Teacher Half-Yearly Journal *17*(1),63-81, 2025

Teachers' Characteristics, ICT Use and Educational Outcomes

Bishnu Maya Joshi, Shambhu Prasad Khatiwada

Mrs. Joshi, Department of Economics Education, Mahendra Ratna Campus, Tahachal, Tribhuvan University. ✉*Joshibishnu92@gmail.com*
Mr. Khatiwada, Central Department of Geography Education,Tribhuvan University,✉*geography.dmc@gmail.com*
Submitted: March 13, 2024; Accepted: July 12, 2024; Published: January 31, 2025

Abstract

The integration of Information and Communication Technology (ICT) into education has gained momentum due to its potential to revolutionize teaching and learning. However, the success of ICT implementation relies heavily on various factors related to teachers' attitudes, skills, and beliefs toward technology use. This study sought to examine the relationship between teachers' characteristics, their use of ICT, and its impact on educational outcomes. A systematic review was conducted, identifying 17 high-quality studies that met rigorous methodological criteria. The analysis revealed that teachers' digital competence, alongside their perceptions of the usefulness of ICT tools, were significant predictors of effective technology integration in the classroom. Furthermore, teacher motivation, mindset, and opportunities for collaboration emerged as critical drivers for successful ICT adoption. The study also underscored the pivotal role the COVID-19 pandemic played in accelerating teachers' acquisition of digital skills, emphasizing the urgent need for expanded access to technology and professional development programs aimed at enhancing online instructional capabilities. These findings point to the necessity of addressing not only individual teacher characteristics but also institutional and systemic factors to ensure the successful integration of ICT in education. A holistic approach is essential to improve teaching practices and maximize the benefits of ICT in educational settings.

Keywords: Teachers' characteristics, ICT use, teacher motivation, digital competence, systematic review

Introduction

In recent years, the integration of information and communication technology (ICT) into education has become increasingly common (Ayu, 2020; Garzón Artacho et al., 2020). This trend is largely due to the increasing recognition of the potential of ICT to enhance teaching and learning processes. Information technologies include computers, tablets, smartphones, interactive whiteboards, instructional software, and online resources. These facilitate personalized learning experiences, and provide rich access to information and educational resources (Henderson, 2020; Zainuddin et al., 2020).

However, the effectiveness of ICTs in education does not depend on technology alone. The role of teachers' attitudes and practices in effective use of information technology cannot be overstated. Teachers play a key role in shaping the learning environment, and their attitudes, beliefs, and knowledge significantly influence the integration and impact of ICTs in the classroom. This study aimed to explore the relationship between teachers' characteristics, ICT use, and educational outcomes in education settings.

Teachers' Characteristics

Several studies have highlighted the significance of teachers' characteristics in determining the effectiveness of ICT integration. For instance, a study by Li et al. (2019) found that teachers' beliefs, knowledge, and skills regarding ICT significantly influenced their instructional practices. Similarly, a study by Gilkes (2020) emphasized the importance of teachers' self-efficacy in using ICT, which was found to be positively associated with their willingness to adopt innovative teaching methods.

ICT Use

The use of ICT by teachers has been shown to have a significant impact on students' learning outcomes. ICT integration positively affects student achievement across various subjects and grade levels (Basri et al., 2018; Park & Weng, 2020). Furthermore, a study by Fonseca and García-Peñalvo (2019) highlighted the role of ICT in promoting student engagement and motivation, which are essential for effecting learning.

The Interaction Between Teachers' Characteristics and ICT Use

The relationship between teachers' characteristics and their use of ICT is complex and multifaceted. A study by Lawrence and Tar (2018) found that teachers' attitudes towards ICT were influenced by their beliefs about teaching and learning and their prior experiences with technology. Similarly, a study by Abedi (2023) highlighted the importance of teachers' pedagogical beliefs in shaping their use of ICT in the classroom.

Review of the Role of Teachers' Characteristics and ICT Use in Education

The study conducted by Suárez-Rodríguez et al. (2018) focuses on teachers' integration of ICT at different levels of education (Primary, Secondary, and University) and examines the relationship between teachers' competencies in ICT and their use of these resources. It addresses the dimensions of teachers' competencies in ICT and how they link to the dimensions of their use of technological resources. The study utilized a secondary analysis approach, using data

collected from two survey design studies conducted with 1095 male and female teachers from the Valencian Community in Spain. The information was collected through questionnaires, which were mainly administered online. In cases where teachers lacked installation or knowledge, printed questionnaires were sent and answered. The paper highlights the importance of teachers as decisive actors in the integration of technological resources into their teaching practice. It emphasizes that teachers ultimately decide whether to apply ICT to their teaching practice and how to put them into practice. Personal and contextual factors such as gender, frequency of computer use at home, level of education, and computer use in the classroom are significantly connected with the competences and use dimensions.

