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Systematic Review on Technological Knowledge and Attitudes of Secondary School Teachers

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ABSTRACT

Rapid integration of technology in education has transformed teaching and learning processes globally. Secondary school teachers play a pivotal role in harnessing technological tools to enhance student outcomes. However, the effectiveness of technology integration largely depends on teachers' technological knowledge and their attitudes toward technology use. Understanding the current evidence on these factors is essential for informing policy, professional development, and future research. In this article, systematic review on technological knowledge and attitudes of secondary school teachers have been discussed.

Keywords: *Technological, Knowledge, Attitudes, Secondary, School, Teachers.*

INTRODUCTION

In the rapidly evolving landscape of education, technology has become an indispensable component of teaching and learning processes. The integration of digital tools into classrooms has reshaped pedagogical practices, offering opportunities to enhance student engagement, personalize learning, and support differentiated instruction. However, the effective utilization of educational technology is contingent not only on the availability of technological resources but also on teachers' technological knowledge and their attitudes toward technology integration**.**

Teacher preparedness in using technology has been identified as a critical factor influencing the success of technology-supported instruction. Technological knowledge encompasses teachers' understanding of digital tools, their affordances for learning, and the pedagogical strategies required for meaningful integration. This domain extends beyond basic operational skills to include technological pedagogical content knowledge (TPACK), which reflects the dynamic interplay between technology, pedagogy, and disciplinary content. Teachers who possess strong technological knowledge are more likely to design and implement technology-enhanced lessons that foster active learning and student achievement.

Alongside knowledge, teachers' attitudes toward technology play a pivotal role in shaping their instructional practices. Attitudes reflect beliefs, perceptions, and emotional responses toward technology adoption. Positive attitudes are associated with greater willingness to experiment with innovative tools, sustained use of technology in instruction, and resilience in overcoming implementation barriers. Conversely, negative attitudes—often stemming from lack of confidence, fear of complexity, or previous negative experiences—can hinder effective technology use despite access to resources.

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Secondary school teachers occupy a strategic position in the educational ecosystem, as they prepare students for higher education and workforce readiness in an increasingly digital world. Given the pivotal role of secondary education, understanding the extent to which teachers are equipped with technological competencies and the nature of their attitudes toward technology becomes essential for policymakers, teacher educators, and school leaders. Despite growing research interest in this area, findings remain fragmented across different cultural contexts, disciplines, and methodological approaches.

This systematic review aims to synthesize empirical evidence on secondary school teachers' technological knowledge and attitudes toward technology integration. By examining the existing literature, this review seeks to identify prevailing trends, measurement tools, contextual factors influencing these constructs, and gaps that warrant further research. Through this synthesis, insights into how teachers' technological readiness shapes educational practice can inform targeted professional development, resource allocation, and strategic planning for technology integration in secondary schools. The objective of the study was to systematic review on technological knowledge and attitudes of secondary school teachers.

SYSTEMATIC REVIEW OF LITERATURE

Mahanta, K. (2024). This study sought to investigate secondary school teachers' attitudes toward the utilization of information and communication technologies in education. The investigator employed the descriptive survey method for this purpose. One hundred samples (57 girls and 43 males) were obtained by multistage random sampling. The researcher has developed a scale for data collection. The investigator employed simple percentages, mean, standard deviation, and t-tests to generate the results from the data. The researcher has determined that 23% of teachers have a highly positive attitude toward ICT. 56% of educators exhibit moderate attitudes, while 20% demonstrate low attitudes about the utilization of ICT in education. This study indicates that there is no substantial disparity between the attitudes of male and female teachers on the utilization of ICT in education. Conversely, there is no substantial disparity between the perspectives of rural and urban educators on the utilization of ICT in education.

