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Information Communication Technology in Classroom Instruction

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Abstract

This is the age of information communication and technology. It has controlled everyday's work of people. Without it, people now-a-day feel themselves completely isolated. From the very beginning of the day, people use it as the mainstay of their daily affairs. This study investigates the utilization of ICT tools in educational settings focusing on the ICT resources commonly employed for classroom teaching and to explore the challenges faced by both teachers and students. It has used the descriptive survey research design to outline the overall strategy and procedures for data collection and analysis consisting of 83 students and 25 teachers as the sample and observation notes and open-ended questions as the tools. The study concludes that teachers require adequate training, resources, and support to successfully implement ICT-based instruction and become more capable, professional educators, equipped to address the global challenges of teaching ICT in modern classrooms. For teacher education programs to effectively prepare educators for the demands of the 21st century, they must prioritize competitiveness, competence, and skill development, with ICT playing a central role.

Keywords: Information, communication technology, pedagogy, computer, classroom activities.

Introduction

Classroom is an educational space where students are taught in groups in a school or an institution. Classroom instruction is the learning process that occurs between teachers, students, and instructional materials, along with planning and management. It is regarded as a primary teacher activity and a basic component of the educational system. The technologies, infrastructure, and components together referred to as information and communication technology (ICT), enable the access, storage, transmission, and manipulation of information through computers, wireless networks, the internet, mobile phones, software, social networking, video conferencing, and telephony. Technologies for live and recorded broadcasting are just a

few of the many technologies that fall under the umbrella of ICT. So, ICT is a broader term than Information Technology (IT).

Integrating Information and Communication Technology has become an essential component in modern education, significantly transforming how knowledge and skills are delivered in classrooms. ICT encompasses various communication tools such as audio, video, radio, television, computers, the internet, wireless networks, mobile devices, and various software applications. These technologies enable teachers to monitor and manage student progress effectively, offering a global perspective on knowledge acquisition and communication processes. By incorporating ICT, educators can engage in more creative and critical approaches to teaching, equipping students with the skills necessary to navigate an increasingly interconnected world.

The use of ICT in higher education has proven to be an unavoidable phenomenon, as it streamlines communication, reduces time and costs, and facilitates access to information across diverse geographic locations. With just a few clicks, ICT provides learners with immediate access to a wealth of resources, promoting a more inclusive and efficient educational experience. Moreover, the application of ICT in education fosters literacy development, supports language acquisition, motivates students, and enhances their self-esteem (Dahal, 2080).

Over the past decade, the transformative power of ICT in education has become evident in schools, universities, and other learning institutions. Its capacity to revolutionize teaching and learning processes aligns with the global shift toward technology-driven education, ensuring that both educators and students are better equipped to meet the demands of the 21st century. There are several ways that information and communication technology (ICT) can be utilized in the classroom to enhance learning outcomes. They include personalized learning, increased engagement, resource accessibility, collaboration, communication, critical thinking, innovation, creativity, etc.

Students can receive tailored feedback and advance at their own speed with the aid of ICT. They can interact with content tailored to their own learning preferences. By offering multiple approaches to teaching the same material, ICT can make learning more entertaining and pleasurable. ICT makes a wide range of resources available, including games, images, movies, and websites. By making it simpler for team members to collaborate and create projects together. ICT can also improve collaborative work. Through a variety of methods, ICT can help teachers

and students communicate. Critical thinking is something that ICT can promote. ICT can help students develop new skills and become more creative, supporting the development of problem-solving abilities.

Poudel (2015) conducted a study on ICT and teacher education in Nepal, highlighting numerous challenges in the sector which have worsened over time. He emphasized the urgent need for improvement. The study aimed to assess the current knowledge, practices, and expectations of English teacher educators in both public/community and private teacher education institutions regarding the use of ICT. Data was collected through a questionnaire, with 25 respondents providing complete responses. The findings revealed that while educators recognized the importance of integrating ICT into classroom teaching, they faced significant barriers such as limited resources, insufficient training, and an unprepared administrative system, preventing them from implementing ICT effectively (Dahal, 2080).