Atman Uslu and Usluel (2019) proposed a conceptual framework for classifying ICT use in education and developed a structural model to explain technology integration based on teacher and school-related factors. The framework classifies ICT use with an instrumentalist perspective, and indicators of technology integration are identified and associated with the constructs in the framework. The model, tested through structural equation modeling, shows that factors in the model explain 70% of the variance in technology integration, indicating a significant prediction of technology integration. Data was collected from 403 teachers working in primary and secondary schools in Ankara, Turkey. Two instruments were used to collect teachers' perceptions of technology integration and their use of ICT in education. The study highlights the importance of factors such as access, technical support, administrative support, professional development support, teachers' beliefs, and ICT competencies in predicting technology integration.

Tondeur et al. (2019) utilized a person-centered approach called latent profile analysis (LPA) to cluster teacher educators based on their individual characteristics and support strategies, contributing to understanding the relationship between teacher educator characteristics and their support for preservice teachers in educational ICT use. It provided insights into the ICT profiles of teacher educators, identifying two profiles based on their attitudes, self-efficacy, competencies, and support strategies. This understanding can help teacher education institutes in preparing teacher educators to effectively support preservice teachers in integrating technology into their educational practice. The authors highlighted the importance of teacher educators acting as role models and providing scaffolds for discussing and reflecting upon successful technology use. It also emphasized the significance of group work, authentic technology experiences, and ongoing feedback in preparing preservice teachers for technology integration.

The study conducted by Ifinedo et al. (2020) underscored the influence of technology integration on Nigerian teachers' knowledge and pedagogical practices, highlighting the need for improved ICT integration in education. The study employed a paper-based self-completed survey administered to Nigerian teachers from three government-owned schools in the southern part of Nigeria, using convenience sampling. The survey measured the teachers' characteristics, knowledge constructs, ICT practices, and beliefs and perceptions of technology integration. The study highlights the low level of ICT integration among Nigerian teachers and students and emphasizes the need for improved technology integration in education. The study identified that technology integration can be understood as a combination of individual teacher-level factors, such as knowledge, perceptions, characteristics, and practices.

Panisoara et al. (2020) conducted a study in Ireland on the impact of the Covid-19 pandemic on teachers' technology use. The study focused on the challenges, skills, competencies, and technological requirements for online teaching. The researchers surveyed 38 primary and post-primary teachers in Ireland and found that teachers faced challenges transitioning to online teaching and needed skills and competencies to effectively teach online. Additionally, the study found that the lack of technology access at home led to learning inequalities among students. the study highlights the importance of considering multiple factors, including psychological needs, job demands and resources, and technology acceptance, in understanding teachers' continuance intention during the COVID-19 outbreak. It suggests that interventions aimed at improving teachers' continuance intention should focus on enhancing their information management skills, technological pedagogical knowledge and self-efficacy, and reducing occupational stress through motivational practices.

Vermote et al. (2020) explored the relationship between teachers' motivation and mindset and their teaching practices. They found that autonomous motivation and a growth mindset were positively related to motivating teaching practices, while controlled motivation, amotivation, and a fixed mindset were positively related to demotivating practices. The study also illuminated the factors underlying teachers' engagement in motivating practices. Autonomous motivation refers to being driven by internal factors such as interest, enjoyment, and satisfaction. A growth mindset is the belief that one's abilities and intelligence can be developed through effort and dedication. Controlled motivation, on the other hand, refers to being driven by external factors such as rewards or punishments. Amotivation refers to a lack of motivation, while a fixed

mindset is the belief that one's abilities and intelligence are fixed and cannot be changed. The study found that teachers who were autonomously motivated and had a growth mindset were more likely to engage in motivating teaching practices, such as providing students with opportunities for autonomy and choice, fostering a sense of competence, and promoting a sense of relatedness and belonging. On the other hand, teachers who were controlled motivated, amotivated, or had a fixed mindset were more likely to engage in demotivating practices, such as using rewards or punishments to control student behavior, focusing on grades and performance rather than learning, and creating a competitive and judgmental classroom environment. So, the study suggests that teachers' motivation and mindset play a significant role in shaping their teaching practices. Teachers who are autonomously motivated and have a growth mindset are more likely to create a positive and engaging learning environment, while those who are controlled motivated, amotivated, or have a fixed mindset are more likely to create a negative and demotivating learning environment.

