Peer Reviewed Article

OJED
OPEN JOURNALS IN EDUCATION

Volume 6, Issue 1 (2021), pp. 36-51
International Journal of Multidisciplinary Perspectives in Higher Education
ISSN: 2474-2546 Print/ ISSN: 2474-2554 Online
https://ojed.org/jimphe

Exploring the Information and Communication Technology (ICT) integrated Pedagogy: A Contextual Study in Tribhuvan University, Nepal

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Abstract
The integrated information and communication technology (ICT) as the pedagogical content has led to great opportunities and challenges in the educational ideas and practices. This study explores the contextual use of the ICT integrated pedagogy in Tribhuvan University. The detail analysis has been made on the basis of primary and secondary data collected from the respondents, and literature respectively. The qualitative approach, phenomenological design, constructive paradigm, descriptive methodology and inductive data analysis system have been applied for this study. The ICT technique that teachers apply as a tool or as pedagogy in the classes are analyzed. On the basis of it, the shortcomings, improvements and possible recommendations for the improvement of the existing scenario have been presented.

Keywords: ICT technique , ICT tools, Pedagogy, Effective measures, Existing scenario.

Information and communication technology (ICT) refers to technology used to do tasks. ICT incorporates wireless networks and antiquated technologies such as landline telephones, radio and television broadcast, etc. (Lupak, Kopotun, Hamza, Albul, Panova, 2019). In Nepal, the School Sector Development Plan (SSDP) has envisioned the implementation and expansion of ICT assisted teaching-learning processes in all schools (UNESCO, 2020) to eradicate poverty by 2030 through 17 sustainable development goals of UNESCO. Plan is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Education is UNESCO's top priority because it is a basic human right and foundation on which peace and sustainable development can be built (UNESDOC, 2020).

There is an integrated relationship among ICT education, cohesive pedagogy and national policy to the development of education. In the present world ICT itself and ICT in education greatly revolutionized the thinking style, working skills and even attitudes of a person which makes significant impacts in daily lives and to change human existence (Acharya, U. & Upadhyaya, P. R., 2076 B. S.). So, teachers and students are benefited due to the sophisticated development of technologies like high-speed computers, mobiles and internet, and advanced software. It has become one of the vital technologies to carry out the activities including teaching and learning. The knowledge and ideas among teachers, students, classmates and other needy people are easily shared. The sharing process has enhanced the large numbers of opportunities in various fields and to cope such opportunities became one of the challenges of the 21st century (Hamza, Alhalabi, Marcovitz, 2000) (Jude, & Dhankaro, 2012). To enhance all, educators need to acquire ICT skills and competencies like ICT operation and concepts, planning and designing, learning environments and experiences, teaching-learning and the curriculum, assessment and evaluation, productivity and professional practices and social, ethical, legal and human issues surrounding the use of ICT in instruction (Kop, 2011). However, to make every educator under the access of ICT is a great challenge.

Due to the unexpected circumstances created by COVID-19, many teachers forcefully entered the ICT world. As the whole country was shut down to prevent the spread of COVID-19, teachers and students from different parts of the country, especially city areas, continued their teaching-learning activities. TU has also launched online classes in its

campuses and departments throughout the country. But, there is a deficiency of skilled human resources and infrastructure related to ICT integrated pedagogy. Similarly, frequent electricity cuts, weak networks, etc. are the common problems of the country.

Many researchers have done extensive work in the field of integration of ICT tools into pedagogy. (Díaz et al, 2020, Cabrera et al, 2019 and Amhag *et al.*, 2019, Zhang *et al.*, 2020). However, the limited data has been used in those researches. This motivated us to collect the data from the primary source i.e. teachers from different disciplines and study in detail about them again. As a result, we decided to study the opportunities and challenges of using ICT in pedagogy for the targeted community at the university level.

The Tribhuvan University (TU) is one of the largest universities in Nepal. It has 60 constituent campuses and more than 1040 affiliated colleges. Similarly, there are more than 7592 teaching staff and more than 335,126 students. Teacher-students' ratio is 1: 44.14. (U G C, 2017) and more than 7,000 non-teaching staffs are working together throughout the nation. Due to being massive, teaching-learning activities have become tough in this university.

