

Teacher Education in a Technology Driven Era: Implication for Quality Teacher Training

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ABSTRACT

As technology progresses rapidly, the role of teachers in Teacher education vigorously grow more than it was in the previous centuries in order to meet the needs of students and the society at large. This research work focuses on effective means of incorporating technology into teacher education programmes and particularly the 21st century classroom. The study explores the current state of teacher education and the need for adequate technology integration. It highlights the importance of digital literacy among 21st century teacher educators and technology application in all facet of teacher education. Furthermore, it discusses the advantages of effective technology integration into teacher education and provides recommendations on how teacher education programmes in this technology driven era can equip trainees with necessary technological knowhow to function adequately in the technology based classroom which requires a total shift from conventional teaching methods to computer assisted teaching and learning.

Keywords: *Technology, Teacher Education, Digital Literacy, Integration, Incorporating.*

Introduction

The incorporation of technology into teacher education has become progressively more important in today's digital world due the rapid advancement of technology usage in the classroom. Trainee teachers need to be highly equipped with the necessary teaching skills and other technological knowhow to navigate and thrive in a technology-driven classroom and in the society at large. The necessity lies on teacher's acquisition of these skills and technological knowhow to fit in adequately in the technology driven classroom. Therefore, it is essential to effectively integrate technology into every facet of teacher education. Technology should assume the focal point of teacher education as digital literacy is quintessential for teacher's fortification in educational process in the digital era.

The need for pedagogical transformation towards digital world of education should be re-emphasized when redesigning the teacher education curriculum in a technology driven era like ours. Technological proficiency should be incorporated into teacher education as a significant quality with the fact that being technologically literate is advantageous in the 21st-century classroom and a requirement to meet the world class standard of teachers. Kormos (2019) instructively advised that one area of training that is becoming increasingly critical in teacher education is instructional technology. Hence, the need for teacher education programmes to incorporate the skills necessary to use technology effectively in classrooms should be highly intensified.

Statement of Problem

The current state of technology integration in teacher education programmes is inadequate, many teachers do not receive sufficient training or support to effectively use technology in their teaching and learning endeavors. This has hindered their ability to provide efficient and effective learning experiences to their trainees.

Objective of the study

The purpose of this study is to:

1. Investigate the current state of teacher education programmes in terms of technology integration.
2. Identify ways for improving teacher education towards technology based.
3. Identify the challenges and opportunities that come with technology integration.

Conceptual Clarification Education

Education is a complex concept that has been defined and understood in different ways by various scholars, educators, and institutions. Education is an essential process in human development. It can be seen as a dynamic instrument of change. The purpose of education is not just to impart knowledge or skills, but to help learners develop their potentials to the fullest to become well-rounded individuals who are capable of fulfilling their responsibilities and contributing positively to the society. Darling-Hammond (2017) advocates for a more holistic approach to education that addresses not only academic achievement, but also social-emotional development, health and well-being, and civic engagement. This means that education should involve acquisition of skills and application of technology which will influence the society positively and not academic success only. The organization for Economic Co-operation and Development OECD (2018) emphasizes the importance of developing key competencies such as literacy, numeracy, problem-solving, and critical thinking. The organization's work also focuses on identifying effective teaching practices and policies on promoting equity and inclusion of effective technology in education.

Education in the 21st century can be defined as a constantly changing process that aims at equipping educators and learners with the technological competencies, pedagogical skills, knowledge, and the right mindset needed to succeed in a dynamic

world. It is a complete paradigm shift from the traditional subject-based instruction to technology application, critical thinking and problem-solving based education. According to UNESCO (2015), "education in the 21st century must prepare learners for a rapidly changing and interconnected world in which they will need to navigate complex systems and problems, work collaboratively, think critically and creatively, and be innovative and adaptable." Similarly, the World Economic Forum's Future of Jobs Report states that education in the 21st century should focus on developing "soft skills" such as creativity, emotional intelligence, and cognitive flexibility, in addition to traditional academic knowledge.

