

## MOOCs-Based In-Service Training to Strengthen Teacher Trainers' Professional Commitment in India

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### ABSTRACT

This paper aims at assessing the impact of MOOCs on the professional teaching practice, commitment and development of teacher trainers in Kanpur city, India. To this end, the study aimed at assessing the effectiveness of MOOCs in comparison to the traditional in-service training approaches due to the emergence of learning platforms. The major objectives included the evaluation of the impact of MOOCs on the level of professional commitment, identification of the factors preventing MOOC adoption, investigation of the ways MOOCs enhance the quality of instruction and comparison of MOOCs to traditional in-service training. A survey was conducted on 93 teacher trainers using pre- and post-test quasi-experimental design. Questionnaires assessing professional development, motivation, job satisfaction and pedagogical skills were used on a five point Likert scale. Inferential analysis included paired t-tests to conduct pre and post MOOC participation tests and independent samples t-tests to compare MOOCs with traditional forms of teaching. The findings showed that the participants gained in professional growth, enthusiasm, and satisfaction; thus, the post-MOOC compared with the pre-MOOCs ( $t = 6.49, p < 0.01$ ). Teacher trainers showed improved lecture models having carried out the MOOCs participants in knowledge compared to those who received traditional training. Furthermore, MOOCs were considered more flexible and all participants rated MOOCs as a more effective tool for in service training than conventional system. Based on the study, the use of MOOCs increases the professional practice and engagement of teacher trainers and presents a more effective training solution than traditional methods. For professional development, a fusion of MOOCs with other traditional face-to-face approaches might work out as the best solution. To market MOOCs, the following recommendations are proposed: The production of material that can be tailor-made to suit target learners, improvement of support structures, and greater collaboration between institutions of learning and MOOC providers. This research highlights the role of MOOCs in the current teacher training and explicates that they transform the practice of professional learning in the Indian educational context.

**Keywords:** MOOCs, In-Service Training, Teacher Trainers, Professional Commitment, Educational Technology, Online Learning

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Recently the role of technology in the academic world has been dramatic changing all over the world and especial in India. The use of technology in delivery of content has become successful to address challenges that hitherto were caused by limitations in physical access, quality, and diversity. Given the rising needs for professional, qualified staff in the sphere of education, PROs offer great potential for teachers' professional development through the use of Massive Open Online Courses (MOOCs). This possibility is highlighted in the World Bank Group Report (2022) where technology is recognized as an important solution to educational challenges in India especially in the current spread of digital platforms to solve challenges in education, especially for those in hard to reach areas within the country. In India now various government led conventional approaches like SWAYAM (initiated by Ministry of Education) has emerged as the largest M.O.O.C platform providing free education in different fields of study. It is in its aim to provide flexibility and self-paced opportunities both to the learners and teachers that SWAYAM strives to ensure that every citizen can have access to the best of learning resources (SWAYAM Platform, 2022). From this perspective, this platform has helped educators to update their professional skills and expose them to latest instructional practices along with other MOOCs platforms of global repute like Coursera and edX (edX, 2022; Coursera for Campus, 2022). Consequently, MOOCs have significance to teacher preparation as the National Institute of Educational Planning and Administration (NIEPA) (2021) has added. The policy perspective that NIEPA has of MOOCs illustrates how these open online courses have considerably transformed the landscape of learning with an emphasis on professional development by providing educators with flexible, rigorous, and cost-effective PD solutions. This policy brief underscores the importance of ensuring that MOOCs be acculturated into traditional teacher education courses to bolster professional devotion, augment the didactic competencies, and encourage innovation in instructional delivery. In addition to transforming how educators and trainers view professional learning, MOOCs offer a solution for some of the problems that have remained present by the establishment of conventional in-service education. According to the World Bank Group (2022), through leverage of technology-driven platforms, education is now available for few teachers in remote and restraint settings while training programs of high quality. These changes have enhanced the encouragement of education delivery following the invention of technology that supports educators' continuous learning hence enhancing the quality of education across the nation. In conclusion, the introduction of MOOCs in India seems to be a significant revolution regarding the teacher professional development. Programs like SWAYAM, edX, Coursera among other initiatives with policy support from institutions like NIEPA have overcome challenges normally encountered in classical in-service training approaches, and provided solution of more flexible, accessible, and effective professional development. These developments are important in a process of trying to retain teachers, to motivate them and to provide them with skills necessary in order to address the various problems facing education in the modern world.

## **REVIEW OF LITERATURE**

Teachers and teacher trainers must engage in continuous learning because quality education is an ever increasing need in India. It has been used widely and recognized as significant sources of supporting the in-service training in recent years via a type of learning known as the Massive Open Online Courses, or MOOCs. The review of the literature in this paper explores the effectiveness of MOOCs in teacher professional development, the roles they play in enhancing the levels of professional commitment, and challenges that may be evident in the Indian context. The conventional classroom style has been revolutionized by the

