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Charting the Constraints and Strategies for Integrating Technology and Open Educational Resources in Teacher Education Programme

Parinka Sharma[1], Seema Rani Thappa[2], J.N. Baliya[3]

[1]Department of Educational Studies, Central University of Jammu, Jammu
[2]Department of Teacher Education, Nagaland University, Kohima
[3]Department of Educational Studies, Central University of Jammu, Jammu
Corresponding author: parinkasharma@gmail.com
Available at https://omniscientmjprujournal.com

Abstract

This empirical study investigates the technical barriers of integrating technology and Open Educational Resources (OER) into Teacher Education Programs. The aim is to identify the challenges educators face and propose strategic solutions to enhance the effectiveness of technology integration in education. The research employed a mixed-methods approach, combining quantitative data from structured questionnaires with qualitative insights to comprehensively understand the current situation. The study's findings reveal that technology integration is crucial for modernizing teaching techniques and addressing students' digital preferences; nonetheless, it poses considerable hurdles. Significant issues include teachers' reluctance to use new technologies, insufficient institutional support, and the necessity for enhanced training to acquire essential skills. The study emphasizes the significance of institutional assistance in overcoming these hurdles and fostering an environment conducive to technological advancement. By addressing these issues, the study provides recommendations for enhancing the integration of technology and Open Educational Resources in teacher education programs. Further, it emphasizes the significance of institutional backing, the advancement of novel pedagogical approaches, and the fostering of a technologically proficient educational environment. Moreover, the study eventually supports working together between schools and teachers to get future teachers ready for a classroom that is always changing and using technology.

Keywords: Educational Technology, Open Educational Resources, Teacher Education, ICT

Introduction

The integration of technology and Open Educational Resources (OER) has become a crucial strategy in transforming contemporary education, especially within teacher education programs. The integration of technology with Open Educational Resources (OER) creates endless opportunities to develop engaging, accessible, and adaptable learning environments that address the varied needs of teacher trainees. Also, it can be seen in various research that Open Educational Resources (OER) can democratize education by offering free, high-quality

materials, while technology improves the delivery and interactivity of these resources (UNESCO, 2019). Mutually, they possess the capacity to provide teacher trainees with the necessary skills and competencies to effectively manage the complexities of 21st-century classrooms.

Despite the transformative potential, the implementation of technology and OER in teacher education presents significant challenges. A notable obstacle is the digital divide, which restricts access to technological infrastructure, especially in rural or resource-limited institutions. Moreover, numerous teacher educators and trainees do not possess the requisite digital literacy to employ these tools effectively. In the study of Allen and Katz (2020) reported that while awareness of OER is on the rise, its incorporation into curricula is obstructed by issues related to quality, sustainability, and alignment with institutional objectives. Resistance to change and a preference for traditional teaching methods hinder the adoption of innovative practices (Bliss et al., 2013).

A significant challenge in achieving quality assurance in Open Educational Resources has been marked. In the absence of effective evaluation and adaptation mechanisms, institutions may find it challenging to ensure that resources align with educational standards and cater to learners' diverse needs. The lack of consistent policy frameworks for technology adoption and open educational resources (OER) intensifies these challenges, resulting in institutions managing integration efforts autonomously (Wiley et al., 2014).

To have a proper solution to this, a comprehensive approach is needed that incorporates capacity building, collaborative practices, and supportive policies. Studies indicate that professional development programs emphasizing digital competencies can enable educators to effectively utilize technology and open educational resources (Mishra, 2018). Fostering collaboration among educators, institutions, and policymakers can facilitate the co-creation and adaptation of high-quality OER suited to local contexts.

The National Education Policy (NEP) 2020 emphasizes the integration of educational technology to enhance access, improve quality, address inclusion and diversity, and ensure equitable, affordable, and accountable education. It acknowledges India's leadership in information and communication technology (ICT) and other advanced fields. The key highlights of the policy on ICT integration are as follows:

- "To be successful online educators, teachers need the right kind of training and development." It is not a given that an instructor who excels in a traditional classroom would also excel in an online setting. … **Para 24.3**

- "As technology is changing quickly and requires experts to provide high-quality e-learning, a thriving ecosystem must be promoted to develop solutions that not only address India's issues of scale, diversity, and equity but also adapt to the rapidly changing technology, whose half-life is decreasing with each year." **Para 24.5**
- "HEIs will actively participate in the study of disruptive technologies, as well as the development of early iterations of educational resources and programs, including online courses in cutting-edge fields, and the evaluation of their effects on certain fields, such as professional education. HEIs with thousands of students will be in a prime position to expand these teaching and skilling initiatives, which will include specialized training for work preparedness, once the technology reaches a mature state." **Para 23.10**

Analysis of the Related Literature

Numerous studies offer educational leaders' options to improve technology integration and execute interventions, hence enhancing students' educational experiences. In 2024, Celeste and Osias examined the barriers to the adoption and execution of technology in educational institutions in the Baungon Districts, Division of Bukidnon, during the 2023–2024 academic year. The findings of the study indicated a spectrum of concerns, with infrastructure and resources obtaining the lowest evaluations, while equity and access garnered the highest ratings. Notwithstanding these challenges, it was evident that technological integration was occurring, particularly in the domains of communication and instructional integration. Comprehensive interviews revealed that educators were committed to employing technology innovatively to provide their pupils with optimal education. Strategic measures are required to enhance technology integration and overcome barriers. Instructors should be afforded opportunities for continuous professional growth.

