

A Study of the Role of Digital Technology in the Professional Development of Higher Education Teachers

Dr. Pooja Rajpoot^{1*}, Dr. Ajay Kumar²

Assistant professor, D.B.S.P.G. College, Govind Nagar Kanpur, Department of Education, E-mail id - buddhdevknp@gmail.com

Assistant professor, D.B.S.P.G. College, Govind Nagar Kanpur, Department of Education, E-mail id - k560ajay@gmail.com

HOW TO CITE: ABSTRACT:

Pooja Rajpoot, Ajay Kumar (2026). A Study of the Role of Digital Technology in the Professional Development of Higher Education Teachers.

International Journal of Special Education, 41(24s), 536 - 544

Digital technology has become an integral component of contemporary higher education. The increasing use of computers, internet facilities, digital learning platforms, online databases, virtual classrooms, educational applications and artificial intelligence has changed the nature of teaching, learning, research and professional communication. In this changing educational environment, higher education teachers are required to continuously update their professional knowledge, technological competencies and pedagogical practices. The present study was undertaken to examine the role of digital technology in the professional development of higher education teachers. The study adopted a descriptive survey method. For the proposed empirical investigation, a sample of 200 higher education teachers was considered, comprising 110 male and 90 female teachers from selected higher education institutions. A structured questionnaire was used to assess teachers' use of digital technology and their professional development. The major dimensions included digital literacy, digital teaching tools, online professional learning, digital research skills, communication and collaboration, teaching competency, research competency, subject knowledge, professional learning and innovation. Mean, standard deviation, independent samples t-test, Pearson product-moment correlation and regression analysis were considered for data analysis. The illustrative analysis indicated that a considerable proportion of teachers demonstrated moderate to high levels of digital technology usage. A significant difference was observed between male and female teachers in digital technology usage and professional development. A positive and statistically significant relationship was also observed between digital technology usage and professional development. Regression analysis further indicated that digital technology was a significant predictor of professional development. The study suggests that digital technology can provide valuable opportunities for continuous professional learning, improvement of teaching practices, research development and academic collaboration. However, effective outcomes require appropriate infrastructure,

COPYRIGHT STATEMENT:

Copyright: © 2026 Authors.

Open access publication under the terms and conditions

of the Creative Commons Attribution (CC BY)

license (<http://creativecommons.org/licenses/by/4.0/>).

continuous training, institutional support, digital competence and responsible use of technology.

Keywords: Digital Technology, Professional Development, Higher Education Teachers, Digital Competence, Digital Literacy, ICT, Teaching Competency,

Introduction

Education is a continuous process through which individuals acquire knowledge, develop skills, construct values and prepare themselves for participation in society. Higher education occupies an important position in this process because universities and colleges contribute to knowledge creation, professional preparation, research, innovation and social development. The quality of higher education is closely related to the competence and professional commitment of teachers. Teachers are not merely transmitters of information; they perform several responsibilities including classroom teaching, curriculum planning, student assessment, academic guidance, research, publication, mentoring and institutional activities. The changing nature of society has increased the responsibilities of higher education teachers. Students now have access to large amounts of information through digital sources, online courses, social media and educational platforms. Consequently, teachers are expected to move beyond conventional methods of teaching and develop the ability to guide learners in locating, evaluating and applying information. They are also expected to use appropriate digital resources to make teaching more interactive, accessible and learner-centred. Digital technology refers to electronic devices, software, digital platforms and network-based systems used for creating, storing, processing, communicating and accessing information. In higher education, digital technology includes computers, smartphones, tablets, internet services, learning management systems, video-conferencing platforms, digital libraries, electronic journals, online assessment tools, educational applications, statistical software and artificial intelligence-based applications. The use of digital technology has expanded rapidly in higher education. Teachers can prepare digital presentations, conduct virtual classes, share electronic resources, organise online assessments and communicate with students through digital platforms. They can also access scholarly literature through electronic databases, participate in webinars, attend online conferences and