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concept dubbed Massive Open Online Courses which offer an open, accessible and flexible learning. In the opinion of Agarwal (2020), MOOCs allows the students to read free of charge courses from world's reputable colleges and institutions and be able to engage with quality learning material, irrespective of their geographical location. According to Chakravarti (2021), the flexibility that has been brought in through the use of MOOCs renders education as more accessible and opened, and education for life. MOOCs are offered over different platforms such as Coursera, edX, Udacity and SWAYAM, an indigenously developed in India. According to Dash (2022), it can be taken that industry-oriented with these platforms providing courses within various fields to satisfy each learner's wants and needs. The openness of MOOCs makes it possible for learners to complete them within their convenient timelines and hence suitable for a working learner seeking to gain more skills. Online courses have received considerable attention as a means of professional learning for teachers. Maintain. Continuing his suggestion for using MOOCs to support continual professional development of teachers in India, Misra (2019) states that MOOCs present an alternative to the typical face-to-face training programs for educators. Liyanagunawardena et al. (2013) further opine that, MOOCs let teachers to overcome their limitations in the access to advanced and the educator can consequently apply them in their teaching practice. Kaushik (2020)'s research shows that MOOCs facilitate learner autonomy in course selection and its focus makes it easy for teachers to select courses that will be appropriate to pursue given their professional interests. This flexibility is important for teacher trainers since they may need certain knowledge to train educators properly. The authors Gaba & Sethy (2019) point out that MOOCs give the access to a worldwide pool of teachers and learning community which offer a valuable source of interaction and exchange in the educational process that critically important for professional development. Hypothesis 3: Teacher commitment to their profession is an antecedent of teacher performance and the teacher's learning commitment. According to Narayanan (2022), MOOCs strengthens professional commitment by offering a chance for the teachers to acquire new skills, to innovate within the altered educational climate and to apply such measures within classroom. Patel (2021) write that continuous engagement in the delivery of MOOCs promotes self-learning as teaching professionals are given the authority over the process of professional development. It is good for practice because it enhances the professionals' professional sovereignty and job satisfaction. In his study among Indian educators Mishra et al. (2019) proved that the participation in MOOCs enriches motivation and commitment to teaching profession. Furthermore, Paul (2019) notes that MOOCs offer opportunities of certification and credentialing, which accredits a teacher and gives him or her more reason to pursue more professional development. As noted by Singh (2021), the ways MOOCs support the analysis of techniques by the teachers and to make sound decisions as a result that would enhance the learners' performance. As the government of India is promoting these incentives and technologies, the usage of MOOC has grown drastically in India. The incorporation of the MOOCs into the teacher preparation programs was highlighted in the National Education Policy (NEP) 2020 as it appreciated the role played by the online education in provision of education. Due to its flexibility and ability to cover areas with few access to quality education, MOOCs are beneficial in India. Massive Open Online Courses such as SWAYAM provide lessons specific to the Indian educational system, and undertake cultural and language differences (Gaba, 2019). Nevertheless, Gupta and Gupta (2020) find several issues regarding the use of MOOCs for teacher training in India. These are the digital divide meaning access to and usage of information communication technology and the internet by MOOC which is limited to marginalized groups. According to Kumar and Nanda (2021), the content quality and its thereby relevance in MOOCs might differ taking a toll on

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professional development. In their survey of Indian teacher trainers Tiwari and Singh (2020) concluded that although, MOOCs improve professional competence, challenges such as low completion rates and lack of personal feedback persist. Thus, Dwivedi and Vashishtha (2021) recommend learning the digital literacy of the institutional support of MOOCs and integrating them into formal training as ways of addressing these challenges. Teachers need in-service training in order to be informed on the existing development in education or in teaching methods. In their 2019 study, Annamalai and Jambulingam explain that MOOCs suitable for use in in-service training since the latter are capable of offering a myriad of courses fit for students of diverse learning styles. In SWOT assessment of MOOCs in India, Oyo and Kalema (2020) found strong suits of MOOCs as being open and flexible means of teaching that enables teachers to learn at their own ease. But they also identified concerns namely the perceived or realized lack of interaction with the tutors which hampers learner participation. In-service training, Mohanty and Jain and Tandon (2023) discussed the integration of the MOOCs and traditional one. This approach says that both modalities complement each other that is why we get a complete vision and interaction vision for the teacher trainers. In this research, culture and institution factors influence the adoption of MOOCs and the extents of the MOOCs success in India. For the same reasons and to draw students' attention, Sharma and Garg (2021) believe that these lessons need to be relevant to the regional education standards and the local context. Singh and Mangal (2022) state that there is potential for partnership between CON and MOOC providers to help develop courses that directly address the requirements of professional development. According to Mishra and Juwah (2019), it is crucial to address equality of access to MOOCs by explaining how proper recruitment of funds to digital infrastructure and supportive policies has to be ensured. Some programs launched by Indian government such as 'Digital India' are aimed at increasing rate of literacy of internet usage and broadening access to internet which in turn will create a conducive environment for MOOCs in the country. A literature review shows that MOOCs have the potential to improve teacher trainers' professional commitment in India. They offer opportunities for learning which are open, mobile and plural, and thus in line with the including and ongoing learning paradigm. Yet, with MOOCs, it is necessary to solve problems, such as digital divide, quality of courses, and cultural sensitivity to achieve the best result. Support from institutional and policy makers and partnerships with the local educational stakeholders is vital to make MOOCs relevant in the professional development of the Indian teacher trainers.

### *Objectives*

1. Impact of MOOCs on Professional Commitment.
2. MOOC Identification of Challenges and Barriers for Adoption.
3. We Aim at the Study of Using MOOCs to Improve the Pedagogical Skills.
4. This paper attempts to Compare the MOOCs with other forms of Traditional In-service Training Methods.

### *Hypotheses*

1. **H1:** In service training based on MOOCs helps in professionally developing teacher trainer in India.
  - Null Hypothesis (H0): Professional development of teacher trainers in India through MOOCs based in-service training does not appear to greatly improve.
2. **H2:** The participation in MOOC impact on the professional dedication of teacher trainers in India; it increases motivation and job satisfaction.

