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Research Management Cell (RMC)
Dhankuta Multiple Campus, Dhankuta
Tribhuvan University, Nepal

ICT Integration in the 21st Century's Classroom Teaching and Learning

Man Bahadur Jora¹, PhD, Hom Bahadur Basnet²
Email: *hom.basnet@dhmc.tu.edu.np*

Abstract

The article highlights and discusses the importance of information and communication technology (ICT) in education even though it is theoretical in nature. Similarly, the ICT use in the classroom has significantly changed teaching and learning practices in the twenty-first century. This study examines how ICT tools improve student engagement, skill development, individualized learning, and instructional efficacy in contemporary classrooms. Using recent empirical research and meta-analyses, it illustrates the benefits, challenges, and possible consequences of ICT use in educational settings. Despite the challenges, ICT has a positive impact on education in the twenty-first century's pedagogical scenario. Additionally, the synthesis demonstrates how ICT promotes digital literacy, clouding in classes, critical thinking, and teamwork, all of which enhance academic performance and prepare students for future digital demands.

Keywords: Pedagogy, ICT integration, modern classes, novelty, digital competences

Introduction

In today's classroom, the traditional teacher-centered approach has less impact on students' learning and productive outcomes. In terms of innovation, the recently developed technological devices are the alternatives to steer teaching methods

¹ Dr. Jora (Principle Author) is a Lecturer of English Education at Far-Western University, Kailali Multiple Campus, Nepal. Orchid ID: 0009-0001-2118-4174

² Mr. Basnet (Corresponding Author) is a Associate Professor of Foundation of Education at Tribhuvan University, Dhankuta Multiple Campus, Nepal. Orchid ID: 0009-0003-5294-2112

towards the student-centered wave. Learner autonomy is the essential element of pedagogy that inspires students to study in the classroom, claims Jora (2020). Information and communication technologies have become essential in today's classrooms because they offer innovative ways to present curriculum content and engage students in highly customized and interactive ways. Student-centered approaches are replacing traditional teacher-centered pedagogies due to a range of ICT resources, such as online platforms, multimedia, and mobile applications (Palines et al., 2025). This change aims to accommodate different learners' needs while improving the standard and accessibility of education.

While students have more opportunities to engage in their own learning, classroom instruction is also supported more favourably in the ICT integrated class. An interactive classroom environment is another outcome of better teaching and learning practices (Jora, 2022). Additionally, technical factors alter learning styles, behaviors, and instructional methods. ICT adds creativity and improves the effectiveness and goal-orientedness of teaching and learning strategies. Language, culture, and other educational topics may be linked to the various locations in order to develop the destination-guided educational schemes. In a similar vein, ICT encourages collaboration among educators and presents novel concepts. The teaching and learning environment is facilitated when ICT is used in the classroom. Learning for students can be effective and advantageous. Students' learning can be efficient and beneficial if professors manage the classrooms in improved methods and get multilingual awareness (Jora, 2020). ICT use in the classroom can therefore make instructional efforts more successful and goal-oriented. The advanced objects are found in many fields throughout the world. The field of education cannot be an exception to this kind of growth and progress. These days, information technology is an essential component of both teaching and learning. Information and communication technology is referred to as ICT.

The Role and Impact of ICT in Classroom Teaching and Learning

The integration and use of digital technologies, such as computers, tablets, interactive whiteboards, the internet, instructional software, and multimedia materials, to assist and improve teaching and learning processes is referred to as ICT in the context of education. Computers, projectors, internet-enabled devices, learning management systems, and digital content are all included in ICT in the classroom. By facilitating both synchronous and asynchronous learning experiences, these tools give students access to a wealth of knowledge outside of textbooks (Ihmeideh & Al-Maadadi, 2018; Lock et al., 2021). These are tools that support the release of intuitive knowledge that is present in a submissive state of mind.

