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Analyzing Barriers to ICT Integration in Education: A Systematic Review

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Abstract

This paper examines the barriers to the integration of information and communication technology (ICT) in higher education in Nepal through a systematic review. The term ICT integration in higher education involves integrating digital technologies into teaching, learning, research, administration, and institutional management to enhance educational processes, outcomes, and experiences. The review has focused on studies conducted between 2020 and 2024 to address barriers to the integration of ICT in higher education, which are included in this paper. The study has used a thematic analysis approach to examine and compare barriers in 21 selected articles across various educational contexts. This review highlights the challenges of ICT in enhancing educational outcomes, including inadequate infrastructure, high technology costs, and a lack of digital literacy among educators and students. The paper also reveals the disparities in ICT access across various regions and educational levels, which have been exacerbated by the COVID-19 pandemic. The finding emphasizes the need for enhanced infrastructure, targeted professional development, and strategic policy interventions to fully harness the transformative potential of ICT in education. The paper suggests tackling the challenges preventing equitable access to digital education.

Keywords: COVID-19 pandemic, infrastructure disparities, ICT integration, professional development, systematic review

Introduction

This paper examines the obstacles to information and communication technology (ICT) integration in education, based on a systematic review, and provides relevant references in the context of Nepal. The term ICT integration in higher education involves integrating digital technologies into teaching, learning, research, administration, and

institutional management to enhance educational processes, outcomes, and experiences. The integration of ICT in education involves implementing infrastructure, curriculum, pedagogy, assessment, research, administration, professional development, student services, collaboration, and accessibility. The process involves integrating ICT skills, improving teaching methods, using advanced tools, implementing digital systems, training faculty, providing student support, and ensuring accessibility.

ICT has significantly influenced modern education systems, offering enhanced learning experiences, improved student engagement, and increased access to educational resources (Ahmad et al., 2024). ICT has significantly transformed the teaching-learning process in the modern educational landscape, creating an interactive and engaging learning environment (Saravanakumar, 2018; Shoraevna et al., 2021). The integration of ICT in education has offered numerous advantages, such as improved information access, enhanced instructional methods, and enhanced collaborative learning. ICT integration in education faces infrastructure, digital skills and pedagogical barriers, especially in resource-constrained environments. Despite investments, many institutions struggle to effectively implement and utilize these technologies education (Bice, 2021; Enrique Hinostroza, 2018; Ismail et al., 2020; Singhavi & Basargekar, 2019; Tondeur et al., 2017). Numerous studies have explored barriers in various contexts, but there is a lack of comprehensive understanding of challenges across different educational levels and geographic regions (Hennessy et al., 2010).

The disparity in ICT infrastructure, particularly in developing countries, significantly limits the use of ICT in educational settings due to the lack of reliable internet connectivity and adequate technological resources (Almanthari et al., 2020; Rahiem, 2020b; Rodríguez-Abitia et al., 2020; Soomro, 2015; Suárez-Rodríguez et al., 2018; van de Werfhorst et al., 2020). The COVID-19 pandemic forced Indonesian schools to transition to online learning, revealing gaps in ICT infrastructure, while Kenya's low investment hinders effective technology integration (Bariu, 2020; Graham et al., 2020). The high cost of technology, especially in regions with economic disparity, hinders the full participation of schools and students in ICT-enhanced education, particularly in rural areas like Ghana, despite government efforts to promote "education anytime, anywhere for everyone" (Adarkwah, 2021; Bolaji & Adeoye, 2022; Cruz, 2020; Goh et al., 2016; Van Deursen et al., 2019).