Tribhuvan University (TU), Faculty of Education (FOE), the Office of the Dean, recently introduced the ICT program in Bachelor of Education (B. Ed.) intending to produce qualified teachers who would support pedagogical knowledge in the emerging worldwide phenomenon of ICT in education. It is a semester-based program that began at Mahendra Ratna Campus (MRC), one of the constituent campuses of TU, in the 2073/074 BS academic year. It consists of 9 semester-length courses. Most Teaching learning institutions take measures to adopt and incorporate ICTs in teaching and learning for better information access, better communication, synchronous and asynchronous learning, improved cooperation and collaboration, cost-effectiveness, pedagogical development, and to provide abundant opportunities for students to build or modify their personal knowledge through the rich experiences that technology affords (Kandel, 2022).

ICT plays an important role in the development of students' knowledge. The development of ICT in education has changed the way of conceiving and delivering education. Due to its easy access, this type of education has become very popular worldwide. In the past, educational institutions have provided limited choices for students concerning the methods and styles in which programs have been conveyed. Students were forced to receive what had been delivered. Nowadays, many institutions generate competitive edges for themselves through the selections they offer to the students. Different types of ICT tools help expand access to education,

strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning an engaging, active process connected to real life. However, at MRC, while many instructors and lecturers possess foundational knowledge of ICT, there is room for further development in their ability to integrate these technologies into classroom instruction effectively. This study investigates the utilization of ICT tools in educational settings. Focusing on the ICT resources commonly employed for classroom teaching and exploring the challenges faced by both teachers and students (Dahal, 2078 BS).

Methodology

The descriptive survey research design was used to outline the overall strategy and procedures for data collection and analysis. The study population included all faculty members teaching in the B. Ed. ICT program at MRC. The program comprises 45 subjects spread across nine semesters, allocating 20 faculty members to cover all subjects. The total number of participants included 83 students and 20 teachers. Data were collected using observation notes, interviews, and open-ended questions. Classroom observations were conducted to investigate teachers' use of ICT in instruction, while open-ended questionnaires were distributed to both students and teachers to gather their perspectives. The data were analyzed first by identifying key themes, then by summarizing the information supporting the main ideas related to those themes. The analysis involved synthesizing participants' responses and using direct quotes to highlight key points. Each theme was described in terms of its main idea, with results presented as concise statements reflecting the overall findings.

Results and Discussion

The analysis has been presented under different themes like Subject-wise distribution of faculty members, ICT tools used in classroom instruction, ICT Set Environment of Classroom, and different ICT tools and software in daily classroom instruction.

Subject-Wise Distribution of Faculty Members (2079/080)

The B. Ed. in ICT program at MRC commenced in the academic year 2073/074 under the FOE on a semester-based system. The program spans nine semesters, with ICT education as the core subject in each semester. However, the curriculum is supplemented by various educational subjects such as Foundations of Education, Psychology, Curriculum Development, Classroom Pedagogy, Research, Practicum, Mathematics Education, and courses from other disciplines like

English and Nepali Education. Due to the semester-based structure, not all semesters run simultaneously. The researcher analyzed the faculty members involved in teaching across various semesters during the research period (academic year 2079/080 BS). Many students enrolled in the different semesters of the B.Ed. in ICT program, also referred to as BICTE. The program consists of 45 subjects, spread across nine semesters, with different faculty members assigned to teach each subject. For several semesters, the researcher identified 20 faculty members involved in delivering the courses (Dahal 2080 BS).

Classroom observations revealed that teaching activities were conducted using laptops, multimedia tools, various apps, and internet resources. However, some teachers appeared to struggle with effectively utilizing these ICT tools and were overly reliant on slide presentations. This reliance posed a challenge for slower-paced students, who found it difficult to keep up with the slides. As a result, these students were less engaged and showed reluctance to participate in classroom activities (classroom observation, March 12, 2022). This finding is similar to the study by Almarabeh et al. (2015), and Abdulrahman et al. (2020).

ICT Tools and Software Utilized for Classroom Instruction

Table 1 below shows the Utilization of 'Computer Device' as ICT Tools in classroom activities.