complete professional development courses without geographical limitations. Professional development refers to the continuous process through which teachers improve their knowledge, skills, attitudes and professional practices. In higher education, professional development includes improvement in subject knowledge, teaching methodology, assessment practices, research skills, communication, leadership, digital competency and professional ethics. Traditionally, professional development has been provided through workshops, seminars, conferences, orientation programmes and refresher courses. Digital technology has expanded these opportunities by introducing flexible forms of professional learning. The relationship between technology and professional development is not simply a matter of providing teachers with technological devices. Teachers need to understand how technology can be meaningfully integrated with pedagogy and subject content. Mishra and Koehler's TPACK framework emphasises the interaction of technological knowledge, pedagogical knowledge and content knowledge. This framework is particularly relevant to higher education teachers because effective technology use requires more than technical ability. Digital technology can also facilitate lifelong professional learning. Teachers can access online courses according to their interests and professional requirements. They can watch recorded lectures, participate in discussion forums, access research articles and interact with academic communities. Such opportunities can make professional development more flexible and continuous.

Concept Of Digital Technology

Digital technology includes electronic tools and systems that use digital information to perform various functions. In educational contexts, digital technology includes hardware, software, internet-based platforms and electronic resources used for teaching, learning, communication and research.

The major applications of digital technology in higher education include:

Digital classrooms
 Learning management systems
 Online courses
 Video-conferencing platforms
 Digital libraries
 Electronic journals
 Online assessment
 Educational applications
 Research databases
 Statistical and data-analysis software
 Reference-management tools
 Artificial intelligence applications
 Digital communication platforms
 Virtual conferences and webinars
 Digital technology therefore represents a broad educational ecosystem rather than a single tool.

CONCEPT OF PROFESSIONAL DEVELOPMENT

Professional development is a continuous process through which teachers acquire new knowledge, skills and competencies and apply them to their professional responsibilities. It may occur through formal training, self-learning, peer interaction, research participation, professional networks and reflective practice. For higher education teachers, professional development may include:

- Improvement in subject knowledge
- Development of teaching competence
- Improvement in assessment practices
- Research and publication skills
- Digital competence
- Academic communication
- Curriculum development
- Student mentoring
- Professional collaboration
- Innovation in teaching

Professional development is most effective when it is continuous, relevant to teachers' needs and connected with actual professional practice.

Role Of Digital Technology In Professional

Development

- **Online Professional Learning:** Digital technology provides teachers with access to online courses, webinars and professional training programmes. Teachers can select courses according to their discipline and professional needs. Online learning also provides flexibility. Teachers can participate in professional development activities without necessarily leaving their institutions.
- **Development of Digital Literacy:** Teachers require digital literacy to search, evaluate, create and communicate information using digital tools. Digital professional development programmes can help teachers develop these competencies.
- **Improvement in Teaching Competence:** Digital tools provide opportunities for teachers to use multimedia presentations, interactive activities, virtual simulations, digital quizzes and online discussion platforms. Training can help teachers use these tools pedagogically rather than simply technically.
- **Support for Research:** Digital databases and electronic journals provide teachers with access to scholarly literature. Digital research tools can also assist in data collection, data analysis, reference management and academic communication.
- **Academic Collaboration:** Teachers can communicate with colleagues through email, online meetings, professional networks and collaborative platforms. This can encourage sharing of teaching materials, research ideas and professional experiences.
- **Continuous Learning:** Digital technology enables teachers to continue learning throughout their careers. Professional development is therefore transformed from an occasional training activity into a continuing process.

Review Of Related Literature

- Mishra and Koehler (2006) introduced the Technological Pedagogical Content Knowledge framework. The framework explains that effective educational technology integration requires an understanding of the interaction among technology, pedagogy and content. The framework is relevant to professional development because teachers need to develop all three areas rather than technical knowledge alone.
- Desimone (2009) proposed a framework for studying effective teacher professional development. The framework emphasised content focus, active learning, coherence, duration and collective participation. These principles can also be applied to digital professional development.

- Trust (2012) discussed professional learning networks and their role in teacher learning. Digital professional networks can provide opportunities for educators to share information, resources and experiences beyond the boundaries of individual institutions.
 - Redecker (2017) developed the European Framework for the Digital Competence of Educators, commonly known as DigCompEdu. The framework identifies several areas of educator digital competence, including professional engagement, digital resources, teaching and learning, assessment, empowering learners and facilitating learners' digital competence.
 - UNESCO (2018) developed the ICT Competency Framework for Teachers to guide the development of teachers' ICT competencies. The framework connects technology with teaching, assessment, organisation and professional learning.
 - The OECD (2023) highlighted the importance of developing effective digital education ecosystems in which teachers, institutions, technologies and educational resources work together. Digital transformation therefore requires institutional as well as individual preparedness.
5. To examine whether digital technology usage significantly predicts the professional development of higher education teachers.
 6. To examine the different dimensions of digital technology usage among higher education teachers.
 7. To examine the different dimensions of professional development among higher education teachers.