In higher education, particularly in the arts and humanities, digital tools are underutilized, and students struggle to adapt to new technologies, affecting learning outcomes. The digital literacy and skills gap among educators and students poses a significant challenge, with teachers often feeling unprepared to integrate ICT into teaching

practices due to insufficient training and support (Almazova et al., 2020; Baticulon et al., 2021; Karunakaran & Dhanawardana, 2023; Mercader & Gairín, 2020; Reddy & Babu, 2024; West et al., 2019). The COVID-19 pandemic has exacerbated educational challenges by forcing global institutions to transition to online learning (Baral, 2022; Khati & Bhatta, 2020; Mathrani et al., 2021). The pandemic has highlighted the need to address the inadequate ICT infrastructure, digital skills, and accessibility in schools and universities to ensure equal access to digital education (Azhari & Fajri, 2022; Octaberlina & Muslimin, 2020). All the studies have revealed that ICT barriers in education include infrastructure improvement, cost reduction, digital literacy enhancement, and robust support for educators, but implementation remains uneven across regions and educational levels (Enrique Hinostroza, 2018; Imran et al., 2022; Kaur, 2023a; Warren, 2020).

The National Education Policy 2019 in Nepal aims to integrate ICT in schools, but challenges, particularly in rural areas, are affecting the quality of education (Ministry of Education Science and Technology, 2019). It is mainly due to the lack of infrastructure, inadequate teacher training, and digital device shortages that could widen the educational divide and hinder the adoption of modern teaching methods. Tribhuvan University in Nepal has integrated ICT into various academic programs, including the Postgraduate Diploma, Master in Social Studies Education, English, Political Science, Mathematics, and Master in Pedagogical Science before COVID-19 in the Faculty of Education. The increase in educational institutions has accelerated after the closure of educational institutions due to COVID-19. However, academic programs are grappling with challenges in integrating ICT due to outdated labs, intermittent internet access, and technical assistance, limiting student experience potential (Joshi, 2022; Kandel & Kaphle, 2021; Rana & Rana, 2020). The challenges in implementing ICT in teaching not only hinder its effectiveness but also limit its potential to enhance students' educational experience. Williamson et al. (2020) study highlights the COVID-19 pandemic's acceleration of digital learning, highlighting both its potential and challenges in education.

The rapid advancement of technology and evolving educational approaches necessitate a thorough comprehension of current knowledge on ICT integration barriers. ICT integration in higher education enhances learning efficiency and prepares students for digital demands but faces challenges like infrastructure, staff, pedagogy, security, privacy, and cultural contexts. This paper aims to address the lack of references in the higher education system regarding the barriers to ICT integration in Nepal. This systematic review identifies primary barriers to ICT integration in education, analyzes their impact, examines evolution over time, and synthesizes strategies for overcoming them based on

empirical evidence. This review offers a comprehensive analysis of the obstacles to ICT integration in education, providing valuable insights for policymakers, administrators, and researchers. The results will also guide the development of more effective strategies for ICT implementation, aiming to improve the quality and accessibility of education in the digital age.

Methods and Materials

This paper follows a methodology systematically gathering, assessing, and synthesizing existing literature for a review paper published in the last decade. The systematic literature review aimed to identify peer-reviewed articles on material barriers to ICT use in education from 2014-2024, utilizing electronic databases for all education levels. The search strategy has utilized various electronic databases such as ERIC, JSTOR, Scopus, and Google Scholar. The search terms used to retrieve relevant articles include "ICT barriers in education," "technology in education," "ICT infrastructure in schools," "technical support in education ICT," "ICT use in higher education," and "education technology challenges."

The systematic review has included peer-reviewed articles published between 2014 and 2024 on barriers to ICT use in education, including studies at all education levels, geographic regions, and English. The paper is excluded from the analysis due to its non-English publications, non-peer-reviewed sources, and sample size under a certain threshold. The search has filtered 20,645 articles based on titles, abstracts, full-text versions, eligibility, relevance, quality, and alignment with the study's objectives, narrowing the selection to 21.

The study has utilized a standardized data extraction method to gather key information about the author, publication year, country/region, educational level, barriers, study design, methodology, and findings. The synthesis has aimed at providing a comprehensive overview of barriers faced in various educational contexts, identifying similarities and differences across regions and education levels. The review acknowledges potential limitations, such as publication bias, language bias, and a limited scope of four years, which may overlook longer-term trends. The systematic approach ensures a thorough examination of the obstacles to ICT use in education, despite its limitations.

