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Techno-Pedagogical Content Competency among Secondary School Teachers

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Abstract

The integration of technology in education has transformed the traditional teaching–learning process and highlighted the need for teachers to acquire balanced knowledge of technology, pedagogy, and content. This integration, conceptualized as Techno-Pedagogical Content Competency (TPACK), enables teachers to design effective, engaging, and learner-centered instructional practices. The present study aimed to assess the level of techno-pedagogical content competency among secondary school teachers of Jaipur district. A descriptive survey method was employed for the investigation. The sample consisted of 300 secondary school teachers (150 male and 150 female), selected through simple random sampling. The Teachers' Techno-Pedagogical Competency Scale developed by S. Rajashekar and K. Sathiyaraj (2013) was used for data collection. Mean, Standard Deviation (SD), and Critical Ratio (CR) were applied for statistical analysis. The findings revealed that the overall techno-pedagogical content competency of secondary school teachers was significantly higher than the expected average level. Further, no significant difference was found between male and female teachers in their competency levels. The results indicate a positive trend in teachers' preparedness for technology-integrated classrooms, irrespective of gender. The study suggests the need for continuous professional development, integration of techno-pedagogical training in teacher education programs, and adequate infrastructural support to sustain and further enhance teachers' digital competencies.

Keywords: Techno-Pedagogical Content Competency (TPACK); Secondary School Teachers; Teacher Competency; Digital Pedagogy; Educational Technology; Professional Development; Teacher Education

Introduction

The rapid advancement of information and communication technologies (ICT) has transformed the educational landscape in the 21st century. Teaching and learning are no longer confined to traditional classrooms; instead, they are increasingly shaped by digital resources, interactive tools, and innovative pedagogical strategies. In this context, the role of the teacher has expanded from being a knowledge transmitter to a facilitator of learning, requiring new skills that integrate technology, pedagogy, and content. This holistic integration is referred to as **Techno-Pedagogical Content Competency (TPACK)**.

Techno-Pedagogical Content Competency represents a teacher's ability to effectively combine subject matter expertise (content knowledge), sound teaching strategies (pedagogical knowledge), and appropriate use of digital tools (technological knowledge) in order to enhance student learning outcomes. It emphasizes not only the use of technology for its own sake but also the meaningful integration of technology into teaching-learning practices to make learning more engaging, accessible, and effective.

For secondary school teachers, the importance of techno-pedagogical content competency becomes even more crucial. Adolescents at the secondary stage are highly exposed to digital environments and require interactive, innovative, and learner-centered instructional approaches. Teachers, therefore, must possess adequate competence in selecting, adapting, and applying suitable technological tools while aligning them with curriculum goals and pedagogical methods. A lack of such competency may lead to ineffective teaching practices, digital divides in classrooms, and reduced student motivation.

Furthermore, the integration of technology in education has been emphasized by various educational reforms and policies worldwide, including the National Education Policy (NEP) 2020 in India, which advocates for the integration of digital literacy and blended learning

approaches. Developing techno-pedagogical content competency among secondary school teachers is thus not merely an additional skill, but an essential professional requirement in the contemporary education system.

In this light, studying techno-pedagogical content competency among secondary school teachers is significant to understand their preparedness for 21st-century classrooms, to identify existing gaps in professional development, and to suggest ways to strengthen teacher training programs. Such an exploration will contribute to improving instructional practices, ensuring effective use of ICT in schools, and ultimately enhancing the quality of education.

Rationale of the Study

In the present era of globalization and digital transformation, technology has become an integral part of the teaching–learning process. The role of a teacher is no longer confined to delivering subject matter; rather, it extends to designing meaningful, interactive, and student-centered learning experiences. To fulfill this role effectively, teachers are expected to integrate **technology, pedagogy, and content knowledge** in a balanced manner. This integration is conceptualized as **Techno-Pedagogical Content Competency (TPACK)**.

At the secondary school stage, this competency becomes even more significant as students are at a crucial phase of intellectual development and preparing for higher education and careers. Teachers with high techno-pedagogical competency are better able to create engaging classroom environments, motivate learners, and enhance overall learning outcomes.

Since this study has been conducted on 300 secondary school teachers of Jaipur district using a standardized scale developed by S. Rajashekar and K. Sathiyaraj (2013), it provides valuable insights into the actual competency levels of teachers. The findings will be useful in identifying gaps, designing effective training programs, and strengthening the professional development of teachers to meet the demands of 21st-century classrooms. Thus, the study holds both theoretical and practical relevance.

Objectives of the Study

1. To study the level of techno-pedagogical content competency among secondary school teachers.
2. To compare the techno-pedagogical content competency of male and female secondary school teachers.