Sundqvist et al. (2021) conducted a study to explore the factors that influence Finnish subject-teachers' use of ICT in Home Economics. They found that digital competence and perceived usefulness were key predictors of ICT use among these teachers. Additionally, they emphasized the importance of providing support for teachers to enhance their ICT use. Their findings suggest that support at the school level can significantly influence teachers' ICT use. Moreover, the perceived usefulness of ICT tools can impact the effectiveness of teaching and learning in the classroom. The study also found that teacher age, digital competence, and the level of support they receive all play a role in determining their use of ICT. This highlights the importance of providing ongoing training and support to teachers to ensure they can effectively integrate technology into their teaching practices.

In their study, Aqlan et al. (2021) examined the computer self-efficacy and technology integration of K-12 teachers in Hawaii. They utilized a survey method to collect data from a large number of respondents. The study found that there was no significant impact of computer self-efficacy on the attitude towards Learning Management Systems (LMS) among the participating teachers. This suggests that while teachers may have a certain level of confidence in their computer skills, it does not necessarily translate into a positive attitude towards the use of LMS in their teaching practices.

Winter et al. (2021) conducted a study on the impact of the COVID-19 pandemic on teachers' technology use in Ireland, focusing on the challenges, skills, competencies, and technological requirements for online teaching. The study surveyed 38 primary and post-primary teachers in Ireland and found that teachers faced significant challenges when transitioning to online teaching. These challenges included the need for new skills and competencies, as well as a lack of access to technology at home, which led to learning inequalities among students. One of the key findings of the study was that teachers needed to develop new skills and competencies to effectively teach online. This included the ability to use online platforms and tools, as well as the ability to adapt teaching methods to an online environment. Many teachers also reported feeling overwhelmed by the amount of new technology they had to learn and use. In addition to the challenges of learning new skills, teachers also faced challenges related to access to technology. Many teachers reported that they did not have access to the necessary technology at home, which made it difficult for them to teach online. Overall, the study highlights the challenges that teachers in Ireland faced when transitioning to online teaching during the COVID-19 pandemic. It also highlights the need for teachers to develop new skills and competencies to effectively teach online, as well as the need for increased access to technology for both teachers and students.

Sánchez-Cruzado et al. (2021) conducted a quantitative study on Spanish teachers' digital skills post-COVID-19, focusing on the need for effective teaching. The study involved 4,883 Spanish teachers and aimed to measure their digital skills. The findings revealed a low self-perception of digital skills among teachers, indicating an urgent need for a training program to enhance teachers' digital skills. The study's results showed that Spanish teachers had a low self-perception of their digital skills, which could affect their effectiveness in teaching. This low self-perception may be due to a lack of confidence in using digital tools and platforms, as well as a lack of training and support in this area. The study also highlighted the importance of digital skills for effective teaching, especially in the context of the COVID-19 pandemic. With the shift to online and hybrid learning, teachers need to be proficient in using digital tools and platforms to engage students and deliver effective instruction. This study emphasizes the urgent need for a training program to enhance Spanish teachers' digital skills. This program should focus on building teachers' confidence in using digital tools and platforms, as well as providing them with

the necessary training and support to effectively integrate technology into their teaching practices.

Konstantinidou and Scherer (2022) investigated the variation in teaching practices with technology and the emphasis on developing students' digital skills and computational thinking by examining teacher motivation, collaboration, school conditions, and country characteristics. The findings of this study highlighted the positive and consistent link between teacher motivation and collaboration with teaching practices across countries, the influence of principals' expectations on teaching with technology in Finnish and German schools, and the impact of teachers' professional development on their teaching practices in certain countries. Additionally, the study reveals the role of countries' economic development and innovation in explaining variation in teaching practices. Study explored that the teacher motivation and collaboration were positively and consistently linked to teaching practices with technology across countries.

Szyszka et al. (2022) provide a comprehensive exploration of the frequency of ICT use in education among teachers in Poland, as well as their attitudes toward new media and the support they receive from management. The research was conducted using a questionnaire and data from 258 teachers in the Silesia Province in 2020. The study found that teachers in Poland use virtual systems and interactive whiteboards most frequently, while educational podcasts and software for learning foreign languages are used least often. Approximately 40% of teachers use ICT often or very often in their school teaching. Digital teaching aids are slightly more commonly used in public schools compared to non-public institutions. The study highlighted that the teachers consistently use digital teaching aids, regardless of the type of software and hardware. Active support from school head teachers strengthens the frequency of ICT use in education.