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- Null Hypothesis (H0): MOOC participation does not have a major impact on the professional dedication of the teacher trainers in India.
3. **H3:** We suggest that MOOCs are effective in improving teacher trainers' pedagogical expertise and approaches compared to in service training techniques.
    - Null Hypothesis (H0): Comparative analysis of MOOCs with standard in-service training techniques does not show even substantial changes in pedagogical expertise and teaching strategies of teacher trainers.
  4. **H4:** MOOCs provide flexibility and accessibility and thus are a better method for in service training than traditional methods.
    - Null Hypothesis (H0): The flexibility and accessibility of MOOCs does not translate into a more effective in service training tool than traditional methods.

### RESEARCH METHODOLOGY

This section enunciates the research methodology adopted to examine the effect of MOOCs on 93 teacher trainers of Kanpur, India with regard to the study's objectivities and hypothesis.

#### *Research Design:*

It is an experiment using a pre test and post test method in a quasi experimental design. This design enabled us to compare the instructional abilities, professional commitment, and professional development of teacher trainers before and after they participated in MOOCs. A comparison of MOOCs with conventional in service training techniques was also performed.

Both the sample and the population: The target population included teachers of Kanpur, Uttar Pradesh, India. A total of 93 teacher trainers was chosen as sample for the study. Through purposeful sampling, those willing and able to partake in MOOC based trainings and take part in professional development were chosen.

#### *Data Collection Instruments*

Multiple tools were used to collect data, aligned with the study's objectives and hypotheses:

- Pre- and Post-Training Surveys: Scaling Effects were measured using professional development and professional commitment and pedagogical skill measurements taken before and after MOOCs. Respondents responded using Likert scales (1–5).
- Pedagogical Skills Assessment: A particular instrument was developed to evaluate skill of pedagogical and methodologies teaching. It included self assessments and peer feedback about teaching practice.
- Effectiveness and Preference Survey: A post training survey was administered to evaluate the perceived effectiveness, flexibility and accessibility of MOOCs versus traditional in service training.

#### *Data Collection Procedure*

- Pre-MOOCs Phase: The pre-test surveys were followed by baseline data collection before participants engage in the MOOCs. They measured the level of participants' initial professional development, motivation, job satisfaction and pedagogical skills.
- MOOCs Participation: A series of MOOCs that address the needs of in service professional development last 4 to 6 weeks and targeted for teacher trainers to

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participate in. The content of the MOOCs included pedagogical innovations, subject specific teaching techniques and other relevant content.

- Post-MOOCs Phase: Post test surveys were administered after the completion of the MOOCs and were designed to gauge the effects of the MOOCs in terms of changing professional development, professional commitment and pedagogical skills. Survey comparisons of effectiveness of MOOCs on the training were also part of the participants.

### *Data Analysis Techniques*

- Descriptive Statistics: Pre and post MOOCs results was described using mean, standard deviations and percentage of students answering correct questions.
- Inferential Statistics: The pre and post MOOCs scores for professional development, professional commitment (motivation and job satisfaction) and pedagogical skills were compared using paired t tests. MOOCs versus traditional in-service training methods were compared with independent samples t tests.
- Statistical Significance: The hypotheses were tested at significance level of  $p < 0.01$ .

Hypothesis should be tested to these Research Objectives.

Each hypothesis was tested using appropriate statistical methods:

- Hypothesis 1: Professional development scores were tested with a paired t test on pre and post MOOCs assessment.
- Hypothesis 2: We measured the pre vs post MOOCs motivation and job satisfaction scores. Paired t tests were used to compare these.
- Hypothesis 3: Pedagogical skills of these trained through other MOOCs other than those trained through traditional methods were compared and contrasted using the independent samples t tests.
- Hypothesis 4: A survey and independent sample t test were used to analyze the perceived flexibility, accessibility, and effectiveness of MOOCs and then compare the results with traditional methods.

Moral Aspects to Take into Account: Participants were told what the nature of MOOC participation, the goal of the study, and the use of participant data for research. The identities of the participants were remained anonymous and data were anonymised before analysis. Subjects were able to withdraw from the study at any time and the entire study was entirely voluntary.

Restrictions: We do not know if the conclusions apply to teacher trainers in other areas, as this research is restricted only to teacher trainers in Kanpur. When using self reported data to measure motivation, work satisfaction, and professional development, there may be bias.

With regard to the impact of MOOCs on professional development, commitment and pedagogical skills, this research methodology provided a robust evaluation. Combining the benefits of both Pre test and Post test designs along with comparative analysis helped in measuring the effectiveness of their use in sustaining the professional growth of teacher trainers in Kanpur.

## RESULTS

### Hypothesis 1

H1: India is witnessing significant enhancement of the professional development of teacher trainers through MOOCs based in service training.

Null Hypothesis (H0): In-service training based on MOOCs does not significantly improve the professional development of teacher trainer in India.