Results and Discussion

ICT in higher education system

In this section, this paper adheres to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) reporting guidelines, ensuring transparent disclosure of

authors' reasons, methods, and findings in systematic reviews. It is used for reporting systematic reviews evaluating interventions' effects, with extensions for different types of reviews and evidence synthesis. This paper explores the evolving nature of ICT integration in teaching and learning in the 21st century, revealing a decade-long discourse on teaching, education, and higher education systems. The discourse advocates for a realignment of the higher education system to prioritize learning (not teaching), skills, and dispositions (not disciplinary knowledge), and on preparing young people for a lifelong learning pursuit in the digital age. The future primarily revolves around digital technology, with higher education workers collaborating with teacher educators, accessing resources, and utilizing learning management systems and tools. This paper explores the challenges in integrating ICT into teachers' higher education work, focusing on key themes related to these barriers. Gkrimpizi et al. (2023) identified 20 barriers to digital transformation in higher education institutions, categorized into six: environmental, strategic, organizational, technological, people-related, and cultural.

Rahiem (2020) conducted a qualitative study on university students' experiences with ICT, involving 80 students from Jakarta's Faculty of Education. This study utilized journaling, reflective essays, and online discussions to identify technological barriers faced by students, including internet connectivity issues, high costs, and a lack of technology skills. This study suggests enhancing students' learning experiences and access to education during challenging times by providing practical and theoretical measures for future enhancement of ERL. Adarkwah (2021) explores the role of information and communication technology (ICT) in Ghana's educational reform, development, and achievement of Sustainable Development Goal Four. The paper addresses challenges in ICT integration in education, especially in rural areas, and emphasizes the need for improved online learning during the COVID-19 pandemic.

Digital revolution in higher education

The digital revolution in higher education has revolutionized knowledge delivery, student engagement, and academic operations through online learning platforms like Moodle, Blackboard, and Canvas, facilitating course material distribution, assignment submission, and student-instructor interaction. The digital revolution based on Massive Open Online Courses (MOOCs) and blended and hybrid learning models offers opportunities for increased student participation, global enrollment, virtual discussions, and integration of traditional in-person instruction. University teachers are utilizing digital tools like VR, AR, and AI to enhance experiential learning in classrooms, allowing students to engage in interactive simulations and virtual labs.

University teachers now have access to global resources through digital libraries, open-access journals, and online research databases, promoting research and collaboration across borders. The digital revolution in higher education presents both opportunities and challenges, including the digital divide and inequality, where low-income students lack access to essential digital tools.

Technological barriers

One of the most prominent challenges identified across the studies is related to technological barriers. Rahiem (2020a) highlights issues such as unstable internet connections, restricted access, and the high cost of technology as significant impediments to effective ICT use during Emergency Remote Learning (ERL) in Indonesia. Similarly Almanthari et al. (2020) found that secondary school students in Indonesia faced significant barriers at the student level, including poor internet connectivity and lack of access to necessary devices, which were critical in the e-learning environment. In the context of rural areas, Adarkwah (2021) emphasized the challenges faced by students in Ghana, where the digital divide is particularly pronounced. The lack of infrastructure and limited access to the internet in rural areas significantly hampers the effectiveness of online learning, exacerbating educational inequalities. This issue is echoed in studies conducted in other regions, such as Kenya, where Bariu (2020) found that many schools have made minimal investments in ICT infrastructure, primarily due to the high costs associated with computer hardware and software.

Digital divide and inequality

The digital divide highlights the disparity in digital and ICT exposure among teachers and students, with some having more access to technology and others not. This divide also affects the quality of use of these tools. While laptop use at home promotes ubiquitous learning, a lack of internet access limits formal and informal learning opportunities for students in disadvantaged families and universities.