Further, Panakaje et al. (2024) aimed to investigate the influence of technology integration on the improvement of teaching practices related to student engagement, teacher performance, pedagogical methods, and educator development. This study examined the potential of institutional assistance to enhance the outcome variables. The results demonstrated the significance of incorporating technology into pedagogical practices for educators. Furthermore, the incorporation of technology substantially affects teacher performance and student engagement through the mediation of teacher learning and pedagogical practices. The research revealed that increased institutional support enhances student engagement with technology and instructor effectiveness. This finding also suggested that educators should employ technology to implement varied instructional strategies.

Paskevicius (2023) clarified the possibilities, shortcomings, and future directions for teacher educator programs to incorporate elements of open education into teacher preparation. A short survey of students in a teacher education program in British Columbia, Canada, indicates knowledge deficiencies among teacher candidates. Participant reflections encourage additional investigation into strategies for incorporating open educational practices and materials into teacher education programs. The findings analyze Kahle's (2008) design philosophy, emphasizing the use of technology to promote openness, which corresponds with essential elements in teacher education programs.
In 2022, Samed et al. contend that educators have identified numerous substantial barriers that impede the successful incorporation of ICT into their teaching methodologies. The issues stem from several factors, namely slow internet access, the complications arising from power outages (often referred to as load shedding), inadequate infrastructure, insufficient experience in online education, and the necessity for prompt intervention.

Significance of the Study

The study's significance is as follows:

a. Technology integration and Open Educational Resources (OERs) are influencing policy and practice. This study aids policymakers and educators in understanding the challenges related to the integration of technology and open educational resources (OERs) in teacher education programs. It can establish regulations, criteria, and methodologies that facilitate the effective use of technology and OERs in teacher training, thereby improving educational quality.
b. Teacher education programs are crucial for equipping educators to effectively integrate technology and Open Educational Resources (OERs) into their classrooms. Teacher education programs can improve teacher preparedness by equipping them with essential skills and knowledge, informed by an understanding of the challenges faced during the integration process.
c. Technology and Open Educational Resources (OERs) facilitate the democratization of access to high-quality educational materials and opportunities. This study aims to enhance educational access and equity, especially in underserved regions, by analyzing the obstacles that hinder participation in teacher education programs.
d. Examining the challenges associated with integrating technology and open educational resources (OERs) in teacher education may lead to innovative concepts and collaborative efforts within the educational sector. Collaboration among educators, legislators, and

stakeholders can lead to innovative solutions and support joint initiatives aimed at enhancing teacher training through the identification of challenges and limitations.

e. This report may provide a basis for subsequent research and scholarship in technology-enhanced teacher education. This could stimulate further investigation into particular elements of the integration process, assess alternative methodologies, and examine the long-term effects of technology and OER integration on educational outcomes.
f. The study offers insights into the integration of digital technology and Open Educational Resources (OER) to develop dynamic and interactive pedagogical frameworks, which are crucial for contemporary teacher education.
g. The findings support teacher educators in improving their professional skills through effective technology integration in classroom instruction, thereby enhancing lesson preparation and delivery.

Objective of the study

The objective of this research is to accomplish the following.

- To explore the barriers faced by educators in integrating technology and OERs into pedagogical practices.
- To investigate the availability and effectiveness of pedagogical support and training.
- To suggest educational implications for the effective use of technology integration and QERs in the pedagogical environment.

Research Methodology

In the current study, the investigators used the descriptive survey approach. Data was collected using both face-to-face and online survey approaches, depending on the nature of the problem. The investigator used the simple random procedure to choose a sample from the target group of teacher educators while keeping the fair probability of selection in mind.

Sample

The sample for this study consisted of teacher educators (male and female) enrolled in teacher education institutions at Central University of Jammu and Nagaland University. The sample was drawn at random sampling. A total of 75 teacher educators were taken as samples for the research.

Tool Used

For the collection of data, the Self-constructed Technology Integration scale was used by the researchers. The scale has two major domains. The first domain contains close-ended questions and the other contains open-ended questions. The data was taken via Google form.

Analysis and Interpretation

For the analysis of the collected data, the researchers have employed the Frequency Percentage for the first domain and content analysis for the second domain.