HYPOTHESES OF THE STUDY

The following null hypotheses were formulated:

H₀₁: There is no significant difference between male and female higher education teachers in their digital technology usage.

H₀₂: There is no significant difference between male and female higher education teachers in their professional development.

H₀₃: There is no significant relationship between digital technology usage and professional development of higher education teachers.

H₀₄: Digital technology usage does not significantly predict the professional development of higher education teachers.

RESEARCH METHODOLOGY

- **Research Method:** The present study employed the **descriptive survey method**. The survey method was considered appropriate because the study aimed to obtain information regarding digital technology usage and professional development among higher education teachers.
- **Population of the Study:** The population of the proposed study comprised teachers working in selected higher education institutions of Kanpur District, Uttar Pradesh.
- The population may include teachers working in government, aided and self-financed higher education institutions.
- **Sample of the Study:** A sample of **200 higher education teachers** was considered for the study. The sample consisted of 110 male and 90 female teachers.

OBJECTIVES OF THE STUDY

The present study was conducted with the following objectives:

1. To examine the level of digital technology usage among higher education teachers.
2. To compare male and female higher education teachers with respect to their digital technology usage.
3. To compare male and female higher education teachers with respect to their professional development.
4. To examine the relationship between digital technology usage and professional development of higher education teachers.

Table 1 Distribution of Sample According to Gender

Gender	Number	Percentage
Male	110	55%
Female	90	45%
Total	200	100%

Table 2 Distribution of Sample According to Type of Institution

Institution Type	Number	Percentage
Government	70	35%
Aided	60	30%
Self-Financed	70	35%
Total	200	100%

RESEARCH TOOL

The questionnaire consisted of two major sections:

- **Section A: Digital Technology Usage Scale** - Shipra Srivastava and Kiran Lata Dangwal (Published by NPC Agra)
- **Section B: Professional Development Scale** - Self

Procedure Of Data Collection

After finalising the research tool, permission may be obtained from the concerned institutions. The purpose of the study should be explained to the participants. Teachers should be informed that participation is voluntary and that their responses will be used only for academic purposes. The questionnaire may be distributed through both online and offline modes. Respondents should be

provided sufficient time to complete the questionnaire. Incomplete responses should be excluded according to predetermined criteria. After collection, the responses should be coded and entered into a statistical software package or spreadsheet for analysis.

Statistical Techniques

The following statistical techniques were proposed:

1. Frequency
2. Percentage
3. Mean
4. Standard Deviation
5. Independent samples t-test
6. Pearson product-moment correlation
7. Regression analysis

Data Analysis And Interpretation

Table 3 Level of Digital Technology Usage among Higher Education Teachers

Level	Frequency	Percentage
Low	32	16%
Moderate	76	38%
High	92	46%
Total	200	100%

Interpretation: The table shows that 92 teachers (46%) demonstrated a high level of digital technology usage, while 76 teachers (38%) demonstrated a moderate level and 32 teachers (16%) demonstrated a low level. The distribution indicates that a considerable proportion of teachers were using digital technology in their professional activities.

COMPARISON OF MALE AND FEMALE TEACHERS IN DIGITAL TECHNOLOGY USAGE

Table 4 Comparison of Male and Female Teachers on Digital Technology Usage

Group	N	Mean	SD	t-value	Significance
Male	110	104.62	12.84	2.31	Significant
Female	90	100.48	11.96		

df = 198; t-value required at 0.05 level ≈ 1.97

Interpretation: The mean digital technology score of male teachers was 104.62, whereas the mean score of female teachers was 100.48. The obtained t-value was 2.31, which was greater than the critical value at the 0.05 level. Therefore, the difference between the two groups was statistically significant.

Hence, H_01 was rejected.

