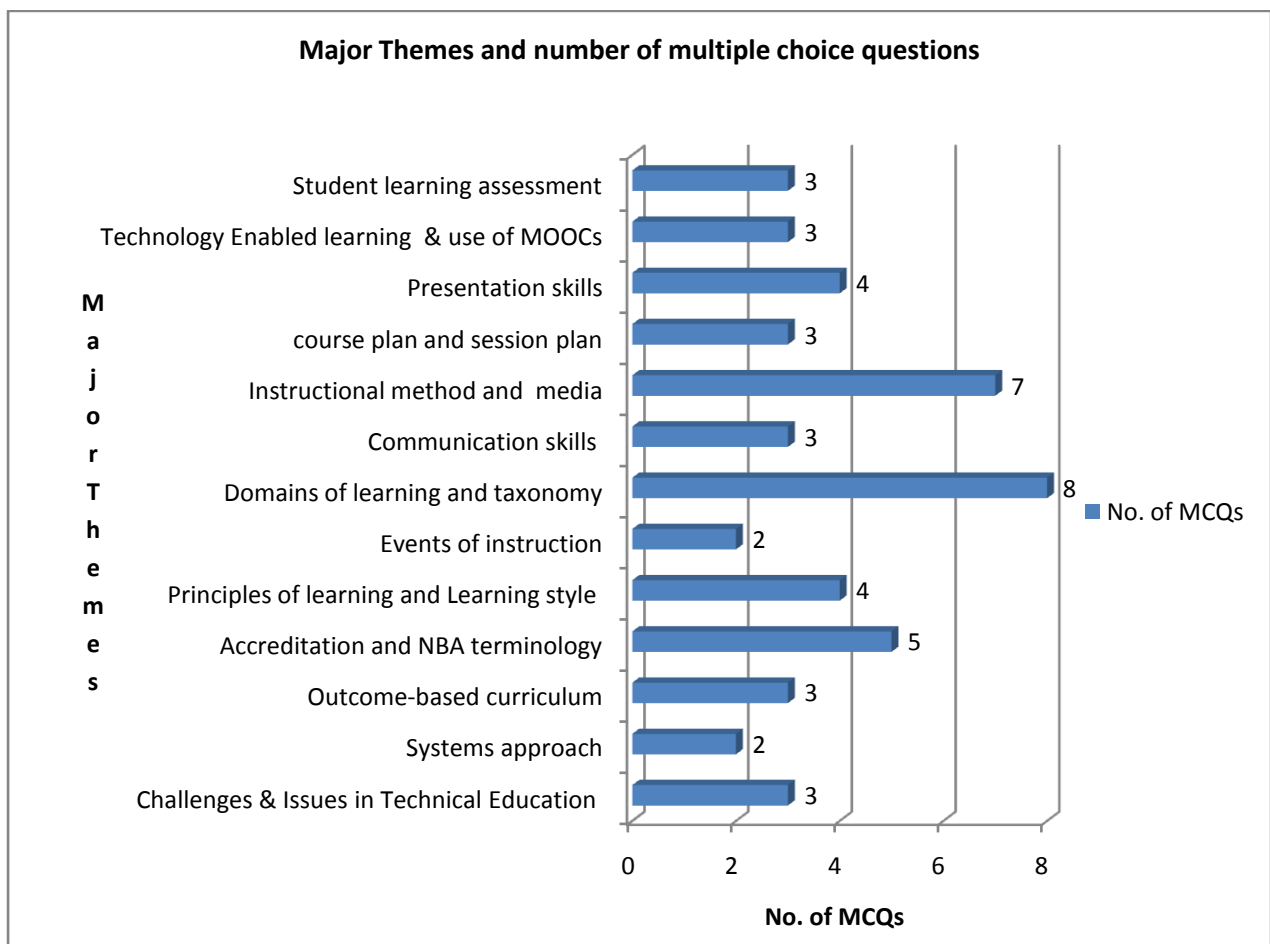

Source: Own study data.

Design of Tools

Design of Achievement Tests

Brown (1970) says Achievement Tests "Measure learning that has occurred under relatively controlled learning conditions (such as classroom) and which measure the students present state of knowledge and/or what he has learned".

As there was no standard test available for teaching competence, an achievement test for a maximum of 50 marks for one hour duration was designed by the investigator. The achievement test was prepared based on theoretical content/themes of induction training programme.