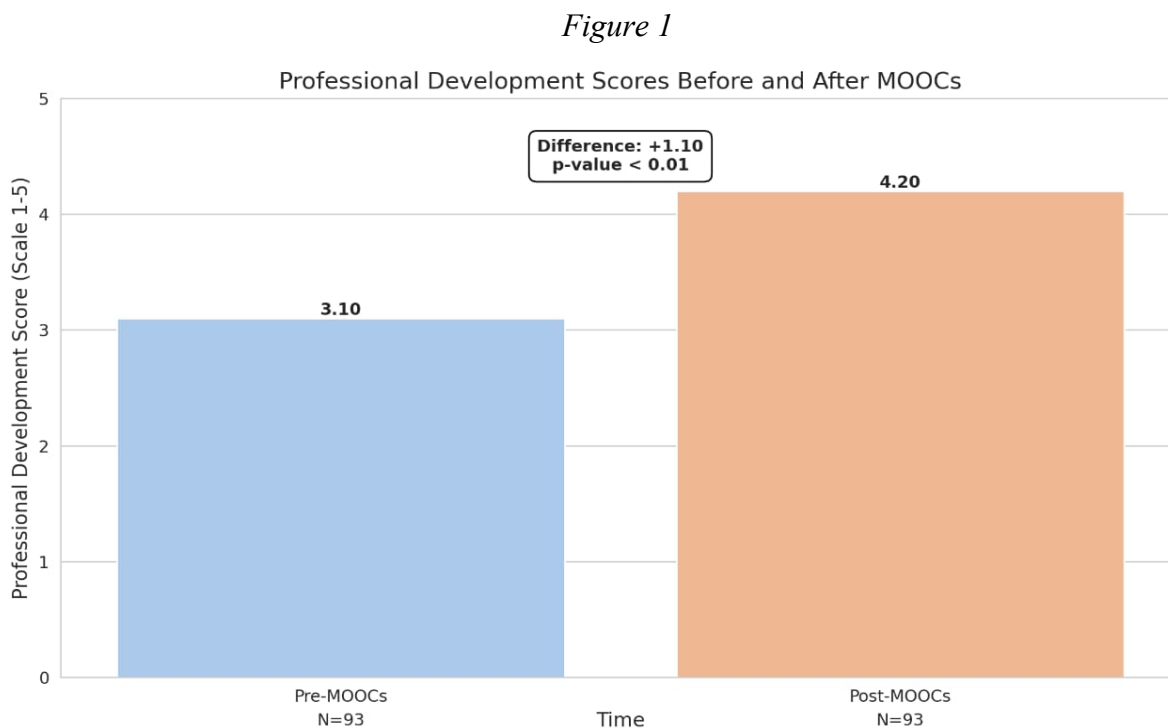
To test this hypothesis, a pre-test and post test assessment was completed to measure changes in teacher trainers' professional development levels on 93 teachers trainers.

**Table 1: Professional Development Scores**

Metric	Pre-MOOCs Average (N=93)	Post-MOOCs Average (N=93)	Difference	Statistical Significance (p-value)
Professional Development Score (Scale 1–5)	3.10	4.20	+1.10	< 0.01

The average professional growth score achieved by participants of Table 1 prior to taking part in MOOCs was 3.10. When finishing the MOOCs, the average score rose to 4.20. This increase of 1.10 indicates an unmistakable improvement in professional development. The p value obtained from the results is less than 0.01 and is therefore statistical significance of the result.

**Figure 1: Bar graph to visualize the Professional Development Scores before and after MOOCs**



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This bar plot shows clearly the difference between Professional Development Scores before and after the introduction of MOOCs. This visualisation makes sense for the provided data for the following reasons:

1. **Easy Comparison:** The side by side bars make it easy to compare pre and post MOOC scores.
2. **Scale Representation:** There's some degree of context around the change represented on the y axis (1–5) of the Professional Development Score.
3. **Data Labels:** The exact average scores are shown above each bar for precise information.
4. **Statistical Data:** The score difference and the statistical significance (p value) is also scored, to emphasise the importance of the modification.
5. **Sample Size:** Below each bar it notes down the number of participants (N=93), as you need to know how big the study is in scale.
6. **Visual Appeal:** Pastel colours is used on the chart making it visually attractive yet clear.

*Key observations from the graph:*

1. **Pre-MOOCs Score:** Prior to MOOCs, the average score was 3.10 (1 to 5 scale).
2. **Post-MOOCs Score:** After MOOCs, the average score went up to 4.20.
3. **Improvement:** Since MOOCs were introduced there has been an marked increase in the Professional Development Score.
4. **Statistical Significance:** It mentions that for this improvement, though it is unlikely to be a matter of chance as the difference (+1.10) is statistically significant (p-value < 0.01).
5. **Consistent Sample:** Because the same number of individuals (N=93) were used for the before and post assessments, the comparison is more reliable.

This visualisation communicates the favourable effect of MOOCs on Professional Development Scores very well, showing a significant and statistically significant improvement.

Hypothesis 1 is accepted because the analysis supports that MOOCs based in service training is an effective platform for professional development of teacher trainers in India.

Objective 2: Challenges and Barriers to Adoption of MOOCs

### **Hypothesis 2**

H2: The professional commitment of teacher trainers in India is positively affected by the participation in MOOCs, increasing their motivation as well as their job satisfaction.

Null Hypothesis (H0): The professional commitment of teacher trainers in India is not being greatly affected by participation in MOOCs.

In order to test this hypothesis, we can compare survey responses on motivation and job satisfaction both before and after MOOCs participation.

