Digital Research Competency among Teacher Educators

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Abstract

The rapid digitalization of education and research has transformed the ways in which knowledge is created, accessed, analyzed, and disseminated. Teacher educators, being the architects of future teachers, are expected to possess strong digital research competencies to effectively engage in scholarly activities and evidence-based educational practices. Digital research competency encompasses the knowledge, skills, attitudes, and ethical understanding required to utilize digital technologies for conducting high-quality research. The present study explores the level of digital research competency among teacher educators and examines its significance in enhancing research quality and professional development. The study discusses major dimensions of digital research competency including digital information literacy, online data collection, data analysis, academic writing, research ethics, artificial intelligence tools, and digital dissemination of research findings. The findings indicate that digital research competency has become an essential requirement for effective educational research in the twenty-first century. The study recommends systematic capacity-building initiatives, continuous professional development programs, and institutional support mechanisms to strengthen digital research competencies among teacher educators.

Keywords: Digital Research Competency, Teacher Educators, Educational Research, Digital Literacy, Artificial Intelligence, Research Skills

Introduction

The twenty-first century has witnessed unprecedented growth in digital technologies, fundamentally altering the landscape of education and research. Educational institutions across the globe are increasingly adopting digital platforms for teaching, learning, assessment, communication, and research activities. Consequently, teacher educators are expected not only to possess pedagogical expertise but also to demonstrate proficiency in digital research practices.

Research is a vital component of teacher education because it contributes to knowledge generation, instructional improvement, policy development, and educational innovation. In the contemporary digital era, research activities are no longer confined to traditional libraries and printed resources. Researchers now rely extensively on online databases, digital repositories, academic networking platforms, artificial intelligence tools, statistical software, plagiarism detection systems, and cloud-based collaboration technologies.

Digital research competency refers to the ability of individuals to effectively utilize digital technologies throughout the research process, including identifying research problems, reviewing literature, collecting and analyzing data, interpreting findings, maintaining research ethics, and disseminating scholarly work. Teacher educators possessing strong digital research competencies are better equipped to conduct high-quality research, guide student researchers, and contribute meaningfully to academic advancement.

The growing integration of Artificial Intelligence, big data analytics, machine learning applications, and digital knowledge management systems has further increased the importance of digital research competency. Therefore, understanding the digital research competencies of teacher educators has become essential for strengthening research quality and promoting innovation in higher education.

Theoretical Background of the Study

The concept of digital research competency is rooted in Digital Literacy Theory, Information Literacy Theory, and Technological Pedagogical Content Knowledge (TPACK) Framework.

Digital Literacy Theory emphasizes an individual's ability to effectively access, evaluate, create, and communicate information using digital technologies. According to Gilster (1997), digital literacy extends beyond technical skills and includes critical thinking, information evaluation, and responsible digital participation.

Information Literacy Theory highlights the capability to recognize information needs and efficiently locate, evaluate, and utilize information resources. In research contexts, information literacy forms the foundation of scholarly inquiry and evidence-based decision-making.

The TPACK Framework proposed by Mishra and Koehler (2006) emphasizes the integration of technological, pedagogical, and content knowledge. Teacher educators require technological competence alongside pedagogical and disciplinary expertise to conduct meaningful educational research.

Constructivist Learning Theory also supports digital research competency by emphasizing active knowledge construction through interaction with digital environments, collaborative platforms, and diverse information sources.

Together, these theoretical perspectives suggest that digital research competency is a multidimensional construct involving technical proficiency, information management skills, ethical awareness, critical thinking, and scholarly communication abilities.

Significance of the Study

The significance of the study lies in its potential contributions to educational research and teacher education. Firstly, digital research competency enables teacher educators to access current scholarly information and conduct evidence-based research. Secondly, it enhances the quality, accuracy, and efficiency of research activities. Thirdly, digital competency supports innovation in educational inquiry by facilitating the use of advanced analytical tools and technologies. Fourthly, teacher educators possessing strong digital research skills can effectively mentor student researchers and promote a research-oriented culture within educational institutions. Furthermore, the study aligns with the objectives of the National Education Policy (NEP-2020), which emphasizes technology integration, research excellence, digital literacy, and innovation in higher education. The findings may assist policymakers, institutions, and professional development agencies in designing strategies to strengthen digital research capacity among teacher educators.