Table 1. *Using 'Computer Device' as ICT Tools in Classroom Activities*

S. No.	Details	Classes	Percent (%)
1.	Daily	32	71.11
2.	Weekly	3	6.67
3.	Monthly	2	4.44
4.	Few	3	6.67
5.	Never	0	0.00
6.	Not available	0	0.00
7.	No Response	0	0.00
8.	Blank	5	11.11
	Total	45	100.00

(Source : Classroom Observations, 2022)

The above information reveals that in 32 classroom sessions, 'Computer Devices' were used on a daily basis for instructional activities. Additionally, 3 classroom sessions utilized these

devices on a weekly basis, while some instances showed occasional use, with 'Computer Devices' employed only a few times per month. The devices used in these sessions included both desktop computers and laptops, integrated into various classroom instructional activities.

Types of ICT Tools used in the classroom Activities

The students were found to use a wide array of ICT tools in B. Ed. in the ICT classroom. These tools are presented in this table.

Table 2. *Types of ICT Tools in Classroom Activities*

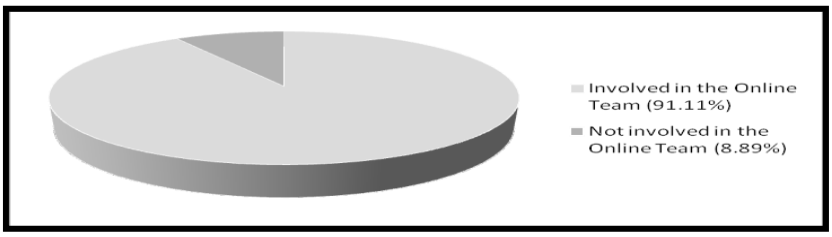
S. No.	Details	Out of each 45 Classes	Percent of each 45 Classes	Remarks
1.	Word Processing	18	40.00	Daily
2.	Spread Sheet Software	11	24.44	Daily
3.	Power Point Software	24	53.33	Daily
4.	Data Base Software	15	33.33	Daily
5.	Graphical Application	9	18.80	Daily
6.	Virtual Reality	9	18.80	Daily
7.	Java Programming	7	15.38	Weekly
8.	Flash Presentation	14	31.11	Weekly
9.	Drill/Practice Tutorials	10	22.00	Weekly
10.	Internet' facilities	16	35.56	Daily
11.	e-learning	10	22.00	Daily
12.	Online Meeting	8	17.78	Daily
13.	Offline Program	37	82.00	Daily

(Source : Classroom Observations, 2022)

Through the observation of the above table only 16 classes (35.56 %) found with internet facilities. Most of the classes were found irregular using insufficient services. Only 22% of classrooms used the Internet for e-learning. So, 78% of classes were deemed to be unreliable and lacking in services. Through observation, 8 classes (17.78%) were using 'Weekly' classroom activities through Microsoft Team and Zoom Meetings. Only 7, 5, and 2 of classes use 'Monthly', 'Daily', and 'occasionally'. The meeting was conducted by program coordinator or subject teacher as per the need base. 82% of classroom instructions were conducted with offline

mood through different software tools. Similarly, 78 % (16 classroom teachers) used ICT tools in their homes for preparing lesson plans and class materials, and 91.11% of classroom members were involved in the online team of their own colleagues (Figure 1). The finding is consistent with the study by Dahal (2080 BS) and Palloff et al. (2013).

Figure 1. Involvements in the Online Team of Their Colleagues



Use of ICT Tools to Facilitate Learning

Teachers' perceptions regarding the use of ICT tools in their classroom instruction reveal several key points: ICT technologies significantly enhance the quality of education by increasing student motivation, connecting learners to a wide range of knowledge sources, and creating active learning environments both in and out of the classroom. These tools allow instructors to dedicate more time to facilitation, fostering an educational atmosphere that empowers students to take charge of their learning. As a result, many educators are focusing on how to effectively leverage ICT tools to improve teaching and learning outcomes. These technologies boost students' motivation, self-confidence, and self-esteem, promoting independent and active learning. Consequently, integrating ICTs aims to enhance educational quality, flexibility, access, and affordability. It indicates a pressing need for universities to develop online software that can effectively assess students' engagement and activity. This initiative prioritizes online courses, ensuring that all students can participate in digital learning environments.