Ferede et al. (2022) employed a qualitative research approach to investigate the determinants affecting Home Economics (HE) instructors in Ethiopian universities. The study focused on the factors influencing instructors' use of Information and Communication Technology (ICT) in higher education settings. Through a field study conducted among HE instructors, the researchers identified several key determinants of ICT use. These included institutional, individual, and infrastructure factors. Notably, the study uncovered new themes such as the importance of management support, students' ICT competence, and course-related factors.

Zubković et al. (2022) employed an online survey methodology in combination with group-administered questionnaires to conduct their study on teachers' attitudes towards ICT, their ICT self-efficacy, and the barriers they face when using ICT. The study utilized a 15-item assessment scale to measure the frequency of teachers' ICT activities and explored the correlations between their attitudes towards ICT use, self-efficacy, and the barriers they encounter.

Kundu et al. (2022) conducted a study using the descriptive survey method and an ex-post-facto research design. They analyzed teachers' self-efficacy, self-concept, and perceptions of ICT usability. The study was funded by Bankura University, India, and no conflicts of interest were reported. The results revealed that teachers' ICT self-efficacy was at a moderate level. Furthermore, statistical analysis showed significant effects of self-efficacy and self-concept on the teachers' perceptions of ICT usability.

Galaraga and Reynato Jr (2022) investigated the readiness of teachers for digital instruction by examining their competence and attitude. They explored the relationship between digital competence, attitude, and readiness for instruction. The study found that teachers' digital competence and attitude are related to their readiness for digital instruction.

In their study, Reddy and Babu (2024) employed a quantitative research design to evaluate faculty ICT skills, challenges, and readiness for online teaching. They utilized an online questionnaire to assess faculty members. The findings indicated that faculty readiness for online teaching requires targeted interventions to address existing challenges and enhance skills. The study also explored the disparities in the adoption of online education between faculty and students, shedding light on potential areas for improvement and alignment. Furthermore, based on their research findings, the authors proposed recommendations for implementing 21st-century teaching strategies to better meet the evolving needs of both faculty and students in online education settings.

Table 1. *Detail Information of Reviewed Articles*

Authors	Year	Source	Title	Methods of study
Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Díaz-García, I.	2018	Educational technology research and development,66	A basic model of integration of ICT by teachers: competence and use	Secondary analysis approach, using data collected from two survey design studies conducted with 1095 male and female teachers from the Valencian Community in Spain
Atman Uslu, N., & Usluel, Y. K.	2019	Technology, Pedagogy and Education, 28(5)	Predicting technology integration based on a conceptual framework for ICT use in education	Data was collected from 403 teachers working in primary and secondary schools in Ankara, Turkey. Two instruments were used to collect teachers' perceptions of technology integration and their use of ICT in education
Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E.	2019	British Journal of Educational Technology, 50(3)	Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education	Person-centered approach called latent profile analysis (LPA) to cluster teacher educators based on their individual characteristics and support strategies
Ifinedo, E., Rikala, J., & Hämäläinen, T.	2020	Computers & education, 146	Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs	Paper-based self-completed survey
Panisoara, I. O., Lazar, I., Panisoara, G.,	2020	International Journal of Environmental	Motivation and continuance intention towards	Surveyed 38 primary and post-primary teachers in Ireland

Chirca, R., & Ursu, A. S.		Research and Public Health, 17(21)	online instruction among teachers during the COVID-19 pandemic: The mediating effect of burnout and technostress	
Vermote, B., Aelterman, N., Beyers, W., Aper, L., Buysschaert, F., & Vansteenkiste, M.	2020	Motivation and emotion, 44	The role of teachers' motivation and mindsets in predicting a (de) motivating teaching style in higher education: A circumplex approach	Multidimensional scaling analyses
Sundqvist, K., Korhonen, J., & Eklund, G. (2021)	2021	Education Inquiry, 12(1)	Predicting Finnish subject-teachers' ICT use in Home Economics based on teacher-and school-level factors	Survey-based study
Aqlan, A. A., Al-Hakim, W., Al-Mamary, Y. H. S., Abdulrab, M., Grada, M., Jazim, F., & Alquhaif, A. S.	2021	Dimensión Empresarial, 19(2)	Factors influencing Behavioral Intention to Use Learning Management Systems among Instructors in Yemeni Universities	Survey method
Winter, E., Costello, A., O'Brien, M., & Hickey, G.	2021	Irish educational studies, 40(2)	Teachers' use of technology and the impact of Covid-19	surveyed 38 primary and post-primary teachers in Ireland
Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compaña, M. T.	2021	Sustainability, 13(4)	Teacher digital literacy: The indisputable challenge after COVID-19	Quantitative study
Konstantinidou, E., & Scherer, R.	2022	Computers & Education, 179	Teaching with technology: A large-scale, international, and multilevel study of the roles of teacher	Large-scale, international, and multilevel study