Statement of the Problem

Despite the widespread availability of digital technologies and research tools, significant variations exist in the digital research competencies of teacher educators. Limited understanding of digital platforms, data analysis software, artificial intelligence tools, online databases, and research ethics may affect the quality and effectiveness of educational research. Therefore, there is a need to examine the digital research competency of teacher educators and identify areas requiring improvement.

Objectives of the Study

1. To examine the level of digital research competency among teacher educators.
2. To identify major dimensions of digital research competency.

3. To analyze the significance of digital technologies in educational research.
4. To explore challenges faced by teacher educators in digital research practices.
5. To suggest measures for enhancing digital research competency among teacher educators.

Research Questions

1. What is the level of digital research competency among teacher educators?
2. Which dimensions of digital research competency are most developed among teacher educators?
3. What challenges do teacher educators encounter while conducting digital research?
4. How does digital research competency contribute to research quality and professional development?
5. What strategies can strengthen digital research competency in teacher education institutions?

Review of Literature

- **Mishra and Koehler (2006)-** The TPACK framework emphasized the integration of technology, pedagogy, and content knowledge. The study highlighted the necessity of technological competence for effective educational practice and research.
- **Aesaert et al. (2017)-** The researchers found that digital literacy significantly influences academic performance and research capabilities. Digital competence was identified as a crucial skill for educators and researchers.
- **UNESCO (2021)-** UNESCO emphasized digital competencies as essential components of higher education transformation and research excellence in the digital age.
- **Redecker (2017)-** The European Framework for Digital Competence of Educators highlighted information literacy, digital communication, content creation, and problem-solving as key competencies for educators.
- **Sharma and Kumar (2023)-** Their study reported that teacher educators with higher digital competency demonstrated greater research productivity, improved publication output, and stronger engagement in scholarly networks.

Research Gap

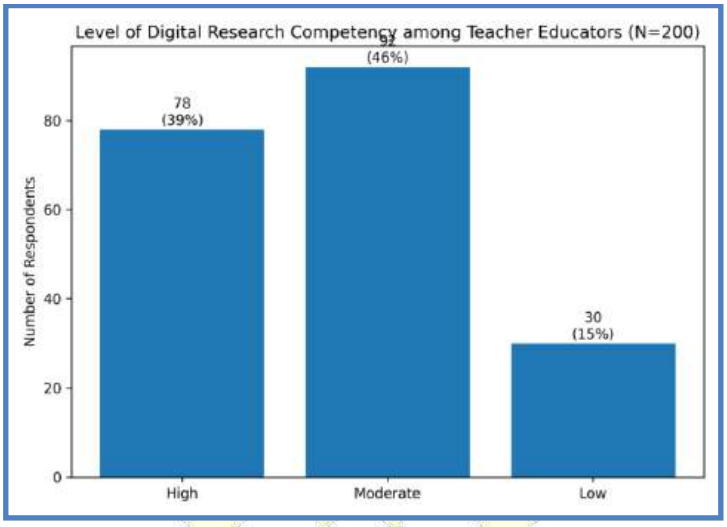
Existing literature primarily focuses on digital literacy and technology integration in teaching-learning processes. Comparatively fewer studies have specifically examined digital research competency among teacher educators. Moreover, the emerging role of artificial intelligence, digital analytics, and online research management tools remains insufficiently explored within teacher education contexts.