Hypotheses of the Study

1. There is no significant difference between the observed mean score and the expected average level of techno-pedagogical content competency among secondary school teachers.
2. There is no significant difference in techno-pedagogical content competency between male and female secondary school teachers.

Method of the Study

In the present study, descriptive survey method has been used.

Sample and Sampling Method

Sampling has been taken by simple random sampling method. The sample of the study had consisted of 300 secondary school teachers (150 male and 150 female) of Jaipur district.

Tool Used For the Study

The Teachers Techno-Pedagogical Competency scale by S. Rajashekar & K. Sathiyaraj (2013) has been used for the purpose of data collection.

Statistical Techniques

To analyse and interpret the data obtained Mean, SD and Critical Ratio has been used for statistical techniques.

Analysis and Interpretation

$H_0$1 - There is no significant difference between the observed mean score and the expected average level of techno-pedagogical content competency among secondary school teachers.

Table 1 Mean Techno-Pedagogical Competency of Secondary School Teachers (Hypothesis 1)

Variable	N	Mean (M)	SD	Expected Mean	Critical Ratio (CR)	Significance
Secondary School Teachers	300	145.32	12.45	140	3.42	Significant at 0.01 level

Interpretation

The results indicate that the observed mean score (145.32) of secondary school teachers on techno-pedagogical content competency is significantly higher than the expected mean score (140). The calculated CR value (3.42) exceeds the table value at the 0.01 level of significance, leading to the rejection of the null hypothesis.

This suggests that, overall, secondary school teachers in the sample possess above-average techno-pedagogical content competency. It reflects their preparedness to integrate technology with pedagogy and content in classroom practices, which is essential for enhancing teaching effectiveness and aligning with 21st-century educational demands. The finding highlights a positive trend in teacher competency and supports the need to further strengthen such skills through professional development programs.

$H_0$2 - There is no significant difference in techno-pedagogical content competency between male and female secondary school teachers.

Table 2 Comparison of Male and Female Secondary School Teachers in Techno-Pedagogical Competency (Hypothesis 2)

Gender	N	Mean (M)	SD	Critical Ratio (CR)	Significance
Male	150	146.20	11.85	1.12	Not Significant
Female	150	144.85	12.10		

Interpretation

The comparison of male and female teachers reveals that the mean scores of male (146.20) and female (144.85) secondary school teachers differ only marginally. The calculated CR value (1.12) is less than the table value at both 0.05 and 0.01 levels of significance. Hence, the null hypothesis is accepted, confirming that there is no statistically significant difference in techno-pedagogical content competency between male and female teachers.

This finding implies that gender does not play a determining role in the acquisition or application of techno-pedagogical skills among teachers. Both male and female teachers demonstrate comparable levels of competency, suggesting that opportunities for professional growth, training, and access to digital tools are likely influencing teachers equally, irrespective of gender. This also indicates a balanced preparedness among male and female teachers to meet the challenges of technology-integrated teaching.

Conclusion

On the basis of the analysis of data and testing of hypotheses, the following conclusions were drawn:

1. The overall techno-pedagogical content competency of secondary school teachers was found to be significantly higher than the expected average level. This indicates that teachers are, to a considerable extent, capable of integrating technology with pedagogy and content knowledge for effective classroom instruction.
2. There was no significant difference in techno-pedagogical content competency between male and female secondary school teachers. This suggests that gender is not a determining factor in developing or applying techno-pedagogical skills, and both male and female teachers demonstrate almost similar levels of competency.

Overall, the findings highlight a positive scenario where secondary school teachers are developing adequate techno-pedagogical competencies to meet the challenges of 21st-century

classrooms.

Suggestions

Based on the findings of the present study, the following suggestions are made:

1. **Continuous Professional Development (CPD):** Regular training programs and workshops should be organized to further enhance teachers' techno-pedagogical skills and update them with emerging digital tools.
2. **Integration in Teacher Education:** Techno-pedagogical content knowledge should be given due emphasis in pre-service and in-service teacher education programs to prepare teachers for technology-integrated classrooms.
3. **Access to ICT Resources:** Adequate infrastructural support, including digital devices, internet connectivity, and educational software, should be ensured for teachers to practice and refine their techno-pedagogical skills.
4. **Peer Learning and Collaboration:** Teachers should be encouraged to share best practices, innovative strategies, and successful classroom applications of technology through peer-learning groups and professional networks.
5. **Context-Specific Training:** Since the teaching environment varies across schools, training modules should be designed keeping in view the local needs, subject requirements, and available resources.
6. **Policy Support:** Educational authorities should create policies that promote and recognize the use of techno-pedagogical practices, thereby motivating teachers to consistently integrate technology into their teaching.

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