Access to technology is crucial for ICT integration in higher education, but many students, especially those from low-income or rural areas, lack essential digital tools, causing a significant gap. The absence of internet access hinders both teachers and students from accessing numerous opportunities for both formal and informal learning. Octaberlina and Muslimin (2020) study reveals students face online learning barriers like unfamiliarity, slow internet, and physical issues. They suggest training LMS, reducing files, and incorporating breaks. Baticulon et al. (2021) study reveals that despite 93% of medical students owning smartphones and 83% having laptops or desktops, only 41% feel capable of engaging in online learning, despite having access to technology. Their

study identified five barriers to medical students' learning, including technological, individual, domestic, institutional, and community issues, emphasizing the need for student-centered interventions. The study by Karunakaran and Dhanawardana (2023) reveals challenges faced by social science teachers in using ICT in their teaching practices in Sri Lanka. The research found difficulties in accessing resources, skill development, and infrastructure quality. Barriers included inadequate resources, strict school regulations, and insufficient computer maintenance facilities.

Infrastructure is also important for ICT integration in higher education. The laptops for teachers and students revealed infrastructure and hardware limitations, highlighting the significant barrier to ICT integration in higher education, but developing countries like, Nepal may lack the necessary infrastructure for reliable digital learning environments. Bariu (2020) study on Kenyan schools' ICT infrastructure highlights low investments due to high hardware, software, and accessory costs, emphasizing the need for training and support for utilizing ICT in education Kaur (2023a)study explores how teachers' beliefs about ICT's role in education influence their confidence and competency, highlighting barriers like lack of resources and technical support. The study underscores the transformative potential of ICT in education. Kennedy (2023) study at the College of Education in Liberia identifies challenges in integrating ICT into teacher education, including inadequate infrastructure, lack of support, insufficient experience, and limited training opportunities. The study calls for ICT as a core subject for Liberia's educational vision.

Personalized learning experiences

The digital revolution holds immense potential for transforming higher education. Personal factors and learning experiences are essential for overcoming barriers and promoting inclusive, effective, and sustainable integration of ICT tools and techniques in learning environments. Personalized learning enhances teachers and student engagement but can create barriers to ICT integration in higher education. Implementing personalized learning systems requires significant technology investments, which may not be feasible for many institutions, particularly in developing regions, due to financial constraints. Personalized learning tools often come with high licensing or subscription costs, putting financial strain on institutions and students, making access to these advanced technologies difficult. Personalized learning experiences rely on vast student data, raising privacy concerns and increasing cyberattack risk. Institutions must invest in robust cybersecurity measures to protect student data, despite the cost and difficulty of maintaining it.

Personalized learning technologies require integration with existing university systems like LMS, SIS, and assessment platforms, which can be complex and time-consuming, necessitating specialized IT expertise. Interoperability issues can arise when different personalized learning tools, such as a platform that customizes course content based on student progress, don't work seamlessly together.

Personalized learning systems necessitate advanced digital literacy skills for educators, but many faculty members lack this training, potentially leading to resistance or ineffective use. Teachers and students require digital proficiency to navigate personalized learning environments, and those unfamiliar with advanced tools may struggle to benefit from these systems, exacerbating existing digital divides. The digital divide widens as students from disadvantaged backgrounds or rural areas struggle to access advanced technology and reliable internet connections, resulting in unequal learning experiences. Customization bias in personalized learning platforms can result from algorithms not considering diverse learning needs, cultural differences, or language barriers, leading to inequitable experiences for students. Azhari and Fajri (2022) study examines teachers' distance learning strategies during COVID-19 school closures, finding challenges due to ICT tool limitations but adapting with dedication and effort.

AI and data analytics in personalized learning systems can improve learning outcomes, but inaccurate algorithms can compromise reliability. The integration of ICT in resource-intensive institutions necessitates continuous improvement in higher education. Almazova et al. (2020) study highlighted the importance of digital literacy and professional development programs in enhancing student motivation, IT skills, and addressing deadline issues. The study revealed that the COVID-19 pandemic has increased the workload and time required for Russian higher education teachers in online teaching. The study by Mynaříková and Novotný (2020) in the Czech Republic highlights the challenges secondary school teachers face in utilizing ICTs for teaching and education. Their study shows that teachers have average ICT knowledge and use them infrequently, suggesting systematic education to reduce computer anxiety and foster trust in new technologies is crucial for successful digital transformation. Bolaji and Adeoye (2022) study examined ICT accessibility and usability among secondary school teachers in Ilorin using a cross-sectional descriptive study with 253 randomly selected respondents. The study reveals that secondary schools lack widespread access to ICT facilities and that most teachers lack fundamental computer and ICT skills.