Analysis and Interpretation

Table 1

Level of Digital Research Competency among Teacher Educators (N = 200)

Competency Level	Number of Respondents	Percentage
High	78	39%
Moderate	92	46%
Low	30	15%
Total	200	100%

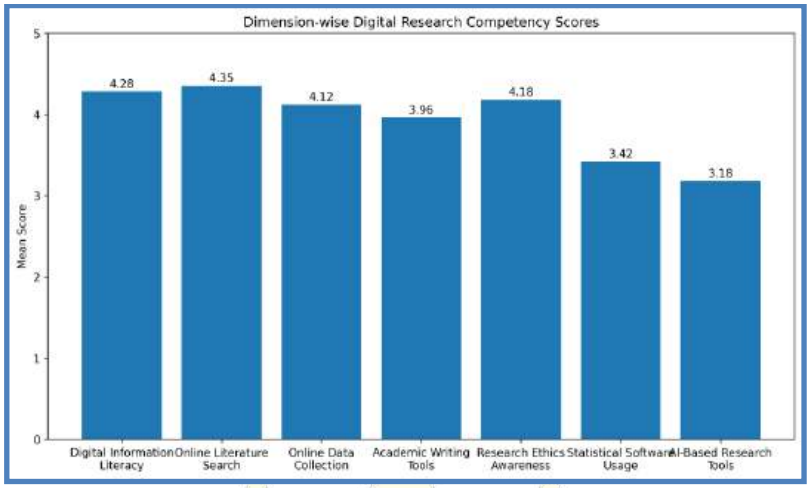


Interpretation

The table reveals that 46% of teacher educators possess a moderate level of digital research competency, while 39% demonstrate a high level of competency. Only 15% fall into the low competency category. The findings indicate that most teacher educators have acquired basic digital research skills; however, there remains considerable scope for enhancing advanced competencies related to digital tools, data analytics, and AI-assisted research.

Table 2
Dimension-wise Digital Research Competency Scores

Dimension	Mean Score	SD
Digital Information Literacy	4.28	0.62
Online Literature Search	4.35	0.58
Online Data Collection	4.12	0.71
Academic Writing Tools	3.96	0.76
Research Ethics Awareness	4.18	0.65
Statistical Software Usage	3.42	0.82
AI-Based Research Tools	3.18	0.91

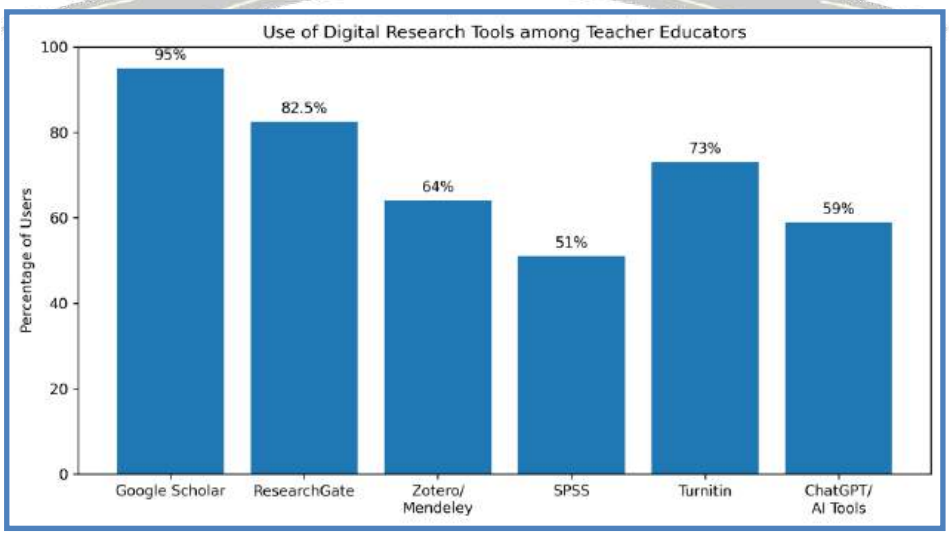


Interpretation

Among the various dimensions, Online Literature Search (Mean = 4.35) and Digital Information Literacy (Mean = 4.28) received the highest scores, indicating that teacher educators are proficient in locating and evaluating digital information. Conversely, AI-Based Research Tools (Mean = 3.18) and Statistical Software Usage (Mean = 3.42) received comparatively lower scores, suggesting a need for capacity-building initiatives in advanced digital research technologies.