			and school characteristics	
Szyszka, M., Tomczyk, Ł., & Kochanowicz, A. M.	2022	Sustainability, 14(14)	Digitalisation of schools from the perspective of teachers' opinions and experiences: The frequency of ICT use in education, attitudes towards new media, and support from management	Using a questionnaire and data from 258 teachers in the Silesia Province
Ferede, B., Elen, J., Van Petegem, W., Hunde, A. B., & Goeman, K.	2022	Education and Information Technologies	Determinants of instructors' educational ICT use in Ethiopian higher education	Qualitative research approach
Zubković, B. R., Pahljina-Reinić, R., & Kolić-Vehovec, S.	2022	Humanities Today: Proceedings, 1(1)	Predictors of ICT use in teaching in different educational domains	Online survey methodology
Kundu, A., Dey, K. N., & Bej, T.	2022	International Journal of Distance Education Technologies (IJDET), 20(1)	Subject-self affecting on teachers' perceived ict usability: A proposition for TAM3+	Descriptive survey method
Galaraga, R. L., & Reynato Jr, C. A.	2022	Sapienza: International Journal of Interdisciplinary Studies, 3(7)	Competence and attitude as predictors of teachers' readiness for digitized instruction	Analyze teachers' readiness for digital instruction

Methods of Study

Search Strategy

A comprehensive search strategy was conducted across multiple electronic databases, including PubMed, ERIC, PsycINFO, Google Scholar, and Web of Science. The search terms included combinations of keywords related to teachers' characteristics, ICT use, and education. The search was limited to studies published in English from 2018 to 2024.

Inclusion and Exclusion Criteria

Studies were included if they focused on the relationship between teachers' characteristics, ICT use, and educational outcomes in K-12 or higher education settings. Only empirical studies written in English (e.g., quantitative, qualitative, mixed-methods) were included, and literature reviews, editorials, and opinion pieces were excluded. Studies that did not provide sufficient information on the relationship between teachers' characteristics, ICT use, and educational outcomes were also excluded.

Data Extraction and Synthesis

Data were extracted from the included studies using a standardized form, which included information on study design, participants, measures, and key findings. The extracted data were synthesized using a thematic analysis approach, which involved identifying common themes and patterns across the studies.

Quality Assessment

The quality of the included studies was assessed using established criteria for evaluating the methodological rigor of empirical research. Studies were rated on various dimensions, including sample size, research design, data collection methods, and statistical analysis. The studies that met the criteria for high methodological quality were given greater weight in synthesizing findings.

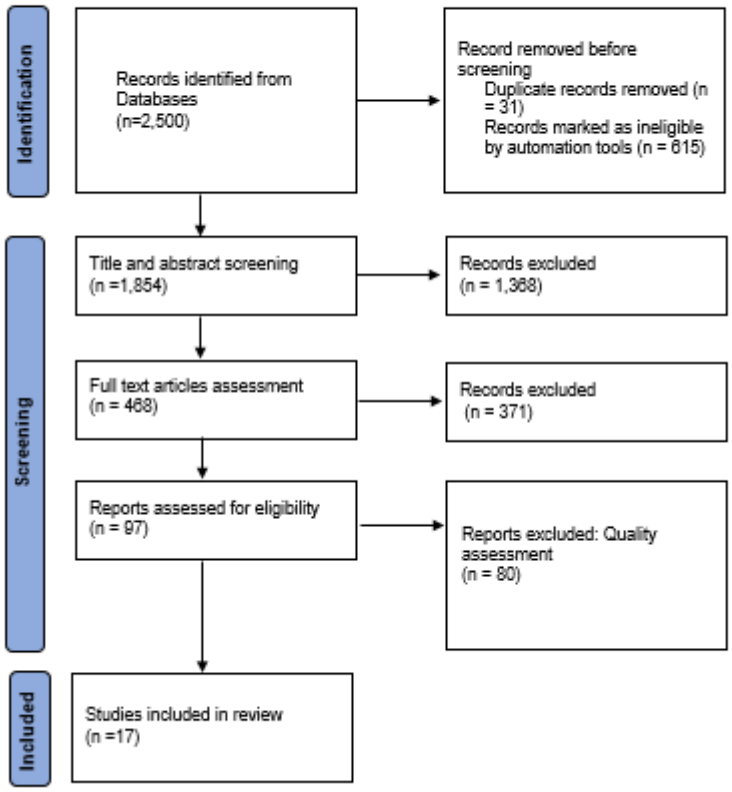
Description of Screening Process for Identifying Relevant Articles