Exposing students to IT-friendly environments is crucial, regardless of whether their subjects inherently involve technology. Instructors across all disciplines cultivate this approach to prepare students for a technology-driven world. A supportive policy environment is also necessary to facilitate the effective integration of ICT in educational practices. Furthermore, ICT classes focus more on practical applications than theoretical concepts, encouraging educators to explore technological solutions for real-world challenges. Therefore, teachers must be well-versed in the proper use of ICT tools; while general subject presentations are valuable, there is an expectation for teachers to offer more comprehensive insights. (Kim et al. 2011)

Teachers view that the curriculum needs to be regularly updated to reflect advancements in global technology, emphasizing practical application over mere theoretical knowledge. Increasing learner motivation and engagement is vital, and it can be achieved by enhancing basic skills acquisition and providing improved teacher training. Teachers and students should also have the opportunity to explore a wealth of subject-related materials, create notes, and delve into topics of personal interest, expanding their knowledge base. Continuous support and training for educators are essential to keep them informed about the latest technological developments.

Incorporating IT-based learning activities could be enhanced through classroom observations. Allocating an adequate budget to the education sector, offering qualified teachers, and maintaining a conducive working environment will further support this endeavour. Encouraging creative activities within educational settings and promoting creativity in classroom activities are also important aspects. Various ICT tools are available for educational purposes, which can be utilized in diverse contexts and take both software and hardware forms, depending on their operational requirements. In light of the pandemic, actively engaging with online resources for study has become increasingly important.

Exploring new areas of interest through online courses and virtual classes can broaden students' horizons. Effective data management and secure information storage are also critical components in leveraging ICT tools for educational success. Through the observation, 55.50 % of subject teachers supplied their assignment/evaluation marks/results in the Classroom Instruction Period, and 44.50% were from the Online Portal. More than half (55.50%) of subject teachers agree that ICT helps both formal and informal education. Similarly, 83.50 % of subject teachers agree social media positively affects learning activities. This result aligns with some of the past studies (e.g., Fedock et al., 2019; Dahal, 2080 BS; Sarwar et al., 2019).

Learning Process to Improve ICT-Based Knowledge, Skill, and Behavior in Day-to-Day Learning Activities

Since the B.Ed. in ICT program is designed with practical courses and implemented in an environment familiar to IT professionals, it is crucial to develop the program's infrastructure with a well-structured plan, successful execution, and a need-based approach. This foundational requirement sets the stage for effective learning and teaching. Teachers play a pivotal role in classroom activities; therefore, it is essential for them to stay updated on information technology

before the start of each class. Their proficiency in IT directly impacts the quality of instruction and student engagement.

The successful development of this program hinges on its association with IT-oriented institutions. Students' learning processes must align with IT-friendly classroom pedagogy and practical laboratory activities to ensure a comprehensive educational experience. For students enrolled in semester-based ICT programs, certain expectations must be established. Regular attendance, timely participation in class activities, consistent submission of assignments, and frequent evaluation procedures are essential. These activities are supported by adapted skills and appropriate behavioral learning strategies that will help students navigate daily life earning and achieve goal-oriented outcomes. Additionally, expanding access to IT-related resources is vital. Field trips and providing access to Wi-Fi in classrooms for students, teachers, schools, and communities can facilitate better connectivity and collaboration among both novices and experts in the field.

Furthermore, there is a need for increased internet speed, possibly through government initiatives or partnerships with local service providers. This enhancement is crucial for improving the quality of online education and ICT resource accessibility. Students have expressed concerns regarding delayed exam schedules, which have resulted in the potential loss of an academic year. Given the current circumstances, they advocate for a "systematic online nature" for exams. Their experience with technology-based online and virtual classes during the pandemic has improved their online capabilities, and they believe that these examinations should be affordable and efficient.

In addition, it has been noted that areas lacking electricity face barriers in accessing IT-related courses. The government should explore alternative methods, such as solar power, to ensure that IT training can reach remote locations. Moreover, there is a pressing need for more practical assignments, moving away from traditional theoretical approaches. Students also recommend transitioning to computer-based exams instead of paper-based formats, reflecting the technological shift in education. Effective oversight and management of all ICT infrastructures across the country are necessary. This responsibility largely depends on successfully implementing national policies designed to support ICT education and infrastructure development, similar to the result by Dahal (2080 BS) and Conrads et al. (2017).