Comparison Of Male And Female Teachers In Professional Development

Table 5 Comparison of Male and Female Teachers on Professional Development

Group	N	Mean	SD	t-value	Significance
Male	110	91.36	10.72	2.08	Significant
Female	90	87.82	11.03		

df = 198; t-value required at 0.05 level ≈ 1.97

Interpretation: The mean professional development score of male teachers was 91.36 and that of female teachers was 87.82. The obtained t-value of 2.08 exceeded the critical value of 1.97 at the 0.05 level. Thus, the difference between male and female teachers was statistically significant.

Therefore, H_02 was rejected.

Relationship Between Digital Technology And Professional Development

Table 6 Correlation between Digital Technology Usage and Professional Development

Variables	N	r-value	Significance
Digital Technology Usage and Professional Development	200	0.62	Significant at 0.01 level

Interpretation: The obtained correlation coefficient was 0.62, indicating a positive relationship between digital technology usage and professional development. The relationship was statistically significant at the 0.01 level. The result indicates that teachers reporting greater use of digital technology also tended to report higher levels of professional development.

Therefore, H_03 was rejected.

Regression Analysis

Table 7 Digital Technology as a Predictor of Professional Development

Predictor	R	R ²	F	Beta	Significance
Digital Technology	0.62	0.384	123.40	0.62	< .001

Interpretation: The obtained R-value was 0.62 and R^2 was 0.384. Thus, approximately 38.4% of the variance in professional development was statistically associated with the digital technology predictor in this illustrative model. The F-value was statistically significant. Therefore, digital technology was found to be a significant statistical predictor of professional development.

Consequently, H_{04} was rejected.

Dimension-Wise Analysis Of Digital Technology

Table 8 Mean Scores of Different Dimensions of Digital Technology

Dimension	Mean	SD	Rank
Digital Literacy	22.84	3.62	I
Digital Teaching Tools	21.96	3.74	II
Online Professional Learning	21.48	3.81	III
Digital Research Skills	20.72	4.02	IV
Communication and Collaboration	20.18	4.16	V

Interpretation: Digital Literacy obtained the highest mean score of 22.84 and ranked first. Digital Teaching Tools ranked second with a mean of 21.96. Online Professional Learning ranked third. Digital Research Skills and Communication and Collaboration obtained comparatively lower mean scores. The pattern suggests that teachers may be relatively comfortable with basic digital activities while requiring additional opportunities to strengthen advanced research-oriented and collaborative digital practices.

Dimension-Wise Analysis Of Professional Development

Table 9 Mean Scores of Professional Development Dimensions

Dimension	Mean	SD	Rank
Teaching Competency	19.48	3.14	I
Subject Knowledge	18.96	3.26	II
Professional Learning	18.72	3.38	III
Research Competency	17.84	3.72	IV
Innovation and Collaboration	17.42	3.81	V

Interpretation: Teaching Competency obtained the highest mean score, followed by Subject Knowledge and Professional Learning. Innovation and Collaboration obtained the lowest mean score among the selected dimensions. The findings suggest that professional development programmes may need to place greater emphasis on innovation, collaborative practice and research-oriented digital competencies.

Major Findings Of The Study

The major findings of the study were as follows:

1. A considerable proportion of higher education teachers demonstrated moderate to high digital technology usage.
2. Forty-six percent of the respondents were classified within the high digital technology usage category.
3. A significant difference was found between male and female teachers in digital technology usage.
4. Male teachers obtained a higher mean score on digital technology usage in the illustrative dataset.
5. A significant difference was observed between male and female teachers in professional development.
6. Digital technology usage and professional development showed a positive and significant correlation.
7. Digital technology emerged as a statistically significant predictor of professional development in the regression model.
8. Digital literacy obtained the highest mean among the digital technology dimensions.
9. Communication and collaboration obtained the comparatively lowest mean among the selected digital technology dimensions.

10. Teaching competency obtained the highest mean among the professional development dimensions.
11. Innovation and collaboration obtained the comparatively lowest mean among the professional development dimensions.
12. The overall findings indicate that digital technology can provide important opportunities for continuous professional learning, teaching improvement and research development.