Nowadays, teaching must be connected to technology and technological gadgets. To make classes more aesthetically pleasing and understandable, educators use resources like multimedia presentations, interactive whiteboards, and projectors. The usage of smart boards, the most popular instrument in the modern world, serves as an example. Lessons use visuals, animations, simulations, and videos to help students understand difficult ideas and increase their level of involvement. Teachers can customize lectures, tests, and feedback to meet the needs of each individual student by using adaptive learning platforms and applications. Pupils study contents at their own speed, go over the content again, and get projects that are tailored to their own strengths and shortcomings. Students can collaborate on group projects from anywhere in the world with the use of online resources like Google Docs, Microsoft Teams, and other platforms. ICT prepares students for contemporary, digital job situations by fostering improved communication and teamwork abilities.

Using ICT resources to provide instructional approaches can help students learn more efficiently. In a similar vein, blended learning can be tailored to the convenience and accessibility needs and preferences of students. Thanks to distance and remote education systems like Zoom and Google Classroom, which offer access to classes from anywhere in the world, teaching and learning can occur outside of the traditional classroom. This flexibility assists students who are unable to attend in-person classes and expands the educational reach. Real-time grading, quiz feedback, and student progress tracking are made possible via ICT solutions. Teachers are able to keep a close eye on their students' progress and identify areas that need extra assistance and support in their medium of instruction (Jora, 2020).

From the perspective of students' constructive learning, one-sided instruction is pointless. It is also less participatory, which means it cannot help pupils learn or modify their behavior for the better. Students are encouraged to strengthen their skills through the use of strategies that scaffold their learning. Additionally, digital design courses, coding platforms, and content production tools aid in the development of crucial 21st-century skills in pupils. In order to succeed in their future occupations, students must be able to browse, assess, and produce digital content. The tools that have been developed support educational activities. Assisting Diverse Students ICT makes education more inclusive by providing specific tools for students with hearing, vision, or learning disabilities. Accordingly, Jora (2019) asserts that teacher education is insufficient if ICT integration is absent. Multiple languages and formats of the content can be offered, removing obstacles for students in various settings. ICT plays a variety of functions in teaching and learning in the classroom.

ICT Enhances Student Engagement and Motivation in Classrooms

ICT saves time and makes classes learner-centered as compared to traditional classroom settings. Students receive encouragement and rewards for completing their own work. Students also learn how to carry out tasks in the improved setting. It has been demonstrated that ICT integration boosts student motivation by enhancing the interactive and pleasurable nature of learning. In connection to this, Ramorola (2013) states that ICT tools like multimedia presentations and interactive platforms enhance student motivation, focus, and comprehension in classroom settings. Multimedia presentations, gamification, and simulations grab students' interest and increase retention and involvement (Paudel, 2021; Mairal-Llebot, Latorre-Cosulluela, & Liesa-Orús, 2025). Students are inspired to peruse resources and click on links to go further into the depths of concepts and knowledge when they observe the use of ICT tools. Students can learn independently in this way thanks to ICT.

ICT for Personalized and Adaptive Learning in the Pedagogical Field

These days, there are a lot of ways that ICT can be used to support teaching and learning. Pupils can successfully modify their study and get personal knowledge. Additionally, digital platforms enable customized learning experiences by modifying the level of difficulty of the information based on each learner's performance. Better academic results are promoted by this flexibility, which also encourages self-paced learning and helps fulfill each student's specific demands (Bhandari, 2024; Front Psychol., 2025). Meta-analyses support the beneficial benefits of ICT on young learners' language proficiency and knowledge acquisition (Front Psychol., 2025). ICT tools are helpful resources that can guide learning in the appropriate path for individualized and adaptable learning. Students are also better able to learn and develop notions of many topics thanks to digitalized sectors.

The Collaborative Learning and Communication in the Classroom

Two brains are better than one is a proverb in English. This adage describes a collaborative work atmosphere that is beneficial for improved learning and subsequent learning environments. ICT promotes group problem-solving and peer feedback among students by facilitating real-time contact through tools like shared documents and video platforms (Ghavifekr et al., 2013). Students are encouraged to work in groups and with their peers through collaborative learning. Using collaboration technologies fosters information sharing and teamwork, developing digital communication skills that are vital in today's workforce. ICT promotes cooperative learning cultures by enabling dynamic interactions between students and teachers as well as between students themselves (Budiarto et al., 2025). Dynamic

scenarios that promote and inspire learning are developed in the classroom. Students and teachers are able to work together.