The initial search across multiple electronic data bases yielded a total of 2,500 literatures. Duplicate records were identified and removed, resulting in 31 records being excluded from the screening process. Automation tools were used to mark records as ineligible based on predefined criteria, resulting in 615 records being excluded from further consideration. The remaining records (1,854) were screened based on their titles and abstracts to determine their relevance to the research aims. After the title and abstract screening, 1,368 records were excluded due to various reasons, such as not focusing on teachers' characteristics and ICT use, not being empirical studies, or not providing sufficient information on the relationship between teachers' characteristics, ICT use, and educational outcomes. The 486 records that passed the title and abstract screening stage were subjected to a full-text review. After this review, 371 records were excluded due to various reasons. Among them 97 articles were deemed eligible for inclusion were further assessed for their methodological rigor through a quality assessment. This

assessment involved rating the articles on various dimensions, including sample size, research design, data collection methods, and statistical analysis. After the quality assessment, 80 articles were excluded due to not meeting the criteria for high methodological quality. Finally, 17 articles met the criteria for high methodological quality and were included in this systematic review. This screening process is presents in PRISMA flow diagram in figure 1.

Figure 1

PRISMA Flow Diagram of Literature Identification and Screening Process



Analysis of the Study

The studies mentioned above collectively provide a detailed understanding of the various factors influencing teachers' integration of ICT into their teaching practices. These factors encompass a broad spectrum, ranging from individual characteristics such as motivation, mindset, and digital competence, to external factors like access to technology and institutional support. Here is an elaboration on the key findings and implications of these studies:

Teachers' Digital Competence and Perceived Usefulness

Suárez-Rodríguez et al. (2018) and Sundqvist et al. (2021) emphasize the significance of teachers' digital competence and their perception of the usefulness of ICT tools in predicting technology integration. Teachers who are proficient in using digital tools and perceive them as beneficial for teaching are more likely to integrate technology into their instructional practices. This highlights the importance of providing support and ongoing training to enhance teachers' digital skills and foster a positive attitude towards technology integration.

Teacher Motivation and Collaboration

Atman Uslu and Usluel (2019), and Konstantinidou and Scherer (2022) explore the relationship between teacher motivation, collaboration, and school conditions in predicting technology integration. They found that motivated teachers who collaborate with colleagues are more inclined to incorporate technology into their teaching practices. This underscores the importance of creating a supportive school environment that encourages collaboration and values teacher motivation as key drivers of successful technology integration.

Teacher Attitude

Tondeur et al. (2019) and Vermote et al. (2020) highlight the role of teachers' mindset in shaping their teaching practices. Teachers who possess a growth mindset, believing in their ability to develop and improve, are more likely to engage in motivating teaching practices. Conversely, those with a fixed mindset may exhibit demotivating practices. This emphasizes the need for fostering a growth mindset among teachers to promote effective technology integration.

Impact of COVID-19

Winter et al. (2021) and Sánchez-Cruzado et al. (2021) shed light on the challenges faced by teachers during the COVID-19 pandemic in transitioning to online teaching. These studies underscore the urgent need for increased access to technology and training programs to enhance teachers' digital skills and facilitate effective online instruction. The pandemic has highlighted the importance of preparedness for digital teaching and the resilience of teachers in adapting to new teaching modalities.

Findings of the Study

The studies collectively provide a detailed understanding of the various factors influencing teachers' integration of ICT into their teaching practices. These factors encompass a

broad spectrum, ranging from individual characteristics such as motivation, mindset, and digital competence, to external factors like access to technology and institutional support.

The significance of teachers' digital competence and their perception of the usefulness of ICT tools in predicting technology integration is emphasized. Teachers who are proficient in using digital tools and perceive them as beneficial for teaching are more likely to integrate technology into their instructional practices. This highlights the importance of providing support and ongoing training to enhance teachers' digital skills and foster a positive attitude towards technology integration.