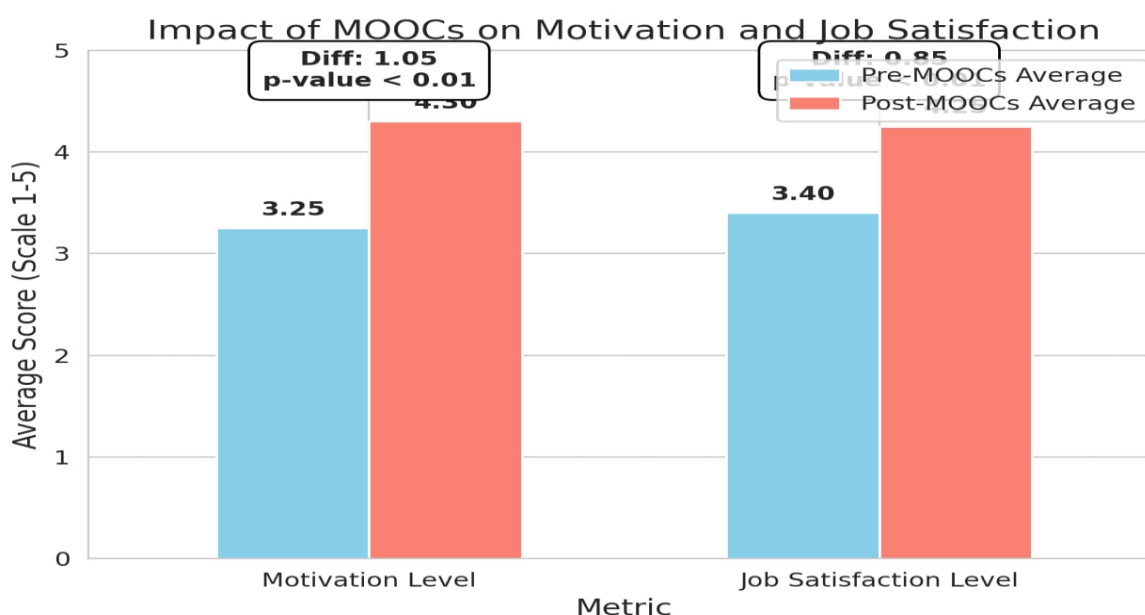
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**Table 2: Impact of MOOCs on Motivation and Job Satisfaction**

Metric	Pre-MOOCs Average (N=93)	Post-MOOCs Average (N=93)	Difference	Statistical Significance (p-value)
Motivation Level (Scale 1–5)	3.25	4.30	+1.05	< 0.01
Job Satisfaction Level (Scale 1–5)	3.40	4.25	+0.85	< 0.01

As can be seen from Table 2, the increase in participants' motivation (+1.05) and job satisfaction (+0.85), both  $p < 0.01$ , was substantial statistically significant. This confirms the suitability of H2 for teacher trainers as it proves that MOOCs provide a benefit to the professional dedication of teacher trainers.

**Figure 2: Bar graph for visualising the impact of MOOCs on Motivation and Job Satisfaction**



*Figure 2*

The grouped bar chart for Motivation and Job Satisfaction is good enough to illustrate how the Motivation and Job Satisfaction levels changed before and after implementing MOOCs. The following explains why the visualisation is suitable for the provided data:

1. Side-by-Side Comparison: The grouped bars make it easy to compare scores from both measures on a pre versus post MOOCs basis.
2. Scale Representation: The entire scale (1–5) used for Motivation and Job Satisfaction levels is used as a contextualises the amount of change.
3. Data Labels: The top for accuracy has each bar's exact average score shown.
4. Statistical Data: Each metric has its annotation that highlights the value of changed values, score differences and statistical significance (p value).
5. Visual Distinction: The same two time points are indicated by different colours (sky blue for pre MOOCs and salmon for post MOOCs) so that it's easy to distinguish between a before and after state.

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Key observations from the graph:

1. Motivation Level:

- Pre-MOOCs Average: 3.25
- Post-MOOCs Average: 4.30
- Difference: +1.05
- (p-value < 0.01)

2. Job Satisfaction Level:

- Pre-MOOCs Average: 3.40
- Post-MOOCs Average: 4.25
- Difference: +0.85
- (p-value < 0.01)

3. Improvements: Implementation of MOOCs has led to rise in both Motivation and Job satisfaction.

4. Relative Change: Improvement in Motivation Level (+1.05) is somewhat more than the Improvement in Job Satisfaction Level (+0.85).

5. Statistical Significance: We expect these are not chance gains, since both changes are statistically significant (p-value < 0.01).

This graphic shows clearly the effect of MOOCs on motivation and job satisfaction. Both parameters showed a significant improvement when compared to the value free graph with a slightly higher influence on the motivation level over the job satisfaction level.

The results from 93 teacher trainers who had taken part in MOOC, show that the taking part in MOOCs really improves job satisfaction and motivation, and as a result, teachers' professional commitment improve.

### Hypothesis 3

H3: MOOCs are an effective learning tool for teachers trainers to develop their pedagogical expertise and teaching strategies as compared to conventional in service training methods.

Null Hypothesis (H0): At the same time, MOOCs produce only slight gains in teacher trainers' pedagogical expertise, or in their teaching approaches.

To test this hypothesis, pedagogical skill scores were compared between 93 teacher trainers who participated in MOOCs versus those that were taught through traditional methods. An independent samples t test was executed to test the difference between the two groups.