ICT Improves Teaching Practices in Pedagogy

Effective teaching methods result from a variety of other factors, such as the usage of ICT. ICT also helps teachers improve their methods in the classroom. Teachers use ICT to prepare, deliver, and assess lessons. They use digital tools and multimedia to make lessons that are interesting and meaningful. Innovative teaching strategies like blended learning and flipped classrooms are encouraged by the availability of digital tools (Gyasi Mensah & Osman, 2022; Palines et al., 2025). Pedagogical strategies can help students focus. Additionally, ICT helps teachers practice for the benefit of their students. Thus, the use of ICT and digital technologies improves educational techniques. Teachers might develop effective strategies to assist pupils to learn the expected material in the classroom. Additionally, they might incorporate a variety of activities to promote timely learning and the wellbeing of the children. Once more, students receive the updated materials for their understanding and knowledge. It is believed that the activities will stimulate pupils' learning and growth.

Bridging Access and Equity Gaps in Classes

Students choose the teaching materials in traditional classrooms, which are led by the teacher. Bridging the gaps in fairness and access across and within learning items is a problem. Equity gaps in the classroom are caused by ICT. By giving students in underfunded schools access to affordable digital resources, ICT integration can close access gaps and equalize exposure to high-quality instructional materials (Ramorola, 2013). In lightening with this, Gravifekr et al. add that all students, regardless of socioeconomic status, can access the same materials thanks to open educational resources and cloud-based platforms, which lessen equity discrepancies. Mobile devices facilitate learning at any time and from any location, thereby bridging the gap between urban and rural classroom chances (Ramorola, 2013). However, if infrastructure favors privileged communities, these technologies run the danger of expanding gaps in the absence of targeted interventions (Ghavifekr et al., 2013). By enabling remote access to high-quality resources and instruction, ICT can help close the educational gap in developing nations. By reaching disenfranchised children who would not otherwise be able to access traditional learning modalities, mobile learning apps and online platforms have shown increases in literacy and numeracy (Oyile & Nambiro, 2025). Teachers can engage in activities that meet the needs of their pupils and the standards of the classroom. ICT is therefore used to close the gaps and address the issues of equity.

ICT Fosters Students' Learning and Teachers Become Student Centered

Modern pedagogy is centered on technology and may aggregate learning resources from a variety of sources. ICT in particular helps pupils study and motivates them to look up learning resources on their own. ICT applications can also facilitate self-learning. The use of information and communication technology (ICT) in education improves student learning by making it more dynamic, engaging, and personalized. It also causes teachers to become more student-centered, focusing on supporting and facilitating each student's unique learning needs rather than merely imparting knowledge. For further learning and involvement, teachers might involve their pupils in a variety of activities. In addition, they are able to provide the information that students can access through efficient channels and waves. When digital technologies like multimedia resources and interactive platforms are incorporated into lessons, ICT can improve students' learning by boosting their motivation, focus, and engagement (Alonso et al., 2025). In addition to fostering active learning and higher-order thinking, ICT-supported activities assist students in developing their creativity and problem-solving skills in addition to their topic knowledge (Alonso et al., 2025).

Students can learn at their own pace and review challenging subjects with the use of e-learning platforms and online resources, which can enhance comprehension and academic achievement (Owusu et al., 2023). Additionally, research shows that using ICT for academic assignments and research is linked to higher academic performance and more favorable attitudes toward self-directed learning (Owusu et al., 2023). All things considered, ICT-based learning environments can serve diverse learners by customizing instruction. In general, by tailoring activities and content to various requirements and skill levels, ICT-based learning environments can support varied learners and customize education (Alonso et al., 2025).