Methodology and materials

There are multiple realities, individuals' experiences and consciousness; thus, qualitative approach, phenomenological design and descriptive methods are applied in this study. It has been done with the constructive point of view to recommend some effective measures to the development of ICT integrated pedagogy in the classrooms (Kothari, 1990) (Criswell, 2003). In the context of curriculum related to chalk and board, ICT replaces digital white boards, e-readers, etc. They have to use zoom, Google meet, team, etc. software apps on various electronic devices like laptops, tablets, smart phones, etc. In this respect they need computer-guided instructions and interactive learning activities in the class (Learning Portal, 2020). This will enhance the research activities and innovative skills. These effects ultimately will come to the society so that lifestyles of people will be changed.

In this respect, ICT education and pedagogy are deeply related with each other. It needs an active classroom, effective teaching with the use of modern technology etc. (Shaikh, & Algannawar, 2019; Hamzeh, 2014). To interlink all technological activities, we must rethink the activities of supervisors, teachers, researchers and students starting from

the classroom to individual tackling of modern technology in different levels (Kop, 2011).

Connective theory focuses on the networking process. Connected learning is a new term emerged due to the rapidly evolving digital technology to education. It is an approach to education that is socially embedded, interest-driven, and oriented towards educational, economic, or political opportunity through Massive Open Online Course (MOOC) (Kop, 2011). This study has been based on connectivism theory.

Information and data were collected from primary as well as secondary sources. Primary data were gathered filling open ended questionnaires sent via email. The key respondents for the primary sources were chosen through purposive sampling. Two-two teachers from twelve institutes of sciences, humanities and social sciences, education and management under TU were selected for the purpose of this study. The researchers' personal experiences are also included in the data. The secondary data were assembled from different literatures.

Questionnaires were prepared and sent to the respondents via email. The questions used for the collection of the data are given below:

1. What do teachers mean by integration of ICT in education?
2. What are the ICT tools that teachers apply in their pedagogy in the classes?
3. How are the teachers applying ICT tools in their classes?
4. What are the effective measures of applying the ICT tools in the classes?
5. What are the suggestions to improve pedagogy using ICT?

Similarly, some of the researchers and experts were interviewed individually to get their views and reflections. After collection, the raw data were analyzed and interpreted using an inductive approach by closely reading the text, creating the categories, removing the overlapping and summarizing into different segments, continuing revision and refining the category system (Thomas, 2003). The analysis was based on fusion of theoretical as well as practical based techniques. Finally, on the basis of this analysis and interpretations, findings, discussion and conclusion are made.

Results

Regarding the question related to understanding the integration of ICT in education, teachers from the different disciplines have different perspectives. Most of the teachers from Science background told that ICT

is an integrated approach of delivering lectures through computer-based equipment using several software tools in order to make better understanding of the subject matter. It helps to produce, store, manipulate, communicate or disseminate information that learners need or require. Experimentation and software are interlinked with each other by means of animations as well as advanced developed and underdeveloped tools for them. Likewise, humanities and social science background teachers have understood the ICT as a part of teaching-learning practice to make more effective use of technology seamlessly for educational processes like transacting curricular content and students working on technology to do authentic tasks. ICT has a huge range of functions in education such as communication, learning tools, administration, information sources and distance learning. ICT has, therefore, a positive impact on education, for instance, the National Curriculum has made plans to teach computers in secondary and higher education to make them able to adopt in utilizing applications' software. In the same way, for the teachers in education, integration of ICT means change in traditional methods of teaching and learning to produce market-oriented manpower as per the globalization of education in this scientific era. The technologies which are used for collecting, storing, processing, researching, transferring and unloading of information directed to teaching-learning activities, all lie within ICT. It can also be used for educational planning, curriculum construction, construction of learning materials etc. Furthermore, it is directly related with convergence of electronics, computing, and telecommunications and it provides access to information through telecommunications. This includes the internet, wireless networks, cell phones, and other communication mediums. It can be done through the network of computers, creating original web pages, producing videos digitally, designing computer systems, selling products on the Internet, 3-D artwork, administering an institution’s database, coding software, providing technical support, managing projects and budgets, writing technical documentation, etc. In education, it is used to support, enhance, and optimize the delivery of information in the classroom. Moreover, management background teachers observe integrating ICT as the coordination of all IT tools. They also told that modern techniques useful for any circumstances are directly linked with the researcher and planners to strengthen the nation and strengthen the economy through national media. This is true with ICT education as well. It receives and shares or imports and exports information or data by using computer and other