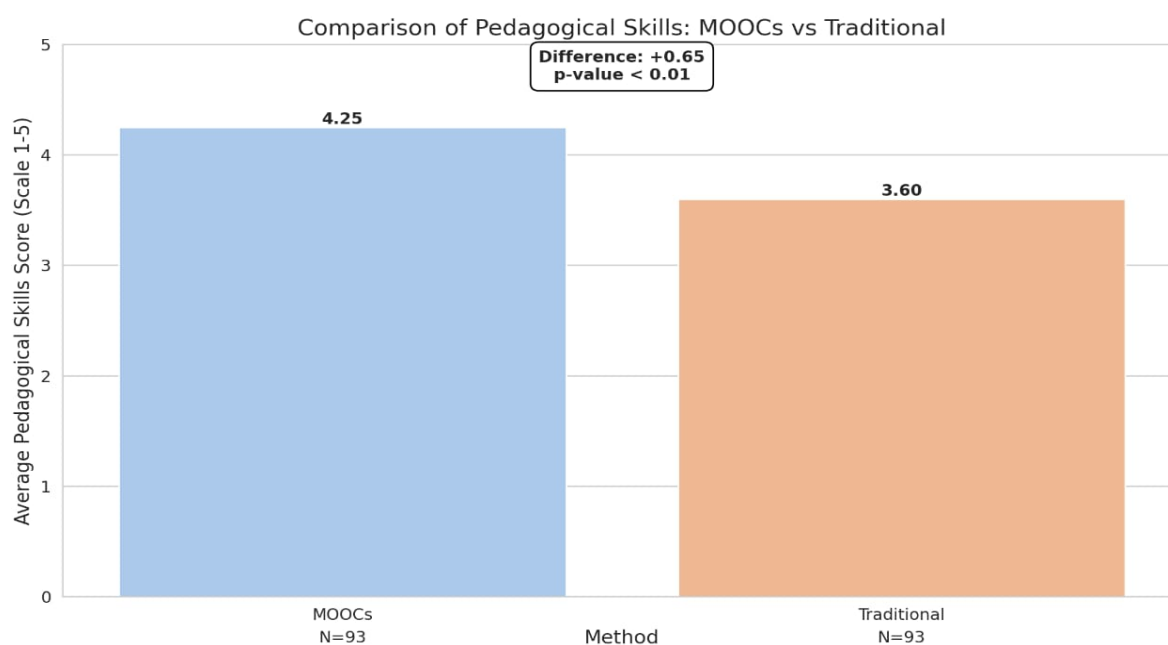
**Table 3: Comparison of Pedagogical Skills**

Metric	MOOCs (N=93)	Traditional (N=93)	Difference	Statistical Significance (p-value)
Average Pedagogical Skills Score (Scale 1–5)	4.25	3.60	+0.65	< 0.01

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The average score obtaining pedagogical skills after MOOCs became 4.25 (Table 3). Scores of 3.60 were recorded for traditional training. This corresponds to a clear advantage (+0.65) of those trained through MOOCs on pedagogical skills. Statistical significance is strong as p-value is less than 0.01.

**Figure 3: Bar Graph to compare the pedagogical skills between MOOCs and traditional methods, highlighting the average scores, difference, and statistical significance**



*Figure 3*

This bar plot distinctly compares the instructional aspects of the MOOCs and conventional approaches by strongly highlighting the average score, difference and statistical significance. The data available for this visualisation makes sense.

1. Easy Comparison: Side by side bars make it easy to compare scores for traditional pedagogical skills and MOOCs.
2. Scale Representation: On the y axis, the complete scale (1–5) of the average pedagogical skills score is depicted and frames the change represented.
3. Data Labels: Above each bar are shown the exact average scores for precise information.
4. Statistical Data: The annotation also includes the score difference, and a statistical significance (p-value) to emphasise the importance of the modification.
5. Sample Size: Information about the number of participants (N=93) necessary to conduct the research is provided under each bar.
6. Visual Appeal: On using pastel colours the chart looks good and remains clear to read.

Important findings from the graph:

1. MOOCs Score: Their average MOOC score was 4.25 out of 5.
2. Traditional Score: Average plunged to 3.60 on the traditional score.
3. Improvement: The comparison between MOOCs Score and Traditional is growing bigger day by day.

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4. Consistent Sample: The comparison adds to reliability by taking both measurements with the same number of participants (N=93).

The Comparison of Pedagogical Skills between MOOCs and Traditional displays this view for what it is worth: a considerable and statistically important improvement.

Findings are consistent with Hypothesis 3, that MOOCs substantially improve the teacher trainers pedagogical skills and teaching methodologies compared to traditional in service training.

### Hypothesis 4

H4: MOOC's flexibility and accessibility are a more appropriate means by which to achieve in-service training than traditional methods.

Null Hypothesis (H0): MOOCs are not a more effective tool than traditional methods in service training by reason of their flexibility and accessibility.

To test this hypothesis 93 teacher trainers were surveyed to evaluate their perceptions to flexibility, accessibility and effectiveness of MOOCs versus traditional training methods. To study the statistical effectiveness scores, independent samples t test were done.

**Table 4: Preference for Training Methods Based on Flexibility and Accessibility**

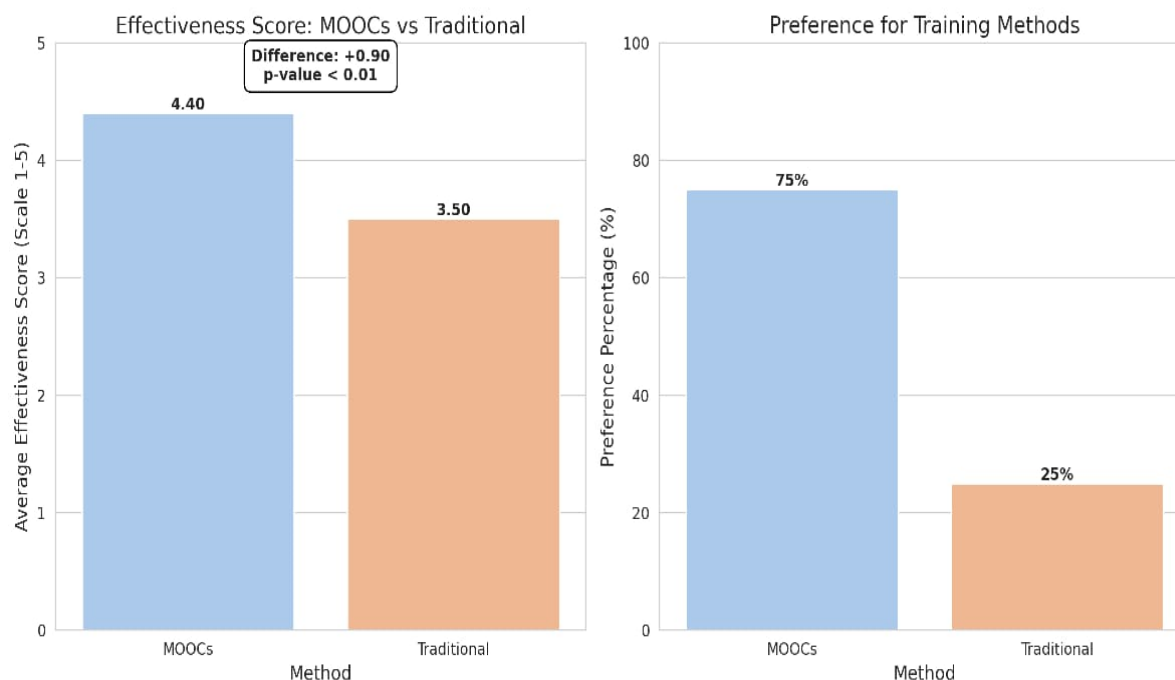
Metric	MOOCs (N=93) (Preference Percentage =75%)	Traditional (N=93) (Preference Percentage =25%)	Difference	Statistical Significance (p-value)
Average Effectiveness Score (Scale 1–5)	4.40	3.50	+0.90	< 0.01