Meena, M.P., Barman, S. & Sharma, S.H.P. (2024). In modern culture, technology has transformed education, emphasizing methods that target student needs. Technological advancements have enabled students to participate actively in their educational journey and advance at their own speed. This advancement has considerably improved the efficacy, cost-effectiveness, and accessibility of education, extending its reach to a wider audience than previously. The advancement of technology has fundamentally altered the educational environment, offering essential assistance to both educators and students. The modification of pedagogical techniques in response to technology structural equation modeling technological enables educators to customize their strategies to address the varied requirements of students. This study examines the perspectives of educators regarding information technology in the Papumpare district of Arunachal Pradesh, taking into account variables such as gender and geographical location. The Attitude Scale towards Information Technology for Teachers was employed in the study. A quota cum random sampling strategy was utilized to choose a sample of 100 school teacher technological school teachers of both genders from urban and rural

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locations. The study identified significant variations in the attitudes of school teachers school teachers school teachers in the Papumpare district of Arunachal Pradesh towards information technology, contingent upon their gender; however, no disparities were noted depending on the teachers' locality.

Kastorff, T. & Stegmann, K. (2024). Educators must have comprehensive technology knowledge (TK) and technological-pedagogical knowledge (TPK) to effectively enhance ICT literacy among secondary school students by integrating ICT into curricula. This study investigates the impact of teachers' professional expertise at TK and TPK on the ICT literacy of secondary school students through multilevel analysis. Based on data from 1,566 students drawn from a larger sample, instructed in 134 classes by 220 teachers across 39 schools, our results indicate—contrary to our hypotheses—that there is no correlation between teachers' professional knowledge of Technological Knowledge (TK) and Technological Pedagogical Knowledge (TPK) and students' ICT literacy across curricula. Moreover, our model revealed no evident association between students' ICT literacy and their study-related ICT usage. This study provides new insights into the correlation between instructors' cross-curricular knowledge and students' cross-curricular achievements by analyzing the relationship between teachers' technological knowledge (TK) and technological pedagogical knowledge (TPK) and students' ICT literacy. It discusses other hypotheses and potential avenues for future investigation.

Prasad, P. K., Rana, K., & Laudari, S. (2024). This study investigated the utilization of mobile devices by secondary educators for instructional and learning activities in under-resourced secondary schools in Nepal. Twelve secondary educators from three suburban schools in a Himalayan province of Nepal were interviewed employing qualitative research methodologies. The data obtained from class observations complemented the information acquired from interviews. Research indicates that mobile devices enhance productivity in creating digital content, accessing online resources, and facilitating classroom instruction. The extent of instructors' technological, pedagogical, and subject understanding was evident in their utilization of mobile devices for information retrieval, language games, dictionaries, and specialized learning applications. This study illustrated how mobile devices enhanced teachers' instructional and learning activities in the absence of desktop PCs and laptops. Teachers could demonstrate enhanced competency in technology utilization if provided with instruction on its application in pedagogy and administrative backing.

Setua, C. & Yadav, M. (2024). This study primarily examines the correlation between attitudes towards ICT and techno-pedagogical skills among rural secondary school teachers in the West Bengal Board. This study involved the random selection of 210 rural secondary school teachers, employing a descriptive survey research approach. Data collection utilized the "Scale to Assess Techno Pedagogical Skills" (SATPS), standardized by the researcher with a content validity and reliability coefficient of 0.56, and the "ICT Attitude Scale for Secondary School Teachers," standardized by Saini, S. Utilized were the data from 2015. The findings indicated that rural secondary school teachers possess a good attitude towards ICT, which does not considerably vary by discipline but discipline but does significantly differ based on teaching experience. The techno-pedagogical competencies of rural secondary school educators are at a modest level and do not

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considerably vary according to their field of expertise or teaching experience. A positive link has been identified between attitudes towards ICT and the techno-pedagogical skills of rural secondary school teachers. The current study indicates that the techno-pedagogical skills of rural secondary school teachers in West Bengal are positively influenced by their attitudes towards ICT.