In achievement test, 50 multiple choices objective type questions with four options were given, out of which one is correct answer. Each correct answer carries one mark and no negative marking for incorrect answer. The investigator develops the questions from each one of the input themes of the induction programme. The number of multiple choice questions for each theme in the achievement test is shown in Figure 2.

Figure 2 : Major themes and number of multiple choice questions for various themes in the achievement test

Source: Own study data.

Design of assessment tool for assessing teaching performance

The achievement test discussed in earlier section is able to assess the theoretical knowledge of pedagogy and educational technology aspects. But this induction training programme also aims to develop skills for better teaching by trainee teachers in classrooms. For this purpose, at the day before last day of the training programme, every teacher trainee asked to teach in a mock teaching session of about 15 minutes, which is video recorded so that later on teacher trainee can see their own performance to identify strength & weaknesses and also to provide proper feedback to other presentation, a rubric is prepared.

Muralidhar (2012) says, a rubric is an assessment tool which takes into account the various criteria based on which a teaching practice presentation is being evaluated. For each criterion the various levels of clarity are defined and grades/marks are allotted for each level. Levels could be articulated in the following manner – 'Excellent', 'Very Good', 'Good ','Fair' and 'Poor'. When the criteria for each level are specified, the objectivity of the tool is enhanced.

A rubric was developed and various important criteria or performance indicators were mentioned. In this assessment tools the focus is on the assessment of classroom teaching by trainee teachers in a simulated class. As many activities go into the preparation and execution of the presentation, a rubric would be the most suitable tool.

Similarly, in this rubric performance of trainee teachers assessed on different aspects of performance i.e. (1) Presentation which includes the basic three elements that is Introduction of topic, content development and consolidation (2) Power point preparation and slide arrangement (3) delivery which covers the following aspects such as voice audibility, speed, body gestures & mannerisms and (4) overall grade.

The trainees' performance for each aspect is ranked on 5 point rating scale and indicators for each point as mentioned in rubric. The most important aspect of any assessment tool is the process of sharing the tool with the student whose work is being assessed and discussing the criteria for evaluation. Therefore, this rubric is also shared with the trainee's teacher in advance so that they know expected criteria on which their performance is going to be evaluated. For better reliability of assessment, each performance of trainee is assessed by four faculty members and six fellow teacher trainees of the same batch of the induction training programme.

Data Collection

For the present study, the data were collected in two stages. In first stage, the achievement test was administered to know the understanding of theoretical knowledge of various themes covered during the programme. In second stage, the teaching practice session for each trainee teacher is given for a period of 15 minutes. This session followed by a feedback session for a period of about 5 minutes. The performance of teacher trainee was assessed by suitably designed rubrics on the basis of 5 point rating scale. The scores of both achievement test and teaching practice performance of each trainee teacher of selected three induction programmes were recorded in tabular form. The format is shown in Table-1.

Table 1: The format for data collection

Code Number of Trainee	Rank in Achievement Test	Achievement Test Score – (Out of 50 Marks)	Mean of overall grades in Teaching Practice (on 5 point rating scale)	Rank in Teaching practice

Data Analysis & Result

In view of the objective of present study, the tabulated data were analysed by using the statistical technique, namely, coefficient of correlation.

Pearson Correlation (r) was used to find the relationship between achievement test on theoretical knowledge and teaching practice performance scores of selected three batches of induction progrmmes of eighty teacher trainees . Correlation is a statistical techniques used for analysing the behaviour of two or more variables. Its analysis deals with the association , between two or more variables (Murthy, 2009). Pearson correlation is a mathematical method for measuring the magnitude of linear relationship between two variables and how strongly pairs of variables are related.

The value of Correlation ' r_{xy} ' was calculated using the formula where deviations are taken from actual means of the two distributions X and Y.

$$r_{xy} = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}} \qquad ....(1)$$

Where r_{xy} = correlation between X and Y

x = deviation of any X score from the mean in the test X

y = deviation of corresponding Y score from the mean in test Y.

$\sum xy$ = Sum of all the products of deviations (X and Y)

$\sum x^2$ and $\sum y^2$ are the sums of squared deviations in x and y taken from the two means.

The table 2 and 3 shows the batch size, mean, median and standard deviation (SD) of both achievement test and teaching Practice performance of the selected three induction training programmes.