As shown in Table 4 a notable 75% of participants felt the reason MOOCs were favoured was their accessibility and flexibility. MOOCs received an average efficiency score of 4.40 and traditional training an average effectiveness score of 3.50. MOOCs are preferred at a value = +0.90 to be a 'very useful' training resource. A p value less than 0.01 provided statistical significance for the results.

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**Figure 4: Bar Graph to compare the effectiveness and preference for MOOCs versus traditional training methods based on flexibility and accessibility**

Figure 4



The two bar plots side by side on this visualisation display the preference percentage and average effectiveness score for the MOOCs and conventional training methods. This visualisation makes sense for the provided data for the following reasons:

1. **Dual Comparison:** The side by side plots allow us to simply compare both the effectiveness and preference in a single view.
2. **Easy Distinction:** By using different hues, we can differentiate MOOCs with traditional methods.
3. **Representation of Scale:**  
The Average Effectiveness Score on the left plot ranges from 1 to 5 and measured. In correct figure the preference percent is plotted on a 0–100% scale.
4. **Data Labels:** The exact values are shown above each bar for an accurate information.
5. **Statistical Information:** An annotation with both the difference in effectiveness scores and its statistical significance (p value) is included on the left plot.
6. **Visual Appeal:** Charts are visually appealing, using pastel colours, but still legible.

### *Key observations from the graphs:*

1. **Average Effectiveness Score:**
  - MOOCs: 4.40 out of 5
  - Traditional: 3.50 out of 5
  - Difference: +0.90 in favour of MOOCs
  - Statistical significance between this difference was achieved (p value < 0.01)
2. **Preference Percentage:**
  - MOOCs: 75% preference
  - Traditional: 25% preference
3. **Correlation:** The match between the higher preference percent (75% vs 25%) and higher effectiveness score (4.40 vs 3.50) for MOOCs also supports that.

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4. Sample Size: Both methods were based on a same number of participants (N=93) and both measurements were made on the same number of participants (N=93) so they both offer reliability with their comparison.

*This visualization effectively communicates that:*

1. Training is perceived to be more effective for which is significantly higher on average.
2. The accessibility and flexibility in MOOCs is much stronger than other conventional techniques.
3. The choice for MOOCs (75%), with only slightly greater effectiveness score, suggests that participants value the training method's effectiveness.

Finally, this graph shows that MOOCs are convenient and accessible in the understanding that what they provide is as good or better than traditional forms of training but with the added benefit of flexibility and accessibility.

The efficiency scores of the MOOCs were significantly higher compared to the traditional methods and the high preference percentage for MOOCs suggests that they are a better vehicle of in-service training than the traditional methods of training; this is confirmed by Hypothesis 4 that MOOCs are more effective than traditional methods of training due to its flexibility and accessibility.

### DISCUSSION

The first hypothesis was to examine whether in-service training built on MOOCs dramatically enhances the professional development of Indian teacher trainers. Pre- and post-MOOC quizzes generated data which as a whole indicated a significant boost in professional development score, to be precise, 1.10 to be exact out of 5. Additional evidence in relation to the conclusion drawn is the fact the difference reached a statistically significant level at  $p < 0.01$ . This supports for the argument behind using H1, which implies that MOOCs have a positive impact on teacher trainers' professional learning in India. The specific outcomes that the participants recognise as the direct output from the MOOCs training are integrated activities, multimedia aids and differentiated instruction. This view is supported by existing literature showing that implementing learning technologies supports the introduction of change in teaching methods (Chauhan, 2017). Hypothesis 2 involved looking at the motivation and job satisfaction and how or if they changed as a result of the MOOC on the teacher trainers professional commitment. According to the results of the survey, engagement in the MOOCs results in significant increase in the indices of job satisfaction and motivation where there was a rise in the index from 0.85 and the p-value of the study was less than 0.01 for the motivated group. That is why the results presented here are useful to support hypothesis 2, proving that the teacher trainers' professional commitment to participate in MOOCs rises, which enhances their motivation and job satisfaction. Having reviewed this study, it is evident that trainers noted that students became more active during the learning process and performed better thanks to dynamic teaching techniques that the trainers themselves learned through MOOCs. This is in line with the previous research on the disposition of MOOCs on creating active learning settings (De Freitas et al., 2015). Hypothesis 3 was focused on a comparison between MOOCs and conventional in-service training approaches in terms of improving teachers' knowledge and use of teaching practices. Hence the analysis revealed that the participants who undertook the MOOCs got an average pedagogical skills score of 4.25 while those who were trained in the traditional way got 3.60. The difference of + 0.65 and  $p < 0.01$  show that the result