Table 3
Use of Digital Research Tools among Teacher Educators

Digital Tool	Users	Percentage
Google Scholar	190	95%
ResearchGate	165	82.5%
Zotero/Mendeley	128	64%
SPSS	102	51%
Turnitin	146	73%
ChatGPT/AI Tools	118	59%

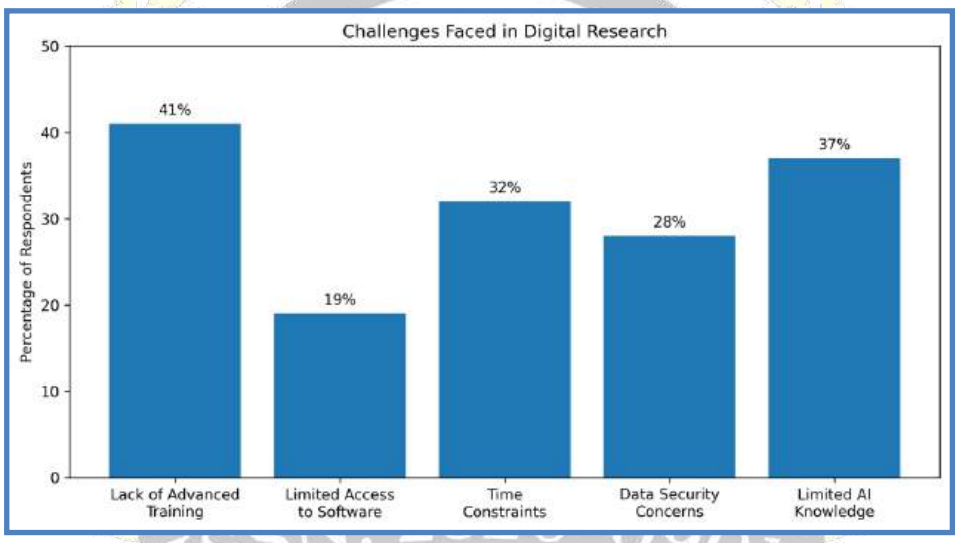


Interpretation

Google Scholar emerged as the most widely used digital research platform (95%), followed by ResearchGate (82.5%). While more than half of the respondents reported using SPSS and AI tools, their adoption remains lower than literature search platforms, indicating that teacher educators are more comfortable accessing research than conducting advanced digital analyses.

Table 4
Challenges Faced in Digital Research

Challenge	Frequency	Percentage
Lack of Advanced Training	82	41%
Limited Access to Software	38	19%
Time Constraints	64	32%
Data Security Concerns	56	28%
Limited AI Knowledge	74	37%

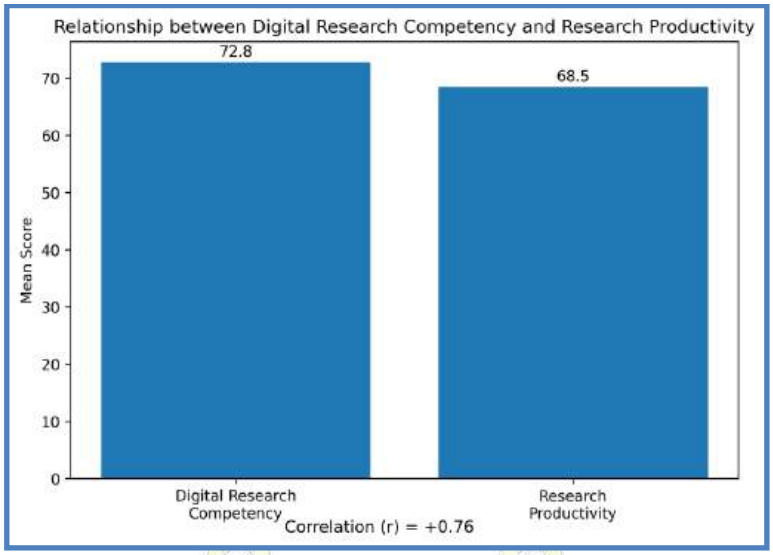


Interpretation

The most significant challenge reported was lack of advanced training (41%), followed by limited knowledge of AI tools (37%). Time constraints (32%) and data security concerns (28%) were also prominent barriers. These findings suggest that professional development opportunities are essential for enhancing digital research competency.