Pedagogical challenges

The integration of information and communication technology (ICT) in higher education presents several pedagogical challenges. Personalized learning may pose a challenge to traditional pedagogical models, particularly in institutions that rely on traditional teaching methods. Faculty members may resist implementing personalized systems if they perceive them as potentially compromising established instructional strategies. The integration of ICT in higher education faces pedagogical challenges, potentially reducing the importance of personal mentorship and guidance. Over-reliance on technology in personalized learning systems can decrease human interaction between educators and students, potentially leading to a decrease in overall effectiveness. Almanthari et al. (2020) investigate the impact of school closures in Indonesia during the COVID-19 pandemic, focusing on secondary school mathematics teachers' views on barriers to e-learning implementation. This study reveals student-level barriers significantly affects e-learning use, with a strong correlation between these barriers and school and curriculum issues. Teachers' demographic backgrounds did not significantly influence barriers. The study encourages further discussion on overcoming e-learning barriers. The study of Mercader and Gairín (2020) highlights underutilization of digital technologies in education due to personal, professional, institutional, and contextual barriers. This study suggests improved professional development and strategic planning.

The Imran et al. (2022) study found a significant relationship between extrinsic barriers, teachers' beliefs, and self-efficacy in classroom teaching, with 305 college teachers from 48 private colleges in Karachi participating in a survey. The study highlights the obstacles and misconceptions influencing ICT integration in education, offering valuable insights for stakeholders to improve technology-supported teaching methods. Okoye et al. (2023) found that in Latin America, the main challenges to implementing digital technologies in education include lack of training, resources, and internet access. A Caldwell (2020) study on Japanese university educators' perceptions of ICT use in EFL revealed barriers to integration, including teachers' beliefs, traditional methods, and cultural issues, emphasizing the need for pedagogical training.

The Bala et al. (2023) study explores the challenges faced by teachers in integrating ICT into education, highlighting the lack of necessary competencies and confidence. Strategies include ongoing training and redesigning teacher education programs to prepare educators for a technology-driven environment. Ravishankar and Wase (2024) study on ICT implementation in secondary education found significant challenges, including inadequate resources, poor internet connectivity, power outages, limited time, a lack of technical support, insufficient government funding, and inadequate training for educators. The study involved 87 teachers, principals, and department heads from six schools.

Institutional and contextual barriers

Institutional barriers, including inadequate support and insufficient training opportunities, are also widely reported in the literature. For instance, Zhang (2021) found that professional barriers, such as lack of institutional support and insufficient strategic planning, were the most significant obstacles faced by university teachers in Spain. The study by Kennedy (2023) in Liberia also identified inadequate ICT infrastructure and a lack of support for teachers as major challenges in integrating ICT into teacher education. The issue of inadequate resources and poor infrastructure is further highlighted in the study by Ravishankar and Wase (2024), which found that secondary schools in India face numerous obstacles, including poor internet connectivity, frequent power outages, and limited government funding. These institutional challenges are compounded by contextual factors, such as the cultural and traditional resistance to change noted by Caldwell (2020) in Japanese university classrooms, where traditional teaching methods and cultural issues hinder ICT integration.

Individual and motivational barriers

Individual barriers, including a lack of motivation and resistance to change, also play a significant role in hindering ICT integration. The study by Baticulon et al. (2021) found that medical students in the Philippines faced multiple interrelated challenges, including difficulty adjusting their learning styles and poor communication with educators. The lack of motivation and IT skills among students, as reported by Almazova et al. (2020), further complicates the effective use of ICT in education. Kaur (2023b) discusses how teachers' beliefs about ICT's role in education can influence their confidence and competency in using these tools. Teachers who lack confidence in their ICT skills or hold negative beliefs about the effectiveness of digital technologies are less likely to integrate them into their teaching practices. This is consistent with the findings of Bala et al. (2023), who reported that many teachers lack the necessary competencies and confidence to effectively use ICT in basic education settings.