Chauhan, P.S. & Sharma, P. (2023). Teachers' positive attitudes can improve the quality of ICT in schools, and their technological proficiency is essential for fostering this mindset. This study aims to evaluate the attitudes of senior secondary school teachers about ICT instruction in the Saharanpur district. The present study employed a descriptive survey research design. Sixty educators from a designated cohort of schools participated in the present study. The study utilized a questionnaire designed by the researcher to gather data on respondents' demographics and their views towards ICT. A random sample of educators from several U.P. The study utilized senior secondary schools. Board. A t-test, correlation analysis, mean, standard deviation, and a significance test were utilized to assess four null hypotheses. The results indicate a robust positive link with instructors' perceptions of ICT.

Bhadana, S. & Dwivedi, K. (2023). Significant transformations in education have occurred from the conventional Gurukul system to contemporary schools, driven by swift technological advancements. When the educational institution acts, the instructional approaches will undoubtedly have experienced significant modifications. The primary aim of this study was to investigate the correlation between secondary school teachers' views towards e-learning and their self-efficacy through an empirical methodology. The study aimed to ascertain the influence of gender, geography, kind of school, and attitude towards online learning on self-efficacy. The objective of the present study was to examine the correlation between instructors' views towards online learning and their self-efficacy levels. The study utilized a sample of 200 instructors from both government and private secondary schools in Meerut, Uttar Pradesh. One hundred educators were selected from public schools, and an additional one hundred from private institutions. The data was collected using the self-efficacy instrument developed by Dr. Vishal Sood and Ms. Sapna Sen, together with a custom e-learning application. The findings indicated that secondary school teachers' attitudes and perceived self-efficacy levels were unaffected by gender. Research revealed that private school educators exhibited a significantly more favorable disposition towards e-learning and a greater sense of perceived self-efficacy compared to their public school colleagues. Furthermore, it was shown that educators possessing elevated self-efficacy exhibited more favorable attitudes towards online learning compared to those with diminished self-efficacy. The report recommends that the government provide pre-service and in-service training for teachers to enhance their e-learning competencies and foster a positive attitude towards the implementation of e-learning in the classroom.

Tran, M.T., Pham, N.T. & Dinh, T.B.H. (2023). Information and Communication Technology (ICT) has been integrated into university curricula globally due to the necessity for students to acquire knowledge and skills pertinent to the twenty-first century. Information and communication technology (ICT) is increasingly essential for teaching and learning in educational institutions and everyday life. Educators, vital to the educational system, have encountered several challenges in their pursuit of enhancing quality, efficiency, and accessibility. Although highly significant, their attitude

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has not been empirically investigated to assess its effects. The research included quantitative methodologies and a descriptive survey strategy. Structured questionnaires were employed to collect data from 475 teachers at a Kenyan university, selected via a stratified random sample method. Descriptive statistics, factor analysis, inferential statistics, ANOVA, and regression were employed in the Statistical Package for Social Sciences to analyze quantitative data. The study achieved a response rate of 86.4%, and the data conformed to normality as per the Shapiro-Wilk and Kolmogorov-Smirnov test criteria. Normal quantile plots were generated, yielding a Cronbach's alpha of 0.841 and a Kolmogorov-Smirnov test result of (P = 0.78). The attitude scale exhibited a mean score of 80.23 and a standard deviation of 0.403, as per the descriptive results. According to the analysis, 58.3% (277) of the participants expressed favorable thoughts regarding the utilization of ICT. The screen test identified five components with an eigenvalue exceeding one in the factor analysis. The found factors accounted for 57% of the variance in scores. The initial component accounted for 36.14% of the variance in the replies (eigenvalue = 7.23). Component 3 (eigenvalue = 1.42) represented 7.12% of the variance, whereas component 2, with an eigenvalue of 2.087, accounted for 10.43%. A binary logistic regression analysis was conducted to predict categorical variables or factors impacting ICT implementation. The results demonstrated that educators with a favorable disposition towards ICT adoption were almost twice as likely to engage in it compared to those with an unfavourable disposition [OR = 1.966, 95% C.I.] (1.271–3.041), p = 0.002. Consequently, the study determined that teachers' perspectives substantially influenced ICT adoption. To provide teachers with the requisite knowledge and abilities to positively impact their attitudes towards ICT, it is essential to give support and motivation through adequate infrastructure, in-service training, and refresher courses.