The relationship between teacher motivation, collaboration, and school conditions in predicting technology integration is explored. Motivated teachers who collaborate with colleagues are more inclined to incorporate technology into their teaching practices. This underscores the importance of creating a supportive school environment that encourages collaboration and values teacher motivation as key drivers of successful technology integration.

The role of teachers' mindset in shaping their teaching practices is highlighted. Teachers who possess a growth mindset, believing in their ability to develop and improve, are more likely to engage in motivating teaching practices. Conversely, those with a fixed mindset may exhibit demotivating practices. This emphasizes the need for fostering a growth mindset among teachers to promote effective technology integration.

The challenges faced by teachers during the COVID-19 pandemic in transitioning to online teaching are discussed. The studies underscore the urgent need for increased access to technology and training programs to enhance teachers' digital skills and facilitate effective online instruction. The pandemic has highlighted the importance of preparedness for digital teaching and the resilience of teachers in adapting to new teaching modalities.

The studies collectively emphasize the multidimensional nature of technology integration in education and highlight the need for a holistic approach that addresses individual, institutional, and systemic factors to promote effective technology integration and enhance teaching practices. Ongoing support, professional development, and investment in infrastructure are crucial for empowering teachers to leverage technology effectively in their instructional practices.

Conclusion

This study provides valuable insights into the multifaceted factors influencing teachers' integration of ICT into their teaching practices. Key findings underscore the importance of

teachers' digital competence and their perception of the usefulness of ICT tools in predicting technology integration. Additionally, teacher motivation, collaboration, and mindset emerge as significant predictors of technology integration, emphasizing the need for supportive school environments and fostering a growth mindset among teachers. Moreover, this paper found the profound impact of the COVID-19 pandemic on teachers' digital skills and the urgent need for increased access to technology and training programs to facilitate effective online instruction. Overall, these findings emphasize the necessity of a holistic approach that addresses individual, institutional, and systemic factors to promote effective technology integration and enhance teaching practices in education.

References

Abedi, E. A. (2023). Tensions between technology integration practices of teachers and ICT in education policy expectations: Implications for change in teacher knowledge, beliefs and teaching practices. *Journal of Computers in Education*, 1–20. https://link.springer.com/article/10.1007/s40692-023-00296-6

Aqlan, A. A., Al-Hakim, W., Al-Mamary, Y. H. S., Abdulrab, M., Grada, M., Jazim, F., & Alquhaif, A. S. (2021). Factors influencing behavioral intention to use learning management systems among instructors in Yemeni Universities. *Dimensión Empresarial, 19*(2). https://doi.org/10.15665/dem.v19i2.2728

Atman Uslu, N., & Usluel, Y. K. (2019). Predicting technology integration based on a conceptual framework for ICT use in education. *Technology, Pedagogy and Education, 28*(5), 517–531. https://doi.org/10.1080/1475939X.2019.1668293

Ayu, M. (2020). Online learning: Leading e-learning at higher education. *The Journal of English Literacy Education: The Teaching and Learning of English as a Foreign Language, 7*(1), 47–54. https://ejournal.unsri.ac.id/index.php/jenglish/article/viewFile/11515/5528

Basri, W. S., Alandejani, J. A., & Almadani, F. M. (2018). ICT adoption impact on students' academic performance: Evidence from Saudi universities. *Education Research International, 2018*, 1–9. https://doi.org/10.1155/2018/1240197

Ferede, B., Elen, J., Van Petegem, W., Hunde, A. B., & Goeman, K. (2022). Determinants of instructors' educational ICT use in Ethiopian higher education. *Education and Information Technologies*, 1–20. https://link.springer.com/article/10.1007/s10639-021-10606-z

Fonseca, D., & García-Peñalvo, F. J. (2019). Interactive and collaborative technological ecosystems for improving academic motivation and engagement. *Universal Access in the Information Society, 18*(3), 423–430. https://link.springer.com/article/10.1007/s10209-019-00669-8

Galaraga, R. L., & Reynato Jr, C. A. (2022). Competence and attitude as predictors of teachers' readiness for digitized instruction. *Sapienza: International Journal of Interdisciplinary Studies, 3*(7), 2–13. https://doi.org/10.51798/sijis.v3i7.497

Garzón Artacho, E., Martínez, T. S., Ortega Martin, J. L., Marin Marin, J. A., & Gomez Garcia, G. (2020). Teacher training in lifelong learning—the importance of digital competence in the encouragement of teaching innovation. *Sustainability, 12*(7), 2852. https://doi.org/10.3390/su12072852

Gilkes, A. L. (2020). *Teachers' knowledge and self-efficacy beliefs as factors affecting technology integration practices.* Walden University Global.