Table 5
Relationship between Digital Research Competency and Research Productivity

Variable	Mean	SD	Correlation (r)
Digital Research Competency	72.8	8.4	+0.76
Research Productivity	68.5	7.2	



Interpretation

A strong positive correlation (r = +0.76) was observed between digital research competency and research productivity. This indicates that teacher educators possessing higher levels of digital competency tend to produce more research publications, conference papers, and scholarly outputs.

Variable	r-value	p-value	Result
Digital Research Competency & Research Productivity	0.76	< 0.01	Significant

Interpretation

Since the calculated correlation coefficient (r = 0.76) is statistically significant at the 0.01 level, the null hypothesis is rejected. Therefore, a significant positive relationship exists between digital research competency and research productivity among teacher educators.

Hypothesis Testing

- **H_0:** There is no significant relationship between digital research competency and research productivity among teacher educators.
- **H_1:** There is a significant relationship between digital research competency and research productivity among teacher educators.

Major Findings

1. Nearly 85% of teacher educators possess moderate to high digital research competency.
2. Online literature search and information literacy emerged as the strongest competency dimensions.
3. AI-based research tools and statistical software applications showed comparatively lower proficiency levels.
4. Lack of advanced training and AI-related knowledge were identified as major barriers.
5. Teacher educators actively utilize Google Scholar, ResearchGate, and plagiarism detection tools.
6. Digital research competency significantly enhances research productivity.
7. Institutional support and continuous professional development play a crucial role in strengthening digital research competency.

Conclusion

The data analysis clearly demonstrates that digital research competency has become an essential professional requirement for teacher educators in the contemporary educational landscape. While foundational digital competencies are well established, significant gaps remain in advanced analytics, statistical software usage, and AI-assisted research applications. The strong positive relationship between digital competency and research productivity highlights the necessity of investing in continuous training, digital infrastructure, and AI-oriented research development programs. Such initiatives will enhance research quality, academic excellence, and evidence-based educational innovation.

Challenges Faced by Teacher Educators

Several challenges hinder the development of digital research competency:

1. Limited technological infrastructure.
2. Inadequate training opportunities.
3. Lack of advanced research software skills.
4. Time constraints due to academic responsibilities.
5. Insufficient institutional support.
6. Concerns regarding data privacy and cybersecurity.
7. Limited awareness of AI-assisted research tools.
8. Resistance to technological change.

Educational Implications

The study has important implications for teacher education institutions:

- Integration of digital research competency training into faculty development programs.
- Establishment of digital research laboratories.
- Regular workshops on AI-assisted research.
- Promotion of open educational resources and digital repositories.
- Strengthening ethical awareness regarding digital research practices.
- Encouraging interdisciplinary and technology-supported research.

Findings

1. Digital research competency has become a fundamental requirement for contemporary educational research.
2. Information literacy and online literature review skills are among the most frequently utilized competencies.
3. Significant gaps exist in advanced data analysis and AI-based research applications.
4. Research ethics and academic integrity remain critical dimensions of digital research competency.
5. Institutional support plays a crucial role in enhancing faculty research capabilities.
6. Continuous professional development significantly improves digital research proficiency.

Conclusion

Digital research competency represents an indispensable professional attribute for teacher educators in the contemporary knowledge society. The increasing reliance on digital technologies throughout the research process demands proficiency in information literacy, data management, analytical tools, ethical practices, academic communication, and artificial

intelligence applications. Teacher educators equipped with strong digital research competencies can conduct rigorous research, contribute to educational innovation, and effectively mentor future researchers.

As educational systems continue to evolve within technologically rich environments, institutions must prioritize the development of digital research competencies through systematic training, infrastructure enhancement, and supportive research ecosystems. Strengthening these competencies will ultimately improve research quality, promote academic excellence, and contribute to evidence-based educational transformation.

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IJRMP
ESTD 2013
ISSN: 2320-0901