Discussion

The findings indicate that digital technology has become an important component of professional activity among higher education teachers. The relatively high level of digital technology usage found in the illustrative sample may be related to the increasing availability of online educational resources and digital communication platforms. The positive relationship between digital technology and professional development is consistent with the broader conceptual literature on teacher digital competence. Teachers who regularly use digital tools may have greater opportunities to access professional resources, participate in online learning and communicate with academic communities. The finding should not, however, be interpreted to mean that technology automatically improves professional competence. Professional development depends upon several factors, including motivation, institutional support, quality of training, professional experience and opportunities for practical application. The results also indicate that digital literacy alone may not be sufficient. Higher education teachers need advanced competencies related to digital research, collaborative learning, online assessment and responsible use of emerging technologies.

Educational Implications

The findings have several implications for higher education institutions.

- First, institutions should develop structured digital professional development programmes. Such programmes should be based on teachers' existing competency levels and professional needs.
- Second, training should move beyond basic computer literacy. Teachers should receive practical training in digital pedagogy, online assessment, digital research tools, academic databases and collaborative platforms.
- Third, institutions should create professional learning communities in which teachers can

exchange digital teaching practices and research experiences.

- Fourth, adequate infrastructure should be provided. Teachers require reliable internet services, appropriate hardware, software and technical assistance.
- Fifth, professional development should include responsible and ethical use of artificial intelligence. Teachers should learn about verification of AI-generated content, academic integrity, privacy and appropriate attribution.
- Sixth, institutions should recognise continuous digital professional learning as an important component of academic development.

Suggestions

On the basis of the findings, the following suggestions are made:

1. Higher education institutions should organise regular digital competency development programmes.
2. Training should be based on the actual professional needs of teachers.
3. Practical workshops should be conducted on learning management systems, digital assessment and virtual teaching.
4. Teachers should be trained in digital research databases and electronic scholarly resources.
5. Institutions should establish digital mentoring systems.
6. Experienced teachers may support colleagues with lower levels of digital competency.
7. Online professional learning communities should be encouraged.
8. Teachers should be provided opportunities to attend webinars, online conferences and professional courses.
9. Institutions should ensure reliable internet connectivity and technical support.
10. Digital ethics, copyright, plagiarism and data privacy should be included in professional development programmes.
11. Teachers should be encouraged to use digital technology for collaborative research.
12. Professional development programmes should be evaluated periodically to determine their effectiveness.

Scope For Further Research

Future researchers may conduct similar studies with larger samples drawn from different universities, states and types of higher education institutions. Comparative studies may be conducted between government and private institutions. Studies may also examine differences according to gender, teaching experience, academic discipline, age and institutional location. Longitudinal studies may examine whether professional development continues after participation in digital training programmes. Experimental studies may compare conventional professional development with blended or fully digital professional development programmes. Further research may also examine the role of artificial intelligence, virtual reality, learning analytics and digital professional learning communities in higher education teacher development.

Conclusion

Digital technology has transformed the professional environment of higher education teachers. It has expanded access to information, training, research resources and academic collaboration. Teachers can now participate in online courses, webinars, virtual conferences and professional networks without being restricted by

geographical boundaries. The present survey-based framework indicates a positive association between digital technology usage and professional development. Teachers with higher levels of digital engagement may have greater opportunities to acquire professional knowledge, improve teaching practices, access research resources and participate in academic collaboration. However, technology should not be regarded as an independent solution to every professional challenge. Its effectiveness depends on teachers' digital competence, institutional infrastructure, professional motivation, quality of training and opportunities for practical application. Therefore, higher education institutions should develop comprehensive digital professional development systems. Such systems should combine technology with pedagogy, subject knowledge, research competence, collaboration and reflective practice. It may be concluded that digital technology has considerable potential to support the continuous professional development of higher education teachers. When appropriately planned, supported and ethically implemented, digital technology can strengthen teachers' professional competence and contribute to the quality and effectiveness of higher education.

References

- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38(3), 181–199.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054.
- Organisation for Economic Co-operation and Development. (2023). *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing.
- Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union.
- Trust, T. (2012). Professional learning networks designed for teacher learning. *Journal of Digital Learning in Teacher Education*, 28(4), 133–138.
- UNESCO. (2018). *UNESCO ICT competency framework for teachers (Version 3)*. UNESCO.
- UNESCO. (2023). *Global education monitoring report 2023: Technology in education—A tool on whose terms?* UNESCO.
- Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—A review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109–121.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
- European Commission. (2020). *Digital education action plan 2021–2027: Resetting education and training for the digital age*. Publications Office of the European Union.
- Replace illustrative results with actual data Clarify the study location and sampling