In essence, education is a process of acquiring knowledge, skills, values, and attitudes that will enable individuals to grow, develop, and thrive in their personal and professional lives. It can take different forms and serve different purposes. Ultimately education deals with empowering individuals to recover their hidden capabilities and utilize them positively in their communities, and the world around them and to make right decisions and contribute positively to their societies. Arslan (2018) stated that education is a process that begins at birth and continues until the end of life.

Teacher Education

Teacher education can be defined as the process of preparing and training would be teachers to become effective educators who can teach students of different ages and backgrounds. It involves training on application of different teaching skills and techniques, use of instructional materials, application of technological devices, educational theories, classroom management strategies, and acquisition of good knowledge of the subject matter. It is designed to equip prospective teachers with pedagogical ethics required for effective teaching and learning. It is a pre-planned curriculum that is aimed at training a person in an institution of learning in other to become a teacher. Adesoji (2015) states that the quality of any education system is as good as the quality of its teachers. There is need for teacher education program in Nigeria to fully adopt the use of technology in all facet of studies in order to produce world class teachers to adequately occupy the 21st century classroom.

The Indian University Statement in Srivastava (2022) opines that teacher education is a process that is aimed at providing professional development for young teachers through the integration of theory and practice. This program is practiced in universities and Colleges of Education, and they typically include both academic coursework, research activities, practical exercises and hands-on training in classroom settings. These activities are approved for students for Nigerian Certificate of Education to Bachelor's and Master's degrees. Teacher education in the 21st century can be defined as all-inclusive process of training would be teachers with the knowledge, skills, and technological competencies necessary to effectively aid students learning in a dynamic and diverse world. This involves adequate application of critical thinking, problem solving skills, research-based practices, and instructional technologies.

The National Council for Accreditation of Teacher Education (NCATE), (2010) states that "21st-century teacher education programmes must emphasize content knowledge, pedagogical content knowledge, and the dispositions necessary to prepare all students for success in the 21st century. This focuses on teaching for integration of technology into instruction, and working effectively with diverse student populations. Similarly, the American Association of Colleges for Teacher Education (AACTE) (2018) emphasizes the need for teacher education programmes to prepare teachers to be reflective practitioners, able to adapt to new and changing contexts, and to effectively integrate research and practice. Finally, the goal of teacher education is to produce competent, knowledgeable, and skilled teachers who can help trainee teachers to learn and grow to their full potential.

Technology

Technology is a branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society and environment, drawing upon such subjects as industrial arts, engineering, applied science and pure science (Dictionary.com, 2023). Technology refers to methods, systems, devices and scientific knowledge used for practical purposes. www.collinsdictionary.com>English. (2023). Technology can be defined as the application of scientific knowledge and tools for practical purposes in order to solve societal problems. It involves the creation and use of tools, techniques, and systems to meet human needs and enhance his experience. Technology covers a wide range of fields, including information and communication technology (ICT), biotechnology, engineering, medicine, and agriculture, among others. Technology deals with transformation of knowledge into products, processes, services and organizational structures. (Anwar, A. S., Mardisentosa, B., & Williams, A. (2021).

In a broader sense, technology also includes the cultural and social systems that facilitate the development and use of tools and techniques for production of useful materials. It is a dynamic field of learning that is characterized by rapid advancement and innovative platforms that constantly transform knowledge to more useful product which will be beneficial to humans in the way they work and interact with the world around them. Technology has a weighty impact on all aspects of human endeavor such as social, cultural, educational, health, agricultural, religious and business within the society. It is advantageous to them in different ways including increased social relationship, improved cultural activities, increased agricultural productivity, greater involvement in religious activities, improved health and safety, enhanced access to information, increased skill acquisition, knowledge expansion and greater business connectivity. However massive adoption of technology into education will generate challenges in the system such as funding, purchase of the digital devices, and the potential for automation and artificial intelligence.