The impact of corona pandemic period (COVID 19)

The COVID-19 pandemic has had a profound impact worldwide, affecting every nation and its development processes. Closely linked to human health, the pandemic has resulted in various negative repercussions across all sectors of society. However, some respondents have also identified positive aspects emerging from this crisis. Respondents highlighted the significant negative impact of the current crisis on their studies. Physical classes have transitioned to online formats, shifting from in-person interactions to virtual connections. Many expressed concerns about the threat the virus poses to their lives, further complicating their educational experiences (Dahal, 2078 BS).

Additionally, regular classroom instruction programs and exam schedules have been postponed during this period, disrupting the continuity of learning. One respondent noted that, although they participated in online classes, they missed all practical lessons. This individual expressed feelings of inadequacy regarding their networking skills, which hindered ability to achieve their academic goals. The disarray in exam schedules and disruptions to regular lifestyles have contributed to confusion and delays in teaching and learning activities. Interestingly, some respondents managed to complete a year's coursework in a single semester, demonstrating adaptability amid the crisis. However, challenges persisted, such as difficulties encountered with the online Moodle platform, which affected the smooth operation of mathematics classes (Dahal, 2080 BS).

Despite the challenges, some respondents maintained a positive outlook. Some individuals believed that, while they faced some difficulties, collaborating while studying using ICT materials was beneficial. The pandemic has posed an existential threat to millions of businesses, yet the transition to online classes has allowed respondents to continue their education. Many noted that ICT facilitated remote learning, enabling classes to proceed without the need for physical presence. Some other students felt that there was no significant lack of practical instruction, even though they preferred online classes. Other respondents faced challenges participating in online sessions due to network issues in their village. Many expressed the emotional toll of missing personal interactions with teachers and the conducive learning environments typically found in physical classrooms (Dahal, 2080 BS).

Although the quality of online classes was perceived to be lower than that of face-to-face instruction, many acknowledged that they remained effective. However, respondents reported

experiencing a lack of concentration and increased mental stress during online learning. Furthermore, sourcing educational materials became increasingly difficult during the pandemic. Overall, the conditions created by the pandemic have affected the nation's overall growth, including its educational system. Nevertheless, respondents indicated that their educational efforts are gradually adapting to the new modern reality, highlighting the resilience and adaptability of both educators and students during these challenging times. (Dahal, 2080 BS)

Challenges of ICT in Classroom Instruction

The analysis revealed several obstacles and challenges hindering the effective use of ICT tools in classroom instruction. Key issues included a lack of skills, insufficient confidence, and inadequate experience among teachers. Additionally, there were challenges related to training, motivation, and access to ICT resources. Technical support was often lacking, and the availability of authentic ICT software was limited. Furthermore, an unstable and unreliable internet connection in schools significantly affected technology integration into teaching practices. As a result of these difficulties, many instructors refrained from utilizing ICT in their classrooms (Dahal, 2080 BS).

Research studies have identified various factors as widespread barriers to implementing ICT in education. One significant challenge is the misuse of technology by students, which can disrupt the learning environment. Teacher knowledge and professional development play a critical role; as inadequate training can leave educators ill-equipped to integrate ICT into their instruction effectively. Furthermore, ensuring student safety online remains a concern, as teachers must navigate the complexities of digital interactions, similar to the result by Dahal (2080 BS) and Shariff (2005).

The cost of acquiring new technology poses another barrier, particularly for schools with limited budgets. Keeping up with rapid technological changes can also be overwhelming for educators, leading to frustration and resistance. Additionally, a lack of computers and quality software further restricts access to effective ICT tools. Time constraints for both teaching and training can hinder the ability to explore new technologies.

Technical problems, such as software glitches and hardware failures, often disrupt classroom activities, leading to a reluctance to incorporate technology. Teachers' attitudes toward computers and technology can significantly impact their willingness to adopt ICT, while poor funding and inadequate administrative support can create an environment resistant to

change. Lastly, a lack of confidence among teachers in using ICT tools can prevent them from fully engaging with the available resources, further perpetuating the cycle of underutilization. This finding is similar to the study by Chankova (2020).