Table 2: Batch Size, Mean, Median and Standard Deviation of Achievement Test

Induction Programme	Batch Size	Mean	Median	Standard Deviation
ITP-1	26	41.0	41	3.22
ITP-2	26	39.6	39	2.98
ITP-3	28	39.3	39	2.88

The above result indicates that on the whole teacher trainees showed good performance in the achievement test. However induction programme (IP1) trainees have shown slightly better mean achievement scores as compared to other two induction programme. From the above table it was found that the values of mean and median were not much widely scattered. The values of SD represent the scattering scores from the mean position,

Table 3: Batch Size, Mean, Median and Standard Deviation of Teaching Practice

Induction Programme	Batch Size	Mean	Median	Standard Deviation
ITP-1	26	3.7	3.95	0.54
ITP-2	26	3.6	3.75	0.42
ITP-3	28	3.5	4.0	0.47

From the above table 3, it was also found that all the trainees of the entire three programme did not differ much in their mean grade scores. However induction programme (IP1) trainees have shown slightly better mean grade scores as compared to other two induction programme in teaching practice performance.

In table 4, the analysis is to determine the correlation between the score in theoretical pedagogical knowledge achievement test and overall grades in simulated teaching performance of all the teachers for all the three batches of induction training programme.

Table 4: Correlation between achievement test and teaching performance

Induction Programme	Batch Size	Correlation coefficient (r)
ITP-1	26	0.88
ITP-2	26	0.83
ITP-3	28	0.85

The following qualitative interpretations were used for further inference of correlation coefficient (r):

Correlation coefficient value	Interpretation
0.00 to 0.30	negligible correlation
0.30 to 0.50	low positive correlation

0.50 to 0.70	moderate positive correlation
0.70 to 0.90	high positive correlation
0.90 to 1.00	Very high positive correlation

Source: Mukaka (2012)

Accordingly, correlation coefficient between theoretical knowledge achievement test score and overall grades in simulated teaching performance for all the three induction training programme were as follows: ITP1(r-0.88),ITP2(r-0.83) and ITP3(r-0.85) respectively. This shows that there is a high positive correlation between these two aspects i.e. theoretical pedagogical knowledge achievement test and teaching performance.

Conclusion:

The analysis of the data clearly indicates that the trainees performance were quite good in paper test in which 50 multiple-choice questions related to different pedagogical aspects were asked. Average score of the trainees in this test was about 80% in case of all the three Induction programmes. This shows quite a high score in the achievement test and hence it can be inferred that induction training programmes are successful in transferring knowledge related to pedagogical aspects to teacher trainees.

The performance of each teacher in teaching practice in a simulated class was assessed on different aspects of presentation through rubric on the basis of 5 point scale. Data analysis of ratings received indicates that the average performance of trainees in all the three induction programme is quite satisfactory as it is in the range of 3.5 to 3.7 on the scale of 5 point.

The results of above two assessment indicate that trainees have acquired theoretical pedagogical knowledge quite well and also developed skills for effective teaching.

This paper has determined the correlation between the score in theoretical pedagogical knowledge achievement test and overall grades in simulated teaching performance of all the teachers for these three induction training programmes. To accomplish this, recorded scores of all the three induction programmes were analysed using pearson correlation coefficient(r).The result showed a statistically positive and high correlation between the theoretical pedagogical knowledge achievement test score and overall grades in simulated teaching performance. It can be concluded that the knowledge gained during the induction training programme have largely and correctly been used by the teacher trainees during demonstration in simulated teaching practice session.

In view of the above results, it can also be concluded that the design and implementation of these induction training programmes are quite effective and they are able to achieve their intended objectives.

Scope for further Research

The present work studied the overall effectiveness of induction training programme for developing the understanding about different aspects of pedagogy and skills required for effective teaching. However, the induction training programme is designed to develop nine different leaning outcomes. A separate study is therefore required to assess effectiveness of these programmes

regarding achievement of all of these nine leaning outcomes independently. Similarly, there is a need to determine the separate correlation between achievement of theoretical pedagogical knowledge related to nine leaning outcomes with achievement of corresponding teaching skills related to these nine aspects. It is hoped that this study will reveal, if induction training programmes are not able to develop theoretical pedagogical understanding or teaching skills related to particular learning outcomes. Based on finding of such studies, designing and implementation of induction training programme may be further improved.

The present study is limited to only three induction training programmes, in future, such studies can be extended for more number of induction training programmes. This will improve reliability of finding of such studies.

Acknowledgement

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