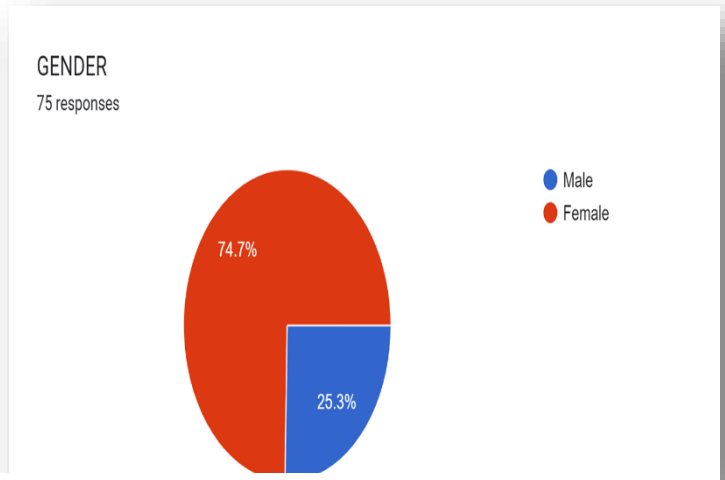

Figure 1: Demographic profile of the respondents

Table 1: Availability and Accessibility of ICT resources in their respective institution

S. No	Subdimensions	Available %	Non-Available %
1.	Multimedia projector	88.00	12.00
2.	Smart boards	96.00	4.00
3.	Computer lab	54.67	45.33
4.	Instructional specific software (MOODLE, online based Instructional Software)	58.67	41.33
5.	Enrichment Material/Reference software in Library (Online encyclopedia, full text magazine and journals)	77.33	22.67
6.	University Wifi	62.67	37.33
7.	Departmental Library	50.67	49.33

Table 2: Problems Confronted by teachers while using ICT in their institution

S.No	Subdimensions	Never %	Sometimes %	Often %
1.	Poor internet connection (LAN, Wifi)	10.67	68.00	21.33
2.	Lack of availability of resources	29.33	61.33	9.33
3.	Inadequate power supply	29.33	42.67	28.00
4.	Lack of technical assistance	21.33	57.33	21.33

Table 3: Problems Confronted while using ICT in their institution

S. No	Subdimensions	Never %	Sometimes %	Often %
1.	Basic ICT skills (word processing, presentation, Software, internet use among Teachers in Classroom	10.67	36.00	53.33
2.	Training for integrating technology with pedagogy	18.67	45.33	36.00
3.	Skills to use ICT equipment (interactive whiteboard, digital projectors, laptops)	12.00	42.67	45.33
4.	Lack of aptitude in using technology in Classroom	24.00	62.67	13.33
5.	More focus on Content Coverage	10.67	52.00	37.33
6.	Lack of Initiation form administration to integrate Technology	10.67	36.00	53.33

The results of the study pointed out that majority of participants agree with the fact that is the availability of some of the physical resources for technology integration in the classroom namely multimedia projector, smartboards, and Material/Reference software in Library whereas only half of the students in the teacher education programme confirms the availability of computer labs, specific instructional software, departmental library and resources etc.

The findings of the study revealed that in most of the problems confronted in teacher education programme in the integration of technology includes the poor Wi-Fi and internet connection in the Institution along with the interrupted power supply within the institution. The study results are in line with the study of Rana & Rana (2020) who reported that the limited ICT infrastructure and teachers' poor ICT knowledge and skills have impacted the expected efficient practice of available digital technology.

Therefore, it is also found that Basic ICT skills (word processing, presentation, Software, internet use among Teachers in Classroom often acts as problem in the effective integration of technology in the teaching learning process.

Further, Skills to use ICT equipment (interactive whiteboard, digital projectors, laptops) and favorable aptitude among teachers in using technology in Classroom are also some other challenges in the inclusion of digital transactional methods. These findings align with the findings of the Johnson et al (2016) and elaborated that technology integration in the classroom will require the ongoing collaborative efforts of teachers, educational technology professionals, school administrators, researchers, and educational software personnel.

Educational Implications of the Study

- Availability of basic physical resources should be there in the institution of teacher education if we want to prepare the future teachers and teacher educator as tech-savvy.

- Developing the proper skills and competencies among the teachers of the teacher education programme to use more than basic knowledge related to hardware and software components of the digital aspects.
- Developing the favorable attitude among the teachers' trainers so that they will use the technology more frequently within the classroom. This can be done if they have enough training through FDP and CBP regularly with the stipulated time duration.
- Teachers should have knowledge about technological pedagogical and content knowledge framework so that they have that effective integration of technology as per the nature of the content. (Baliya & Thappa, 2021).
- The faculty should be appreciated with some incentives if they are making sincere efforts in the integration of technology in the classrooms.

Conclusion

Integrating technology and Open Educational Resources (OER) into teacher education is full of opportunities and problems. While digital technologies have the potential to improve learning engagement and accessibility, many instructors continue to struggle with inadequate infrastructure, intermittent internet, and a lack of suitable training. Without the proper assistance, technology might feel more like an impediment than an opportunity. To use the power of technology in education, institutions must step up and provide greater support systems, hands-on training, and an innovation-friendly culture. Teachers who use digital technologies in the classroom should feel competent and empowered, not overwhelmed. Together, educators, policymakers, and institutions can establish a setting where technology complements education rather than makes it more difficult. Thus the objective is straightforward i.e. to provide aspiring educators the abilities and self-assurance they need to create vibrant, technologically advanced classrooms that motivate and excite the next generation of students.

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