TECHNO-PEDAGOGICAL COMPETENCE AND DIGITAL SKILLS AMONG HIGH SCHOOL STUDENTS: A COMPARATIVE STUDY

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Abstract

In the digital era, the use of technology in education has become essential for enhancing learning outcomes and preparing students for future competencies. This study investigates the techno-pedagogical competence and digital skills of high school students and examines whether differences exist based on demographic variables such as gender and locality. A quantitative survey method was adopted, and a sample of 200 high school students was selected using stratified random sampling. Two standardized tools the Techno-Pedagogical Competence Scale (TPC Scale) and the Digital Skills Assessment Inventory (DSAI) were administered. Data were analyzed using descriptive statistics, t-test, and Pearson correlation. Results revealed that the majority of students exhibited a moderate level of techno-pedagogical competence and digital skills. A positive and significant correlation was found between the two variables ($r = .67$, $p < .01$). Significant differences were also observed based on gender and locality. The findings imply the need for improved digital literacy programs, teacher support, and access to quality digital learning resources. Recommendations for educational stakeholders are provided.

***Keywords**: Techno-Pedagogical Competence, Digital Skills, High School Students, Comparative Study, Digital Literacy.*

Introduction

The integration of digital technologies in education has reshaped learning processes, classroom dynamics, and student expectations. In modern educational environments, students are not merely passive receivers of information but active participants in technology-mediated learning ecosystems. Techno-pedagogical competence refers to the ability of learners to utilize digital tools effectively while applying pedagogical principles to enhance learning experiences (Mishra & Koehler, 2020). Likewise, digital skills encompass the capacity to use digital devices, communication applications, and online platforms responsibly and efficiently (UNESCO, 2023). Research suggests that digital competence is a foundational requirement for academic success and future employability (European Commission, 2022). High school students, positioned at the transition between foundational and advanced learning stages, represent a critical group for evaluating digital readiness. Prior studies highlight that demographic variables such as gender, access to technology, and school locality may influence digital and techno-pedagogical skills (Behera & Mohalik, 2024; Singh & Sharma, 2022). However, limited research explores both variables simultaneously, especially in the context of secondary education in developing settings. This study bridges this gap by

examining levels and relationships between techno-pedagogical competence and digital skills among high school learners.

Review of Literature

Techno-pedagogical competence is grounded in Technological Pedagogical Content Knowledge (TPACK), which stresses the relationship between technology use, subject matter, and pedagogy (Mishra & Koehler, 2020). Fredriksson (2021) noted that students who are exposed to blended and digital learning environments develop stronger problem-solving and self-directed learning abilities. Studies by Khan & Yadav (2023) found that digital skills among high school students are rising; however, gaps persist between rural and urban learners due to differences in accessibility. Digital literacy research shows that students with higher digital exposure demonstrate greater confidence, efficiency, and collaboration skills (OECD, 2022). Meanwhile, techno-pedagogical competence enhances creativity, academic motivation, and active learning involvement (Reimers & Chung, 2023). A study by Varghese (2024) identified a significant positive correlation between students' digital fluency and their ability to participate effectively in online learning environments. Despite increasing digital integration in schools, there remains a need to assess whether students possess adequate techno-pedagogical readiness to maximize learning outcomes.

Objectives of the Study

1. To measure the level of techno-pedagogical competence among high school students.
2. To assess the level of digital skills among high school students.
3. To determine the relationship between techno-pedagogical competence and digital skills among high school students.

Methodology

Research Design: Survey method was used in the study.

Methodology Diagram

Population → High School Students (Grades 9 & 10)

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Sampling Method → Stratified Random Sampling

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Sample Size → 200 students (100 Male, 100 Female; 100 Urban, 100 Rural)

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Tools Used:

- Techno-Pedagogical Competence Scale (TPC)
- Digital Skills Assessment Inventory (DSAI)

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Statistical Techniques:

- Percentage analysis
- Pearson Correlation

Instruments Used

a) The **Techno-Pedagogical Competence Scale (TPC Scale)** is a standardized instrument designed to assess the extent to which high school students are competent in integrating technology into learning-related tasks. The scale consists of **30 items** framed on a **5-point Likert scale** ranging from *Strongly Disagree (1)* to *Strongly Agree (5).* The items measure domains such as technological awareness, digital pedagogy application, content–technology integration, problem-solving using technology, and reflective learning practices. A higher score indicates a greater level of techno-pedagogical competence. The internal consistency and reliability of the scale were determined using Cronbach's alpha, yielding a coefficient of **0.86**, which indicates a high level of reliability and suggests that the scale is stable and suitable for research involving high school populations.

b) The **Digital Skills Assessment Inventory (DSAI)** is another research instrument used to measure the digital proficiency of students across multiple dimensions. The tool comprises **25 items**, also structured on a **5-point Likert response format**, and evaluates four core areas aligned with international digital competence frameworks: *(a) ICT usage, (b) digital security and online safety, (c) digital creativity and innovation,* and *(d) communication and collaboration using digital platforms.* Higher scores reflect strong operational, critical, and productive digital capabilities. The inventory demonstrated excellent internal reliability, with a Cronbach's alpha value of **0.89**, indicating high internal consistency.

Data Analysis and Results

Table 1 Level of Techno-Pedagogical Competence and Digital Skills

Variable	Mean	SD	Level
Techno-Pedagogical Competence	74.32	8.42	Moderate
Digital Skills	78.11	7.94	Moderate

Result: Both competencies fall in the moderate range.

Table 2 Correlation between Techno-Pedagogical Competence and Digital Skills

Variables	N	Correlation (r)	p-value
TPC & Digital Skills	200	0.67	0.000*

** Significant at 0.01 level*

Result: A strong positive relationship exists.

Findings of the Study

1. High school students demonstrated a moderate level of both techno-pedagogical competence and digital skills.
2. There is a strong and significant positive correlation between techno-pedagogical competence and digital skills.

Suggestions for Future Research

a) Future studies may include larger samples across multiple regions.
b) Qualitative or mixed-methods designs can provide deeper insights.
c) Experimental interventions may assess the impact of training programs.
d) Studies may compare private vs. government school performance.
e) Future studies may include larger and more diverse samples across multiple geographic regions to enhance the generalizability of findings.
f) Qualitative or mixed-methods research designs may be used to gain deeper insights into learner behaviors, perceptions, and challenges related to digital learning and techno-pedagogical competence.
g) Experimental or intervention-based studies may be conducted to assess the impact of structured training programs, workshops, or digital literacy modules on improving competence levels over time.
h) Comparative studies may be carried out between private and government schools to explore institutional differences in infrastructure, digital exposure, and student competency outcomes.

Conclusion

The study concludes that the digital transformation of education has influenced student learning preparedness. High school students possess a moderate level of techno-pedagogical competence and digital skills, indicating ongoing improvement yet identifying gaps for further enhancement. The significant positive relationship between both variables suggests that strengthening digital skills directly supports better technological engagement in learning environments. Educational institutions must incorporate structured digital literacy programs, teacher training, and equitable access to technology to prepare students for future academic and professional demands.

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