supported software and hardware equipment in an easy, faster and cost worthy way. ICT tools are integrated in the school management system to make easy, cheap and fast teaching-learning processes visible or observable. It helps to access information through communication technologies.

Regarding the ICT tools used in the classroom, most of the science background teachers said that they are applying PowerPoint presentations with drawings and other relevant chemical bonding in addition to statistical tools. They are also applying telecommunication equipment through video conferencing, teleconference, telephone and modems. According to them, integration of ICT depends on the content and aim of the course. They use ICT as a part of classroom pedagogy including multimedia, sending reading materials or assignments through group emails and google docs, Facebook for group communication and information sharing, using online resources, telephone/mobile and SMS reminder, videos/lectures or other materials on YouTube, uploading own videos and live presentation as well, using free blogs to share materials and personal writings by both teachers and students. Desktop computer, laptop, projector, digital camera, printer, iPods, tablets and audio books are generally used devices in the classroom. Similarly, science teachers focused their area towards reactions, mathematical expressions and practices like electronics and magnetism related problems. Likewise, the faculty of education focuses on explanation of curriculum, lesson plan and teaching methodology implementation. They also used similar ICT devices to access and share the information. Among them video conferencing is the most useful tool for indirect teaching and multimedia is a useful tool for direct teaching. In the same way, teachers from management focus pedagogical tools to link research, publications and actions, like homework, practices etc. related to economic sectors. Teachers use Lithograph Machine, Overhead Projector (OHP), Computer-floppy disc drives, etc. to display files. Similarly, they use Internet-digital technology to acquire information and perform more actions at once. In network environment (online) classes, distance education systems' experts or teachers deliver Massive Open Online Courses (MOOC) using modern ICT-interactive board, notebook pad, tablet, personal computer, software and electronic learning materials, e-Learning portals, websites, electronic learning materials, e-Books etc. The educational software has brought drastic change in the teaching-learning. Facebook, Viber, Instagram,

Google drive and other apps etc. are also being used as tools in the classrooms.

The application procedure of ICT tools also differs depending on faculties. The teachers from science background said that they apply ICT tools in their classroom to transfer knowledge and skill by using computer-based technology, digital imaging, internet, file servers, data storage devices, networking infrastructure, desktop, laptop and broadcasting technologies such as radio and television and telephone as an instructional tool. For practical purposes, they use different software and codes for numerical purposes. Likewise, teachers from education, humanities and social sciences replied that most often, they used ICT as an interactive tool. They encourage students to open a free email account and use it to post assignments through google docs or blogs. They infuse technology and digital devices into many interest areas in the classroom and offer them as choices with clear objectives. The management teachers' and experts' replies were more or less similar. However, dealing styles, focusing areas and applying methods are different in their faculty. In general, teachers use conventional methods as integrating ICT tools, interactive, collaborative and networking strategies, applying online forums, blogs, Facebook and Wiki, virtual labs, Moodle learning platform, Padlet, Google classroom etc. to create an effective learning environment. Furthermore, they are shifting from conventional methods like drill and practice to computer-based learning i.e. internet-based learning or e-learning using software and PowerPoint presentation with enough discussion. These free and open contents have changed the learning methods as well as mindset of the learners.