Henderson, D. (2020). Benefits of ICT in Education. *IDOSR Journal of Arts and Management, 5*(1), *1–5*. https://www.idosr.org/wp-content/uploads/2020/02/IDOSR-JAM-51-51-57-2020.-1.pdf

Ifinedo, E., Rikala, J., & Hämäläinen, T. (2020). Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs. *Computers & Education, 146*, Article 103760. https://doi.org/10.1016/j.compedu.2019.103760

Konstantinidou, E., & Scherer, R. (2022). Teaching with technology: A large-scale, international, and multilevel study of the roles of teacher and school characteristics. *Computers & Education, 179*, Article 104424. https://doi.org/10.1016/j.compedu.2021.104424

Kundu, A., Dey, K. N., & Bej, T. (2022). Subject-self affecting on teachers' perceived ICT usability: A proposition for TAM3+. *International Journal of Distance Education Technologies (IJDET), 20*(1), 1–24. https://doi.org/ 10.4018/IJDET.295980

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International, 55*(1), 79–105. https://doi.org/10.1080/09523987.2018.1439712

Li, Y., Garza, V., Keicher, A., & Popov, V. (2019). Predicting high school teacher use of technology: Pedagogical beliefs, technological beliefs and attitudes, and teacher training. *Technology, Knowledge and Learning, 24,* 501–518. https://doi.org/10.1007/s10758-018-9355-2

Panisoara, I. O., Lazar, I., Panisoara, G., Chirca, R., & Ursu, A. S. (2020). Motivation and continuance intention towards online instruction among teachers during the COVID-19 pandemic: The mediating effect of burnout and technostress. *International Journal of Environmental Research and Public Health, 17*(21), Article 8002. https://doi.org/10.3390/ijerph17218002

Park, S., & Weng, W. (2020). The relationship between ICT-related factors and student academic achievement and the moderating effect of country economic index across 39 countries. *Educational Technology & Society, 23*(3), 1–15. http://index.j-ets.net/Published/23_3/ETS_23_3_01.pdf

Reddy, K. S., & Babu, N. S. (2024). Navigating the digital divide: Assessing faculty ICT skills and challenges in shaping the future of higher education in India. *Brazilian Journal of Development, 10*(1), 355–378. https://doi.org/10.34117/bjdv10n1-023

Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compaña, M. T. (2021). Teacher digital literacy: The indisputable challenge after COVID-19. *Sustainability, 13*(4), 1858. https://doi.org/10.3390/su13041858

Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Díaz-García, I. (2018). A basic model of integration of ICT by teachers: Competence and use. *Educational Technology Research and Development, 66,* 1165–1187. https://doi.org/10.1007/s11423-018-9591-0

Sundqvist, K., Korhonen, J., & Eklund, G. (2021). Predicting Finnish subject-teachers' ICT use in Home Economics based on teacher-and school-level factors. *Education Inquiry, 12*(1), 73–93. https://doi.org/10.1080/20004508.2020.1778609

Szyszka, M., Tomczyk, Ł., & Kochanowicz, A. M. (2022). Digitalisation of schools from the perspective of teachers' opinions and experiences: The frequency of ICT use in education, attitudes towards new media, and support from management. *Sustainability, 14*(14), Article 8339. https://doi.org/10.3390/su14148339

Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology

integration in education. *British Journal of Educational Technology, 50*(3), 1189–1209. https://doi.org/10.1111/bjet.12748

Vermote, B., Aelterman, N., Beyers, W., Aper, L., Buysschaert, F., & Vansteenkiste, M. (2020). The role of teachers' motivation and mindsets in predicting a (de)motivating teaching style in higher education: A circumplex approach. *Motivation and Emotion, 44*, 270–294. https://doi.org/10.1007/s11031-020-09827-5

Winter, E., Costello, A., O'Brien, M., & Hickey, G. (2021). Teachers' use of technology and the impact of Covid-19. *Irish Educational Studies, 40*(2), 235–246. https://doi.org/10.1080/03323315.2021.1916559

Zainuddin, Z., Shujahat, M., Haruna, H., & Chu, S. K. W. (2020). The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system. *Computers & Education, 145*, Article 103729. https://doi.org/10.1016/j.compedu.2019.103729

Zubković, B. R., Pahljina-Reinić, R., & Kolić-Vehovec, S. (2022). Predictors of ICT use in teaching in different educational domains. *Humanities Today: Proceedings, 1*(1), 75–91. https://doi.org/10.2478/htpr-2022-0006