Current State of Teacher Education towards Technology Based

Instructional technology refers to the use of technology to enhance teaching and learning. In teacher education, instructional technology plays a vital role in preparing future teachers to use technology effectively in the classroom, but the challenges facing instructional technology in teacher's education are as follows:

1. Insufficient technological devices such as: computers.
2. Irregular power supply.
3. Inadequate trainings for teachers.

Instructional technology is an essential part of teacher education. Therefore, it should be equipped with all the necessary technological devices, regular power supply and teachers should be adequately trained for effective and efficient teacher's training programmes. All these will help to equip future teachers with the necessary skills needed to fit in properly as world class teachers and also help to integrate technology adequately into their teaching practice to create more efficient and effective learning experiences for teacher trainees.

Here are some ways instructional technology is integrated into teacher education:

1. **Application of Online Teaching and Learning:** Teacher education programmes often use online teaching and learning platforms to deliver coursework and provide students with access to learning contents and materials. These platforms can also facilitate communication and collaboration between students and instructors.
2. **Use of Educational Software:** Teacher education program provides educational software to simulate classroom scenarios and help students develop their teaching skills. This software can provide feedback and assessments to help students improve in their teaching techniques.
3. **Use of Multimedia Resources:** Some teacher trainers use a variety of multimedia resources such as videos, podcasts, and interactive board presentations to create effective learning experiences for their students. In teacher education program students often learn how to use technological devices effectively to enhance learning.
4. **Use of Educational Technology Tools:** Future teachers are trained to use a variety of technology tools such as interactive whiteboards, learning management systems, and digital assessments. This training helps them to integrate technology seamlessly into their teaching practice.

Advantages of Technology Integration into Teacher Education

The technology-driven era refers to the period in human history when technological advancements and innovations have revolutionized the whole system in the world. The era is characterized by the rapid development and adoption of new technologies into every system regardless of the human capital involvement. It focuses on the use of artificial intelligence, robotics, cloud computing, and the Internet facilities. The technology-driven era is a complex era that has brought about both benefits and challenges into the world of education particularly teacher's training education. As

education continues to innovate and develop new technologies, it is important to consider the social, economic, and ethical implications of these advancement and work towards creating a viable and unbiased future for the present and generation unborn teachers.

The impact of technology in education and the society as a whole has been enormous, it has transformed the whole systems of the world and made easy access to knowledge in different facets of human endeavor. It has also enabled new forms of social and cultural interaction, such as social media and other online platforms. The technology-driven era has created new industries for production of human needs, generated economic growth, and improved the quality of lives of many in different parts of the world. For example, advancement in healthcare technology devised new ways of treatment and cure for some internal diseases that claimed lives before this era. Advancement in transportation technology also made transportation easier, faster and more convenient for travelers.

On the other hand, technology has also raised concerns about privacy, security and protection gargets for banks, vehicles and homes. The impact on automation on jobs and the workforce were also created. For example, the intensification of social media has upstretched concerns about the impact on online contents on mental fitness and the spread of misrepresentation of information.

Technology has presented a significant impact in today's education; it is therefore regarded as technology driven era. It revolutionized the way educational contents are designed and delivered and also created new opportunities for personalized and student-centered learning experiences.

Ways of Improving Teacher Education towards Technology Based

Acquisition of knowledge of technological applications will ensure quality educational training that will produce required workforce for today's labor market. The concept of Technological Pedagogical Content Knowledge (TPACK) which involves the integration of three domains of knowledge - content, pedagogy, and technology - and the joining of these domains, which they refer to as TPACK. The authors argue that TPACK provides a framework for teacher education programmes to better prepare educators for technology integration in their teaching practice.