The studies reviewed offer several implications for addressing the barriers to ICT integration in education. There is a clear need for enhanced professional development programs for teachers, as emphasized by Zhang (2021) and Azhari and Fajri (2022). These programs should focus on improving digital literacy, providing training on the pedagogical use of ICT, and fostering a positive attitude towards technology among educators.

Institutional support is also critical in overcoming these barriers. This includes investing in ICT infrastructure, providing adequate resources, and ensuring that teachers receive

the necessary technical support, as suggested by Kennedy (2023) and Ravishankar and Wase (2024). In addition, policymakers should focus on reducing the digital divide by improving internet connectivity and access to devices in rural areas, as recommended by Adarkwah (2021) and Bariu (2020).

Addressing individual and motivational barriers requires a more personalized approach to teaching and learning. Educators should be encouraged to adopt student-centered teaching methods that cater to different learning styles and promote active engagement with digital technologies, as suggested by Baticulon et al. (2021)and Kaur (2023b). The integration of ICT in education faces multiple barriers that are interconnected and context-specific. By tackling these barriers, educational institutions can better harness the potential of ICT to enhance teaching and learning in the post-pandemic era.

Discussion

In Nepal, the development of modern ICT began with the Telecommunications Act and the Telecommunication Regulation of 1997 (Karki, 2019). The Information Technology Policy of 2000 was a major policy aimed at promoting private sector participation in information technology development (Ministry of Science and Technology, 2000). The Nepalese government has revised its Information Communication Policy 2015, regulating all activities related to information communication technology, following a demand for such a comprehensive policy. The vision and mission of ICT in Nepal is to transform the country into an information- and knowledge-based society and economy. The aim is to foster the growth and development of the ICT sector as a crucial driver for Nepal's sustainable development and poverty reduction strategies. Nepal has prioritized education in its COVID emergency response, utilizing remote and e-learning options to compensate for school closures. Tribhuvan University has prioritized education in its COVID emergency response, utilizing remote and e-learning options to compensate for university closures in Nepal (Tribhuvan University, 2023).

This paper draws a conclusion from a systematic review by using different epistemological perspectives on integrating ICT in higher education, based on Nepal's ICT policy. This paper explores the understanding of knowledge and the interplay between learning, teaching, and technology at Tribhuvan University.

Constructivist epistemology

The constructivist epistemology emphasizes the active learning process through ICT (Robertson, 2018). This epistemology promotes a constructivist approach, utilizing e-learning systems and computer skills integration, encouraging students actively

create their own knowledge through self-directed learning and problem solving. The policy aims to expand TU's educational services using ICT-based e-learning systems, promoting student-centered learning and collaboration (Gautam, 2021; Joshi, 2023; Tribhuvan University, 2019, 2023). However, Tribhuvan University faces infrastructure shortages in rural or remote campuses, hindering constructivist epistemology, a student-driven approach focusing on active learning infrastructure using ICT tools. Tribhuvan University's traditional lecture-based teaching methods pose a barrier to change, hindering the development of student-centered, ICT-supported learning environments that promote problem-solving and critical thinking.

Pragmatist epistemology

Pragmatist epistemology is a philosophy that emphasizes practical engagement and problem solving as the primary means of learning(Kalyani, 2024). The epistemology suggests that ICT integration in higher education should focus on practical, skill-based learning that directly applies to real-world contexts like educational management or e-commerce. The ICT policy promotes IT-enabled EMIS and computer skills in education, enhancing practical learning, knowledge application, institutional management, and student participation in active learning environments (Halabi & Hill, 2024). TU faces barriers in integrating ICT into teaching and administrative systems due to limited resources and inadequate practical training for students and faculty. The insufficient funding for ICT infrastructure is preventing the implementation of practical applications like e-learning platforms and sector-specific digital tools. Tribhuvan University's education faculty may face challenges due to underfunding and resource limitations, which may hinder pragmatic approaches based on real-world ICT application (Joshi, 2023). Rana and Rana (2020) reported that the Faculty of Education at Tribhuvan University received international funding to establish ICT infrastructure and provide training for teachers but there was absence of support from either the government or the university itself.