Kharnongrum, D.J., Dunai, D. & Tirkey, Z. (2023). Online learning is characterized as a type of distance education, also known as web-based learning, e-learning, and digital learning. It is provided online and utilizes web-based resources and activities. Competent online educators must be receptive to learning and engage actively in evolving online learning contexts. In online education, certain educators may seek an original and creative learning activity that engages students and is perceived as transformative. Despite the evolution of teaching due to online education, an effective educator continues to significantly impact both learners and the learning process. Students must possess technological proficiency to utilize necessary technological tools. Students in the digital era seem more autonomous, more technologically proficient, and more and more adept, making them well-suited for online environments. Self-paced online learning is advantageous for obtaining a high-quality college degree. Online education presents significant opportunities and formidable problems. It offers advantages for both students and educators. It provides convenience in terms of time and space, economic efficiency, and adaptability. Online education enables students to obtain an internationally recognized degree without attending on-campus classes. This study aims to ascertain the attitudes of secondary school teachers on online teaching and learning.

Zeng, Y. (2022). Technology has facilitated teaching and learning activities and standardized education. Nevertheless, not all educators integrate technology into their lessons effectively. Prior studies indicate that instructor expertise influences this integration. This study examines the

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utilization of technology by instructors in Australian secondary schools teaching Chinese as a foreign language. This study examines (a) the influence of technology on teacher knowledge, (b) the self-perception of CFL regarding their own knowledge, and (c) strategies for the effective development of teacher knowledge. The results indicate that technical knowledge (TK) significantly influences the technology usage of CFL instructors, who exhibited stronger trust in their non-technological knowledge compared to their technological knowledge. The insights about the relationships among knowledge constructs should elucidate the process of knowledge development for teacher preparation. This study enhances secondary teacher training in Australia.

Sailer, M. et al. (2021). No tools presently exist that assess instructors' competencies and dispositions according to a comprehensive array of specific standards and criteria for teaching with digital technology. We validated the scenario-based instrument INK19, which employs self-assessment to concurrently examine attitudes and competencies pertaining to technology-enhanced teaching, grounded in the K19 framework. Our confirmatory factor analyses indicate that the measure possesses adequate factorial validity in our study involving N = 90 teachers and student teachers with teaching experience. We examined the correlations between the instruments and the frequency of technology utilization by instructors in the classroom, as well as the sorts of technology-based learning activities they initiate for their students, to assess the predictive validity of the instruments. Self-reported initiation of student learning activities characterized by overt actions (active, constructive, and interactive) correlates with self-assessed competencies across several phases of technology-enhanced teaching, as indicated by structural equation modeling results. These results corroborate the predictive validity of our instrument. Positive attitudes towards technology in education correlate significantly with the initiation of digital technology-based learning activities, particularly those that do not require students to engage in visible actions (passive learning activities). Consequently, instructors' self-evaluated technology competencies may be more effective than attitudes in promoting learning activities crucial for students' development.

Bevo, W. & Chang, C-Y. (2019). This study aims to assess the progress of the latest innovations in STEM (science, technology, engineering, and mathematics) to promote the advancement of STEM education. All educational activities, particularly in STEM education, necessitate evaluation. However, there is a paucity of comprehensive studies regarding the progression and development of STEM education in specific Asian countries. A detailed review is conducted to examine the sustainable development of STEM education. This survey assesses three dimensions: applications, knowledge, and attitudes on STEM education. This study examines the comparative demographic data, perceived challenges faced by educators, and the contributions of these three sectors to the sustained advancement of STEM education. This study integrates quantitative and qualitative research methodologies. The quantitative analysis method was employed to evaluate the positional level and comparative worth of the three domains. The qualitative analysis method was employed to examine teachers' perceptions and to substantiate the quantitative results analysis. The results demonstrate that scientific educators possess a highly favorable perspective, a modest degree of application skill, and a deficient level of STEM teaching experience. Moreover, variations in teachers' educational backgrounds and teaching experiences result in disparities in the knowledge and

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execution of STEM education; nevertheless, there are no differences in the instructors' attitudes. The educator's viewpoint on the difficulties of instructing STEM is another aspect that is examined thoroughly. The discussion focuses on presenting potential and difficulties for enhancing educational standards in the future. The study's findings indicate that knowledge and attitudes are critical factors for the sustainable implementation of STEM education, especially in Indonesia.