Suggestions to improve ICT Based Learning Activities

The following suggestions aim to enhance ICT-based curriculum learning activities from a classroom perspective:

Firstly, teachers should utilize various ICT resources to enrich their teaching methods. The quality of online courses must be improved, ensuring that they include more interactive features. Recording online classes on video is recommended to provide students with valuable resources for review. Additionally, teachers should gradually strive to enhance their online courses by integrating various ICT tools and devices. Assignments such as case studies and research exploring virtual and physical environments should be assigned to promote critical thinking and real-world application.

Moreover, the government should focus on increasing internet speed and improving access to internet services in isolated areas. This improvement will facilitate better connectivity for online learning and enhance the overall educational experience. Attention should also be given to the online exam scoring methods to ensure accuracy and reliability, which are crucial for maintaining academic integrity in assessments. (Holden et al., 2021).

Expanded access to IT-related resources and field trips to locations with Wi-Fi connectivity can significantly benefit the learning experience. It is essential for teachers to participate in ICT-related training to deepen their understanding of ICT software and best practices. This training will enable educators to incorporate technology into their teaching effectively.

A professional online network should be established for both novice and experienced teachers, fostering collaboration and sharing of resources. This network would serve to modernize student assignments, align with parental expectations, and adapt curricula to meet the needs of learners better. Additionally, all teachers and students should be made IT-friendly, encouraging a culture of digital literacy throughout the institution (Dahal, 2080 BS).

To further support ICT integration, universities must develop online software to assess student activities, prioritizing enhancing online courses. Teachers should also be familiar with the best practices for ICT usage, moving beyond general subject presentations to include more comprehensive and innovative teaching strategies.

As ICT-based curriculum learning activities are new for many, it is essential to first familiarize all educators with how to use ICT tools in the classroom effectively. Given that teachers are already skilled in delivering their specific course content, this familiarity will lead to a more engaging and efficient teaching and learning process.

Moreover, institutions need to provide additional IT-related courses to students, ensuring they have access to the knowledge and skills necessary for the digital age. Subject curricula should remain flexible to adapt to evolving conditions and the diverse needs of students, expanding the scope of ICT education to cover a broad range of technological fields equitably across Nepal.

Education should prioritize practical application over rote memorization of theories. Emphasizing project-based learning and hands-on experiences will enhance student engagement and relevance. Instead of lengthy lectures focused on theoretical knowledge, classes should teach students how to solve real-world problems, fostering critical thinking and creativity.

Practical assignments should replace theoretical ones to better prepare students for future challenges. Additionally, exams should transition from traditional paper-based formats to more sensible computer-based assessments, reflecting today's technological landscape.

Finally, it is important to explore and investigate new technologies continuously. Suggestions for improving ICT-based learning activities include allocating adequate budgets to the education sector, providing qualified teachers and skilled labor, and maintaining a conducive working environment that encourages creativity. There is also a need to oversee and manage the ICT infrastructure nationwide.

To address the gaps in ICT education, the government should provide training for all teachers who lack IT knowledge and do not currently use technology in their classrooms. Initiatives like the "one child, one laptop" program should be implemented to ensure that every student has access to necessary technological tools. In remote areas where a lack of energy hinders access to IT courses, the government should consider alternative solutions such as solar power and targeted IT training initiatives. It is similar to the studies by Dahal (2080 BS) and Izuka et al (2023).

Conclusion

Integrating information and communication technologies is essential for developing effective teaching and learning strategies in today's educational landscape. To adequately prepare teachers for the demands of the twenty-first century, teacher education programs must prioritize enhancing their competitiveness, competence, and skill sets. This research concludes that successful ICT integration in teacher education relies heavily on providing educators with the necessary training, resources, and support. By equipping teachers with the tools and knowledge to implement ICT-based instruction effectively, we can ensure that they become capable, confident, and professional educators, fully prepared to address the global challenges inherent in teaching the B.Ed. in ICT in the modern era.

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