Positivist epistemology

Positivist epistemology emphasizes knowledge as objective and measurable, focusing on the role of technology in gathering, processing, and analyzing data to enhance educational efficiency(Alakwe, 2017). This epistemology focused on EMIS in Nepal improves education quality and decision-making by analyzing student performance, resource management, and institutional effectiveness, promoting a positivist approach. Tribhuvan University faces challenges in Positivist Epistemology due to inadequate data collection and analysis systems for ICT tools, hindering the application of evidence-based assessments and objective measures of educational success. In evaluating ICT's

effectiveness in improving educational outcomes, the absence of measurable impact weakens the case for further technology investment.

Socio-cultural epistemology

Socio-cultural epistemology highlights the importance of culture, social interaction, and community in knowledge creation, highlighting how ICT can facilitate collaborative learning environments(Vatrapu, 2008). The socio-cultural approach to education can be utilized to create inclusive digital classrooms, particularly in rural or disadvantaged areas, to address educational inequalities, especially in rural or marginalized areas(Amin, 2024). Tribhuvan University faces a digital divide and inequality in access to technology, despite emphasizing collaborative and inclusive learning in socio-cultural epistemology(Baral, 2022; Joshi et al., 2023) .However, the digital divide at Tribhuvan University is causing unequal opportunities for students to use ICT-driven learning, thereby reinforcing existing social and educational inequalities.

Critical theory

Critical theory, through its epistemology, challenges conventional power structures in education, promoting empowerment and a more inclusive approach to knowledge production (Green, 2017). ICT in education can significantly enhance knowledge democratization by providing students with extensive information, diverse perspectives, and critical thinking tools (Gupta & Jain, 2017). This epistemology aims to promote inclusiveness and participation in higher education, empowering all students to engage critically with content and challenge existing inequalities. Tribhuvan University faces resistance barriers to adopting ICT tools to democratize access to information and shift power towards students due to entrenched power dynamics and a lack of platforms for critical engagement, highlighting the importance of challenging power structures(Joshi, 2023; Thapa & Khatri, 2023).

Humanistic epistemology

Humanistic epistemology emphasizes personal growth and self-actualization, utilizing ICT to facilitate holistic learning experiences that address emotional, social, and cognitive development (Hod & Ben-Zvi, 2018). The epistemology of transformational learning in higher education emphasizes the integration of computer skills and ICT in teaching, fostering creativity, personal expression, and self-directed learning in students(Sahin Izmirli & Kabakci Yurdakul, 2014). Tribhuvan University's humanistic epistemology may face challenges due to over-reliance on ICT, potentially reducing human interaction in learning and depersonalizing education, as ICT tools may depersonalize education and undermine individual development.

Conclusion

This review paper reveals various challenges in integrating information and communication technology (ICT) in education, including technological, individual, institutional, and contextual factors that hinder effective teaching and learning at Tribhuvan University in Nepal. These various epistemological perspectives provide distinct perspectives on the potential and barriers of ICT integration, including lack of infrastructure, resistance to change, digital inequality, inadequate trainings, and data-driven processes, hinder the efficient use of ICT in higher education.

This paper has identified two barriers to the integration of ICT in higher education at Tribhuvan University. They are a lack of policy alignment and implementation and resource constraints. Tribhuvan University's ICT policy promotes e learning, but implementation gaps as if slow adoption, inadequate funding, and infrastructure hinders its integration based on an epistemological framework. Tribhuvan University faces challenges in effectively integrating ICT with its epistemologies due to resource constraints, such as lack of funding, training, and infrastructure. The finding highlights challenges in ICT integration in education, particularly in developing regions, including inadequate infrastructure, resistance to change, digital inequality, inadequate trainings, and data-driven processes. Addressing these challenges requires policymakers, educational institutions, and stakeholders to create an enabling environment for ICT integration.

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