In the question of effective measures (changes) of applying ICT tools in the class, the teachers from the faculty of science are found different from other faculties. The science teachers said that the use of ICT tools in the classroom do not give satisfactory results compared to chalk/board teaching. Similarly, in the case of practical classes, ICT is useful only for simple techniques like visualizing magnetic lines of forces, Brownian motions of electrons etc., and has failed to build hand to hand problems, circuit diagrams etc. It provides a good understanding of theory but fails to provide mathematical derivations. Under such circumstances, an optimal use of ICT as well as thorough discussion on the matter using moderate time is a must. Otherwise, ICT used at the present scenario by teachers, just to finish appreciable volume of course content within limited time would be just limiting the students at a junk situation. Teachers from

humanities and social science, education and management said that multi-channel learning is a useful concept. The understanding ability drastically changed, students and teachers were equally satisfied and the presence of students in classes were also found to be increased after the use of ICT. Students were always interested and they performed cooperative behavior. Teachers assess students to check their understanding and provide feedback to them. Feedback from the computer during the use of test material improves student performance in later use of the same test material. Paper presentation, classroom presentation, preparing materials, drawing charts, pictures, graphs, diagrams, tables, mapping lines, distance, areas, locations, skills of students to use ICT tools, online class etc. are used in formative measures and online written test, online oral test, computer-based exam, final presentation by ICT tools, assignment work by ICT tools etc. are used in summative measures. Regarding the use of ICT tools, learners and teachers both are satisfactory. These tools support development of professional capacity, making teaching-learning environments enjoyable. It is easier to check whether students collaborate with peers and experts across the country and around the world or not. We can also check whether students search their answers through the internet or not, whether they have understood or not, how they manipulate the information and modify according to their needs and how they link their ideas with theory and experiments, etc.

In the question of suggestions to improve pedagogy using ICT, most of the teachers from science background replied that they are using old pedagogical tools in research, training and teaching activities. Nations, universities and respective departments should be aware of new technology. Therefore, a new highly equipped lab with a full modern facility is required for the practical purpose. They suggested that students, teachers and researchers should be trained to use technology in the classes. Similarly, humanities and social sciences teachers said that most of the classrooms, where they teach, are not ICT friendly. There should be availability of multimedia devices with internet facility for the teachers/students in the classrooms. Similarly, Teachers and students who do not have basic knowledge in handling ICT devices and programmes should be provided training. Training is equally required for updating teachers on new ways of integrating ICT in the pedagogy as well. So, Experts in the related field may be hired to coach about these things. In the same way, there should be the support system for teachers/students (like computer labs in the college/departments where students can access online

contents or prepare their PowerPoint presentations or reply to their emails). Likewise, informants from education wrote that integration of ICT is necessary to make education market oriented and time relevant, effective, qualitative and lifelong to make it modest and accessible to meet the millennium challenge. In this regard, ICT makes class more interactive, which is essential in the 21st century. It also promotes the student centred teaching-learning activities creating interest and developing capability for self-search and group work. As ICT is the new emerging technique in the classroom teaching for developing and less developed countries like Nepal, the classrooms should be made ICT friendly. Teachers from management viewed that it is necessary to follow all ICT measures to make teaching-learning effective. However, misuse of the internet by the students, motivating the college to invest in ICT, and protecting the ICT resources of the institutions, etc. are the challenges. Digitalization in universities and colleges with high-speed internet facilities and modern quality technology, awareness of using ICT by stakeholders and maximum utilization of ICT may be further consideration towards improving our teaching-learning pedagogy in higher education institutions in Nepal. As pedagogy differs from discipline to discipline, possible requirements should be given priority as per the subject and department. For instance, statistical tools for quantitative estimation may be more important for one subject/department but not for others. However, we need to find an amicable (agreeable/friendly) and optimal (best/ideal) situation prior to its effective implementation. It needs a limited number of student-teacher ratios and ICT literate quality students and teachers. Attitudes of both teachers and students should be positive towards it to achieve its goal.

Experts and researchers also said that the use of ICT improves the pedagogical style of the institution. The standard of students, thinking style and use of ICT as well as pedagogical techniques also change accordingly. We have to update and improve our ICT classrooms so that it can interlink theory and practice/experiment, teachers' thinking and students' thinking patterns. As a result, both will enjoy teaching-learning activities by the use of it.

Discussion

Based on primary and secondary data, it can be said that the people from all disciplines and faculties believed that ICT is modern technological tools used by students, teachers, researchers and experts.