Ertmer & Ottenbreit-Leftwich, A. T. (2013) states that the integration of technology into teaching, entails a shift in the pedagogical approach used by teachers. The authors contend that traditional teaching practices that emphasize rote memorization and surface learning are incompatible with the deeper, authentic learning experiences that technology can enable. They suggest that a focus on constructivist pedagogies that emphasize active and collaborative learning, critical thinking, and problem-solving is necessary for successful technology integration in teaching.

According to Voogt & Roblin (2012) an integrated, interdisciplinary approach to teaching and learning is necessary to develop 21st-century competencies, and national curriculum policies should prioritize the development of these competencies to prepare students for success in the modern world. Warschauer & Matuchniak (2010) opines that

while technology has the potential to expand access to educational resources and promote more equitable learning opportunities, it can also exacerbate existing inequalities if it is not implemented effectively. They examine empirical evidence on the impact of technology on educational access, use, and outcomes, and identify several factors that are crucial for ensuring that technology supports, rather than undermines, equity in education. These factors include access to technology, high-quality teaching that integrates technology effectively, and support for learners who may lack the necessary digital literacy skills. The authors bring to the limelight the importance of considering issues of equity and access when implementing new technologies in educational settings.

Archambault & Et Al (2010) argued that technology has the potential to transform teaching and learning, but that realizing this potential requires teacher education programs to integrate technology into their curricula and develop technology leaders who can support effective technology integration in schools. They suggested that effective technology integration requires a combination of technological knowledge, pedagogical expertise, and leadership skills and that teacher education programs should prioritize the development of these competencies in their products.

Technology has had a significant impact on the role of teachers in the classroom. While the fundamental goals of teaching remain the same, technology will enable teachers to create new and innovative approaches to teaching that can enhance the learning experience for their students.

Challenges of Technology Integration in Education

Several challenges arise from technology integration in education.

- 1. Digital Divide:** Not all students have access to technology and the internet, which can create a digital divide in the classroom.
- 2. Privacy and Security Concerns:** The use of technology in the classroom can raise privacy and security concerns, especially with the collection and storage of personal data.
- 3. Technological Issues:** Technical difficulties can arise during technology integration, such as hardware or software malfunctions, which can disrupt the learning process.
- 4. Teacher Training:** Many teachers may not have the necessary skills and knowledge to effectively use technology in the classroom, which can hinder the integration process.

Ways in which Technology Has Impacted Education in the Technology-Driven Era

- 1. Access to Information:** Technology has made it easier for students to access information from a variety of sources, including online textbooks, video lectures, and digital archives. This has expanded the range of resources available to students and has made it easier for them to learn at their own pace.
- 2. Facilitating Learning:** Technology tools such as learning management systems, video lectures, and digital content have made it easier for teachers to facilitate learning and provide students with a variety of resources to aid in their understanding of a topic.
- 3. Managing Administrative Tasks:** Technology has made it easier for teachers to manage administrative tasks, such as taking attendance, grading assignments, and keeping records.

4. Personalized Learning: Technology has enabled educators to create personalized learning experiences that cater to the needs and interests of individual students. This can include adaptive learning platforms, which adjust the difficulty and pace of learning activities based on student performance, as well as online tools that allow students to track their progress and receive immediate feedback.

5. Collaboration and Communication: Technology has made it easier for students to collaborate with teachers, regardless of physical location. This can include online discussion forums, video conferencing tools, and collaborative project management platforms.

6. Teacher Professional Development: Technology has also transformed the way teachers learn and grow professionally. Online courses and professional development programs can provide teachers with access to new teaching strategies and techniques, as well as networking opportunities with other educators from around the world.

However, the use of technology in education also raises concerns about equity and access, as not all students have equal access to technology tools and resources. Additionally, there are concerns about the potential for technology to replace human teachers, which could lead to a loss of important social and emotional learning experiences. Becker, H. J. (2015) sees it as a call to more rigorous research on the impact of innovative approaches to education and a recognition of the importance of balancing innovation with a focus on effective teaching and learning practices.