Begum, S. & Ramachandran, R (2018). To achieve success in academic programs and professional employment, it is imperative for university students to possess enhanced computer abilities. Numerous factors contribute to significant disparities in the computer proficiency of college students, including the courses undertaken in high school and college, their academic major, work experience, and personal interest in computers and computing. There is less consensus regarding the requisite skill level for success in both introductory and advanced coursework, as well as the specific computer skills needed to secure and sustain employment post-graduation. Researchers propose that variables such as gender and computer usage may influence pupils' views about computers and their proficiency in computer skills.

Joaquim, G. (2017). Undoubtedly, we inhabit a digital era where younger individuals are more adept at using technology than their older counterparts, who often must modify their lifestyles and habits to comprehend when, how, and why to use digital tools. An examination of the curricula for teaching Portuguese as a native language and the pedagogical strategies employed by educators in the classroom reveals a distinct difference. We demonstrate that syllabi include residual references and that professors utilize digital resources similarly to traditional methods. This work aims to consolidate and combine insights from prior research on ICT, Portuguese curricula, and ICT behaviors among educators. It also underscores several factors for the absence of objectives aimed at enhancing digital literacy in mother tongue training.

Allen, C, & Berggren, J (2016). This project presents the concept of digital literacy in a practical context to a cohort of EFL instructors at a technologically equipped upper secondary school in Sweden. English instructors received a theoretical and practical review of the digital literacy idea prior to being assigned the responsibility of teaching a lesson each. The educators' reflecting experiences about the integration of digital literacy into advanced English instruction were then assessed through a focus group interview. The findings demonstrate the effectiveness of integrating small-scale exploratory practice research projects with demanding teaching schedules and administrative responsibilities, while also enhancing teachers' viewpoints on Information and Communications Technology (ICT) in the English as a Foreign Language (EFL) classroom. The project has fostered synergies and collaboration among school staff committed to the long-term objective of ongoing professional development.

Hemabala, J. (2015). The key objectives of this project are to promote awareness of mobile learning in India and to improve personalized or self-directed learning within a flexible educational framework. This research study utilized a questionnaire and a quasi-experimental design to evaluate the efficacy of mobile learning and student behavior by analyzing the learning outcomes of engineering students through video lessons. Data collection was conducted at seven engineering

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colleges, comprising affiliated institutions and a deemed university, across seven districts in the northern area of Tamil Nadu. Random samples were collected in the classroom (control group), on an electronic device (experimental group 1), and on a mobile device (experimental group 2) at each engineering college. This primary study reveals the utilization of mobile communication technology and mobile learning through video lessons by 506 students—299 males and 237 females—enrolled in affiliated colleges and deemed universities for second-year undergraduate engineering programs in Electronics and Communication, Electrical and Electronics, and Bio-Medical Engineering in Chennai, Tamil Nadu, India. The 30-minute video lesson utilized for this study was titled "Electrocardiography is Common for ECE and BME, and Electromagnetism is Common for EEE and ECE." Wireless devices, including tablets, PCs, smartphones, and PDAs were employed for this investigation. Students can utilize Bluetooth technology during their leisure time to transfer the video lecture throughout the classroom, library, and halls. Forty criteria have been established for assessing the effectiveness of video courses employing mobile learning technologies for educators and learners. These metrics are derived from a review of the literature and discussions around electronic and mobile learning. Three framework models have been selected for the data analysis. The initial model, termed Osman's model I, employs three mobility concepts—technology mobility, learning mobility, and learner mobility—to characterize mobile learning. The second model, II (Koole's model), categorizes the framework for mobile education into six components: learner, social, device usability, interaction technology, and social technology. Model III (Amin's model) categorizes the practical experience of mobile learning into six distinct classifications. namely, impacts on instructional efficacy, usability, acceptance rates, technical feasibility, and diverse learning methodologies. The learning outcome of students' behavioral performance is ultimately delineated, accompanied by testing of related hypotheses and pre- and post-assessments conducted by both the control and experimental groups.