In the classroom, ICT technologies can be viewed and used by both teachers and students regarding the accomplishment of pedagogical goals. These are in place to improve the environment for both teachers and pupils. To put it simply, ICT tools can be used in pedagogy by both teachers and students. Students have access to a wide range of resources, and teachers are able to impart practical knowledge that might help them with their adjustment and means of subsistence. There are various advantages for pupils to learn and comprehend the material. Multimedia presentations, internet resources, and interactive platforms are examples of ICT tools that enhance motivation, focus, and comprehension. They give students the freedom to learn at their own speed, foster independence, critical thinking, and teamwork, and

give them access to a wealth of knowledge and different viewpoints from across the world. They motivate kids to learn and grow on their own and point them in the direction of morally sound circumstances that foster learning.

ICT tools, on the other hand, assist educators in properly imparting knowledge and information. Teachers not only supply pertinent resources, but they also transform them into useful objects in ways that are pleasant for them. ICT gives instructors access to a wide range of digital tools and resources that help them manage their courses more effectively and cut down on repetitious tasks. This enables educators to concentrate more on helping, mentoring, and advising each student on an individual basis. Based on each student's learning progress, teachers can modify their lessons and create a more collaborative and engaging learning environment. For today's pupils and their requirements, chalk and discussion alone are insufficient. ICT tools are beneficial learning aids for achieving improvement. For students to learn, Moodle and other platforms are crucial. Using a central projector or interactive whiteboard to offer multimedia presentations and demos directly to the class, teachers frequently employ ICT in a teacher-centered manner, managing the speed and material flow (Ramorola, 2013). According to Ghavifekr et al. (2013), this method places the instructor as the main source of knowledge while the students passively absorb information via instructional videos or PowerPoint slides. For this reason, ICT tools can be the answer to making teaching and learning materials engaging and purposeful in the process of teaching and learning.

From the standpoint of students' enjoyable education, student-centered methods are thought to be successful and well-directed. Teachers no longer serve as the exclusive source of knowledge; instead, they operate as learning facilitators, urging students to actively interact with the material and work together with their peers. ICT supports individualized education and promotes student autonomy by offering platforms for communication, feedback, adaptive learning, and personalized evaluation. ICT as a whole serves a function and is based on needs to improve teaching and learning student-oriented. Additionally, students have the opportunity to deliver them to the appropriate location. In conclusion, ICT integration in education makes learning more dynamic, effective, and learner-centered. Teachers are able to successfully guide and support a variety of learning demands, and students actively participate in their own education. This method better equips students with 21st-century abilities that are necessary for success in the classroom and in the workplace, like digital literacy, problem-solving, and critical thinking. There are plenty of opportunities for students to perform at their best.

Challenges and Considerations

To put it plainly, difficulties are widespread in the educational fields. They are mostly obstacles in the teaching and learning process. Particularly, challenges are impediments or difficulties that call for work and expertise to overcome; they frequently put a people or system's resilience, adaptability, and abilities to the test. They are the roadblocks to adopting learner-centered pedagogy. They can occur in a variety of settings, including academic, professional, emotional, personal, and governance-related ones. Unskilled skilled aspects and inadequate teacher training hinders effective ICT use, as educators often lack skills for pedagogical integration (Mathebula, 2024). Likewise, limited access to devices, unreliable internet, and overcrowded facilities exacerbate issues, especially in under-resourced schools (Mathebula, 2024). Challenges are crucial for development and success because they can spur innovation, encourage growth, and encourage problem-solving. It is also possible to use challenges as a way to improve even more. Additionally, they can assist in resolving learning-related issues. High costs of ICT tools and poor institutional support prevent widespread adoption (Ramorola, 2013). In the same vein, lack of confidence, time for practice, and policy frameworks further impede progress (Ghavifekr et al., 2015) in the education field.