According to Spires, H. A., et al (2010) wikis a form of technology, which allow for collaborative editing and sharing of information, has the potential to improve communication and collaboration among students and instructors in online and face-to-face courses. They suggest that wikis can improve communication, facilitate group work, and provide a platform for sharing resources and ideas, but that their effectiveness depends on factors such as the design of the wiki, and the level of participation by students and instructors. The technology-driven era has had a significant impact on education and has created new opportunities for personalized, student-centered learning experiences. As technology continues to evolve, it is important to ensure that all students have equal access to technology tools and resources and that we continue to value the role of human teachers in the learning process.

The use of technology in teaching also requires teachers to develop new skills and knowledge. Teachers must be able to effectively use technology tools and platforms, evaluate the quality of digital content, and manage digital citizenship and safety issues. However, it also requires teachers to continually develop new ideologies to engage technology in their teaching practices.

In today's technology-driven era, teacher education is more important than ever. Teachers need to be equipped with the skills and knowledge to effectively integrate technology into their teaching practices and engage students in meaningful learning experiences.

Key Areas that Should be Addressed in Teacher Education Programmes to Prepare Educators for the Technology-Driven Era:

1. Digital Literacy and Fluency: Teachers should be proficient in using technology tools and platforms, such as learning management systems, video conferencing software, and digital content creation tools. They should also be able to navigate online resources and evaluate their credibility and reliability.

2. Pedagogical Strategies for Technology Integration: Teachers should understand how to design and deliver effective online and blended learning experiences that engage students and promote learning outcomes. They should also be able to use technology to differentiate instruction and personalize learning.

3. Student-Centered Learning: Teachers should be able to design learning experiences that will empower students to take ownership of their learning and collaborate with peers and teachers in virtual and physical environments. They should also be able to use technology to promote inquiry-based and project-based learning.

4. Equity and Access: Teachers should be aware of the digital divide and strive to provide equitable access to technology tools and resources for all students. They should also be able to address cultural and linguistic diversity in their teaching practices and use technology to support English language learners and students with special needs.

Teacher education programs should equip educators with the knowledge and skills to effectively integrate technology into their teaching practices and promote student-centered learning in the technology-driven era. By addressing the challenges and leveraging the impact presented by technology integration, teachers and students can benefit from a more effective and engaging learning experience.

Summary

Technology is fundamental in every facet of classroom activities and therefore should be incorporated adequately into teacher education programmes. Its existence over the years has not been visible and felt in the performance of the trained and trainees in the classroom situation. Therefore, the researcher suggests that teacher education classes should be fully equipped with technology devices such as computers, circuitry, artificial intelligence, software, audio and visual technology and lots more that will be utilized in the technology based classroom of 21st century.

Recommendation

Based on the importance adequate technology integration in teacher education and the challenges and opportunities that accompany with it, here are some recommendations for teacher education programs:

1. Develop a curriculum that emphasizes digital literacy, pedagogical knowledge, and collaboration among educators. This will ensure that teachers are equipped with the necessary skills and knowledge to effectively integrate technology into their teaching practice.

2. Provide hands-on training and mentorship for teachers to ensure they have a strong foundation in using technology tools and resources. This can be done through workshops, seminars, and ongoing professional development opportunities.
3. Encourage collaboration among educators to promote sharing of best practices and learning from each other's experiences. This can be done through online communities, peer coaching, and other collaborative initiatives.
4. Foster a culture of experimentation and risk-taking, where teachers are encouraged to try new technologies and teaching methods in the classroom. This can help teachers develop a growth mindset and become more comfortable with using technology in their teaching practice.
5. Provide ongoing support and resources for teachers to help them stay up-to-date with the latest technologies and teaching methods. This can include access to online resources, professional learning communities, and ongoing coaching and mentoring.

By implementing these recommendations, teacher education programs can better prepare future educators for the technology-driven era and ensure that they are equipped to provide engaging and effective learning experiences for their students.

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