Yeo, M.M.L. (2014). The utilization of social media and social networking apps in educational contexts. This essay aims to elucidate the experiences of young individuals and educators who use social media, including YouTube and Facebook, for educational purposes. This project aims to use the benefits of social media and networking platforms, like Facebook and YouTube, for educational purposes. This paper employs a case study utilizing qualitative methods through informal interviews with tertiary students enrolled in business communication modules at two polytechnics, as well as interviews with lecturers teaching communication modules at two additional polytechnics and a university in Singapore, to assess the feasibility of employing YouTube videos and Facebook postings as informative and communicative tools. The data indicated that students favored utilizing Facebook and YouTube videos for networking, forming friendships, and enhancing their learning at their own pace and location. They favor informal learning via Facebook posts and YouTube videos that provide knowledge and information surpassing classroom and textbook instruction. Nonetheless, there are challenges associated with utilizing Facebook and YouTube as teaching resources. These concerns encompass the plethora of games and social invitations that can "detract from the learning time" allocated to viewing videos on Facebook and YouTube. The data indicated that adolescents, students, and educators had favorable views of the utilization of Facebook as a "social" platform to

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cultivate healthy interpersonal ties beyond the classroom environment. The research demonstrates that Facebook's connectivity and communication promote effortless relationship-building between students and lecturers, along with the exchange of information and knowledge beyond the classroom and textbooks. Consequently, Facebook's connectivity and communication facilitate the cultivation of positive relationships and enhance rapport between students and teachers. However, both lecturers and students underscored the necessity of in-person instruction to enhance formal education and communication. In conclusion, although reading and writing proficiency are essential, they are no longer adequate. Classroom contacts, instruction, and in-person communication are critically significant. Obsolete technology and literacy are augmented rather than entirely supplanted. In the twenty-first century, social media and networking applications can be utilized alongside conventional and contemporary literacy forms to augment teaching and learning.

Ouma, G.O., Awuor, F.M. & Kyambo, B. (2013). Readiness of Kenyan public secondary schools for e-learning. Prior to initiating e-learning adoption, it is essential to assess the institutions involved to ascertain their preparedness to avoid rendering the commendable initiative unproductive for society. Ten schools in the Rachuonyo South and Rachuonyo North areas that received funding for ICT development were assessed for readiness. The survey examined the technical ability of teachers and students, their computer literacy, their attitudes towards e-learning, and their opinions of it. A descriptive study was utilized to elucidate the scenarios of school settings and to collect data on the preparedness for e-learning implementation. The computer literacy of educators and learners, along with their attitudes and perceptions of technology, were significant markers of their preparedness for the adoption of e-learning. This study's findings indicate that while educators and learners are willing to embrace e-learning, they must first enhance their technical skills through training. Although most students embrace online learning, they lack the essential technological skills required to utilize the platforms. The study indicates a positive correlation between the acceptance of e-learning and computer literacy.

Iema, H. et al. (2012). This paper reports the findings of a study about students' valuation of information and communication technology (ICT) applications in general secondary education. We examine the degree to which students of diverse gender and racial origins value distinct attributes of ICT tools. The research topic is, 'What is the relationship between students' qualities and their appreciation of ICT tools in secondary education?' A survey was administered to 495 students from educational institutions in the Netherlands. A questionnaire was created utilizing the research on cultural sensitivity and gender inclusivity in educational software. The study's results indicate that the questionnaire effectively differentiates between tools that are positively and adversely assessed by various student groups. Secondly, concerning group disparities, the findings indicate that girls favor programs that address engaging topics, are user-friendly, and offer substantial support. Diverse evaluations among students of varying backgrounds were seen for language proficiency and ICT competencies. The findings are examined, together with the potential educational ramifications for the design and selection of ICT tools.