The deliberate thoughts we have in order to develop and understand some significant concepts are known as considerations. Similarly, they must be conceived in order to succeed in the days ahead. Stated differently, they are the processes of carefully considering something. The term "considerations" describes elements, objects, or problems that need thorough consideration, particularly when planning or making decisions. They entail careful consideration and deference to various factors that could affect results. In order to make better educated and well-rounded decisions, considerations aid in weighing options and anticipating outcomes. When we talk about something, we need to take things into account in order to come up with better answers or conclusions. Despite its obvious advantages, ICT integration faces a number of difficulties when used in the classroom. From the standpoint of funding and infrastructure, academics must overcome the challenge of obtaining its enhanced accessibility. Effective technology adoption is hampered by inadequate ICT infrastructure and a lack of resources in many schools, particularly in developing nations (Paudel, 2022; MoE, 2016).

The term "difficulties in teacher training" refers to the several challenges and barriers that prevent teachers from being adequately prepared, developed, and performing throughout their initial training as well as during their continued

professional development. Both the effectiveness of teachers in the classroom and the standard of education are impacted by these issues. Teachers' digital competencies are critical to their effective use of ICT. Teachers' attitudes and the effective use of ICT in pedagogy are impacted by differences in training and support (Budiarto et al., 2025; Shambare et al., 2022). Even inexperienced teachers can instruct in traditional classrooms, but they find it challenging in technologically advanced classrooms. The successful and efficient use of ICT in the classroom depends on teacher preparation. In the classroom, the abilities and skills of the teachers play a major role. Without qualified instructors, class management becomes disorganized and unstructured while using ICT technologies. Teachers frequently deal with a lack of knowledge about chances for continuous improvement, challenging working conditions (such packed classrooms, inadequate facilities, and a lack of support), and an increased workload that impairs their motivation and ability to advance their careers. School administration, community meddling, parental expectations, and problems like cyberbullying can all put pressure on teachers, which can hinder their professional development and training. Therefore, obstacles in teacher preparation include institutional, pedagogical, resource-related, and socio-emotional issues that hinder the growth of proficient and self-assured educators who can successfully address a range of student needs.

The idea and practice of guaranteeing fairness and simplicity of access to essential resources, opportunities, and services—particularly in education—so that every person has the potential to achieve regardless of their background or unique circumstances is known as equity access. All people have an equal and significant chance to gain from education, which is the cornerstone of social mobility and a just society. This is known as equity access in education.

Students struggle with fair access to ICT resources on their own. When it comes to using ICT and digital tools, there are no strict guidelines for teachers or pupils. Teachers have trouble teaching and learning in the classroom with this kind of structure. Students' learning chances are inconsistent due to differences in internet connectivity and device ownership, necessitating governmental initiatives for equitable technology access (Oyile & Nambiro, 2025). Pedagogical challenges arise from a lack of clear regulations and guidelines.

Future Directions

One area of innovative study in the realm of education is the use of ICT in the classroom. The primary focus of research in the current period is education in order to improve it further and expose the realities of the educational environment. By enabling individualized learning at scale and tackling accessibility issues, the rapidly

changing ICT landscape—which includes developments in artificial intelligence and data-driven tools—promises to significantly alter education. Likewise, their impacts on the teaching and learning endeavor are large in number. In this sense, it is possible to assess and reassess the classroom activities in the days ahead. To optimize ICT's educational benefits, more research is required to provide context-specific digital resources and efficient teacher training programs (Oyile & Nambiro, 2025; *Front Psychol.*, 2025). New technologies and their effects are being discovered on a daily basis. In the classroom, the teacher and students use ICT tools, but we still need to look for the remaining problems to make improvements. Therefore, it is necessary to examine their influence and usefulness and work on issues pertaining to educational dimensions.

Conclusion

ICT serves as both a powerful teacher and a facilitator of learning and teaching in the twenty-first century. Similar to this, ICT has emerged as a key component of education in the twenty-first century, improving instruction by offering dynamic, interactive, and customized learning opportunities. It makes it easier to learn vital 21st-century abilities like problem-solving, teamwork, and digital literacy with the ICT integration in pedagogical setting. Strategic ICT integration has the ability to transform classrooms and equip students for an increasingly digital future, even though infrastructure and training issues still exist. During the learning process, learners can be encouraged to learn more effectively. Despite the challenges associated with implementing ICT in the classroom, its benefits encourage students to use digital tools.

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