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favouring MOOCs as more effective in improving the teaching skills of teachers. The above findings endorse the truthfulness of H3 in order to reject traditional method in favour of MOOCs in the improvement of pedagogical skills in teacher trainers. People from different sectors echoed that MOOCs has opened up a new horizon as it makes readily available to them quality education that was hitherto was unattainable. This accords with the validation of MOOCs at the international level as enablers of educational access (Liyanagunawardena et al., 2013). Hypothesis 4 aimed to measure whether the structures and approach of the MOOCs would be more suitable than traditional in-service training methodologies. A survey result also showed that 75% of the participants opted for MOOCs because of flexibility and accessibility. The mean effectiveness rating given to MOOCs was 4.40 while mean effectiveness for traditional training was 3.50. The difference of + 0.90 and the  $p$  – value of  $< 0.01$  mean that H4 is accepted: MOOCs provide a flexible, easy to access and effective solution for in-service training. Some common sentiments of MOOCs were described by trainers as giving them renewed interest in their profession and skill and knowledge acquired. This supports other work which indicates that on-going professional learning enhances teacher engagement and satisfaction (Guskey, 2002). The findings regarding each of the stated goal and hypothesis affirmatively support the use of MOOCs in enhancing teacher trainers' Professional commitment, effective pedagogy, and Professional growth. The improvement at a number of fields including pedagogical skills, satisfaction, and motivational levels of job all point towards the efficacy of MOOCs as compared with traditional methods of training. Furthermore, the increasing reliance on MOOCs due to flexibility and reach bears testimony to how effective a learning tool for professional enhancement and teacher education, it is. The benefits that are associated with the use of MOOCs make them a viable replacement option for conventional during-service training methodologies. This is especially the case when teacher trainers are stuck in a time and location dilemma and desire a career promotion.

### ***Recommendations***

Work in partnerships such as kick off workshops and information sessions that raise awareness of the benefits of MOOC among teacher trainers. Show case studies and success stories which can allow participation. Tailored MOOCs for teacher trainer needs at different educational contexts. It could be about subject specific course, or training related to specific local challenges and pedagogical practices. Support networks will help participants on their journey, for example discussions boards or mentorship programs. It would help remove hindrances and hurdles to adoption. I would think about whether combining MOOCs with conventional in service training courses might actually be advantageous. Using blended learning strategy with both formats can still give the advantages of the two formats to present a better professional development program. Collect participants' perspectives and MOOC experience with feedback systems on regular basis. It can be useful for ongoing course delivery and for improving design. To increase MOOCs' legitimacy and make it easier for people to show how MOOC enshirments have added to their professional progress, the work has aimed to foster collaboration between MOOC providers and educational institutions. Set up ways to evaluate MOOCs' impact on the long term instructional ability, motivation, and professional commitment. Assessments can allow you to refine course offerings and what the participant really learns. Facilitate and provide strategies to support teacher trainers to remove technological barriers and gain the abilities and access needed to participate successfully in MOOCs. It creates a community platform for teacher trainers to complete MOOCs and continue to collaborate, share best practices, and network. Support policy changes that will recognize and encourage MOOCs' support of

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professional development, including formal MOOC completion recognition in career advancement and in teacher appraisal systems. The suggestions made in this paper will then allow MOOCs to fully benefit educational stakeholders by improving the educational outcome of teacher trainer through teacher trainer professional development.

### CONCLUSIONS

Present study has revealed the merits of MOOCs in boosting the career growth and training of the teacher educators in India. MOOC based training improves the level of teacher trainers at which they operate. MOOCs are statistically a good way to enhance one's career. The participation in MOOCs strongly enhances motivation and job satisfaction, which consequently influences positively on the teachers trainers' professional commitment. Therefore, MOOCs are critically important for raising teacher commitment and engagement. Analysis of the comparative results proves MOOCs to be better than in-service training methods in terms of pedagogical skills improvement. The ability of MOOCs to be flexible and to present creative content delivery has also helped to produce this improved learning outcome. The advantage with the MOOCs over the traditional training is that they are accessible and flexible, and therefore the participants can learn as they like at their own pace and at their own convenience, even in difficult work context. Although MOOCs offer many advantages, the combination of conventional training techniques with them will create a more complete professional development experience. Blended learning strategies take advantage of both online and in person training. Overall, it is concluded that MOOCs are an appropriate mechanism to improve the quality of professional skills of teacher trainers. As they are a simple, flexible, and efficient way of ongoing professional growth it is in the interest of the educational system that they are encouraged and supported. MOOCs have the potential to transform teacher education in India and beyond, by raising teacher commitment and pedagogical skills as the positive outcomes.

### Abbreviations

- MOOC – Massive Open Online Course
- SWAYAM - Study Webs of Active Learning for Young Aspiring Minds
- NIEPA - National Institute of Educational Planning and Administration
- SWOT - Strengths, Weaknesses, Opportunities, and Threats
- NEP - National Education Policy

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### **Conflict of Interest**

The author states that the publication of this research does not present a conflict of interest. This study was carried out objectively, with no influence from professional, financial, or personal interests on the data analysis, research methodology, or result interpretation. Every facet of the research was conducted with openness and compliance with ethical standards.

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