Zhiwen, H. & McGrath, I. (2011). This research examines a study on ICT-related teacher development within the framework of a national reform of college English instruction in China. The reform emphasized the integration of information and communications technology (ICT) in classroom instruction and self-directed learning, compelling English as a foreign language educator to adapt to new teaching resources, implement student-centered pedagogies, and facilitate students'

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autonomous learning. The research investigated educators' perceptions on ICT utilization in education and the policies and practices related to ICT-focused continuing professional development (CPD) at a university in southern China. Mixed approaches were employed, including questionnaires for instructors, classroom observations, and interviews with teachers, management, and administrative personnel, as well as focus groups comprising both teachers and students. The results demonstrated that insufficient ICT skills and pedagogical knowledge hindered the implementation of ICT in English language instruction. Furthermore, while the majority of educators initially maintained favorable attitudes towards the integration of ICT in English instruction and the national reform, their excitement diminished due to insufficient support and training. The discussion encompasses the implications for policy and teacher education, alongside the proposal of an ICT-based continuing professional development paradigm for language educators.

Nachimuthu, K. (2010). The imperative of digital literacy in teacher education. Upon reviewing pertinent material, the researcher concluded that learning technologies are not a panacea for the challenges now confronting higher education. New technologies exacerbate institutional issues, highlighting them against the backdrop of the widespread demand for education and the opportunities technology presents to address that want. Contemporary higher education has the opportunity to transform and become increasingly essential to the future of our society. The execution of that obligation will depend on imaginative and creative thought, together with a resolute commitment to advance the institution, teaching, and learning into the digital age. The digital era has heightened individuals' desire to learn more than ever before. The term "Information Age" is sometimes employed when referring to the utilization of digital music, digital cameras, high-definition television, cell phones, the Internet, cable television, and other goods that have gained widespread availability in the past five years. The knowledge obtainable through digital media is more essential for future requirements than for our present comprehension. Utilizing existing digital knowledge during application is a significant challenge for any digital learning resource. In circumstances where an individual lacks digital proficiency, the ability to obtain pertinent information becomes a crucial skill. As digital knowledge evolves, learners' access to essential information becomes more critical than their existing comprehension. There is a necessity for innovative efforts in digital literacy within educational settings, particularly in analyzing the impacts of growing social networking, knowledge-sharing, and knowledge-building platforms. Finally, considering the pervasive utilization of digital technology, the financial investment associated with it, and the typically unregulated nature of Internet-based information, it is imperative to begin delineating the components of critical digital literacy. In conclusion, substantial efforts are required to equip children and adolescents to be essential contributors to the digital future.

CONCLUSION

This systematic review highlights that secondary school teachers generally possess a foundational level of technological knowledge, but significant variability exists across regions, subjects, and access to resources. Many teachers demonstrate competency in basic digital tools and an openness to integrating technology into classroom practice. However, deeper pedagogical integration of technology, such as using digital resources to enhance learner engagement and support differentiated instruction, remains inconsistent.

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The review also shows that attitudes toward technology are predominantly positive, with most teachers recognizing the potential benefits for student motivation, learning outcomes, and classroom management. Positive attitudes are strongly influenced by factors such as prior training, perceived self-efficacy, and institutional support. Conversely, barriers such as limited professional development, lack of technological infrastructure, and concerns about increased workload continue to constrain effective technology adoption.

Overall, the findings suggest that enhancing both technological knowledge and positive attitudes requires holistic approaches—including sustained professional development, leadership support, and equitable access to resources. Future research should explore longitudinal changes in teachers' technological competencies and investigate how specific interventions impact both beliefs and classroom practices.

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