The means of ICT depends upon the materials used by teachers, trainers and experts in their respective fields. The most used tools in today's classrooms are desktop computer, laptop and mobile phone. Similarly, the use of advanced and equipped laboratory etc. enhance and improve quality of teaching, training and make the environment learning friendly. The students of all levels have positive thoughts on the use of modern technologies.

Most of the teachers try to use available resources, like PowerPoint presentations, explanations through smart boards, telecommunications etc. personally. However, due to the lower level capacity of students in ICT and lack of ICT equipped classrooms, the teachers and students are not benefited completely. Even teachers and experts need more training on it so that they can motivate the students, researchers and even parents towards the use of it. For this, they have to be motivated towards the use of modern technology. Moreover, the role of ICT is important in each and every step of life. They are also equally important to agriculture, planning, teaching, research activities etc. In this condition, people either from rural or town areas are frequently using laptop, mobile, tablet, computer, etc. but they don't have adequate knowledge about the advantages and disadvantages of it.

Teachers are mostly using computer PowerPoint, smart boards, flies, etc. They are interlinked with old techniques, which are teachers-centered. This has to be shifted to students-oriented, but most of the teachers fail to do so because of the multiple difficulties which are directly linked with the level of students, thinking of society etc. However, interested students and researchers have started to make groups to discuss, and learn from each other using mobile apps, laptop, team, zoom etc.

From the use of ICT techniques, the thinking level of students and researchers were found broadened. They are more excited to learn new things. This has facilitated them to be more creative. Institutions are also being well equipped forcefully. As a cause, this will contribute to the development of the society and nation. However, there is a necessity of making them aware of advantages and disadvantages of using it. As being the oldest university of the nation, Tribhuvan University can help in the policy making, implementation of pedagogy replacing traditional chalk and talk method in the classrooms.

Conclusions and recommendations

ICT means receiving and sharing information, interactive processes by using computer and other supported hardware and software equipment in an easy, fast and cost worthy way. Integrating ICT in education denotes the use of ICT tools in the school management system as well as inside and outside the classrooms. There should be better teachers' understanding of the integrated approach of delivering lectures through computer-based hardware and software tools to impart information and knowledge to the learners. Integrating ICT also facilitates administrators to produce, manipulate and communicate the information. It helps in collecting, storing, processing, researching, transferring and uploading the information connected to the teaching and learning process as well as planning to enhance the quality education. It equally helps in creating an enjoyable teaching-learning environment as well.

Entering the classroom, taking laptop or desktop, connecting to the internet, multimedia projector, presenting the slides and sharing their instructional materials are common practices of the teachers. They use websites, e-library, YouTube, social media to collect and deliver the information. It has been easy to collaborate in learning with their peers and assess their students transparently. This multi-channel learning concept has made students interactive. Virtual teaching-learning along with the mechanism of providing assignments and assessment system has become more formative. Critical thinking and creativity within the students also have been enhanced.

Literature and answers of the teachers reveal that teachers are aware of ICT tools and are applying them in their pedagogy in their best manner. While applying ICT in their teaching-learning process, they have also suggested some constraints, however, they are discipline and faculty oriented. The most common constraints depend upon teacher-student ratio, quality of students, amicable and optimal situation prior to its effective implementation, attitude of the teacher and students to achieve the goal. But most of the classrooms are not resourceful in terms of ICT. Many teachers and most of the students do not have even basic skills of handling ICT devices. There is a need to alert them about misuse and violation of cyber law as well. Moreover, digitalization of every material of university and colleges with high-speed internet facilities and modern quality technology is the most important step for integrating ICT in the education process.

In short, by the use of ICT, the thinking styles and living standards of people are changing rapidly. Institutions are becoming ICT friendly. Students are becoming able to access learning resources in a better way. This ultimately strengthens the institutions. But that is not complete. For further, there should be plan of making it better So, following recommendations are made regarding human resources and making ICT friendly environment,

1. Users should be familiarized with ICT tools like mobile downloading apps, computers and hardware and software skills etc. They should have fundamental knowledge of operating systems.
2. Institutions or experts should integrate the learning and methodological guidelines; Learning principles, teaching methods, teaching activities, collaborative work, ICT resources, etc.
3. Teachers or experts must have the knowledge and skills of the latest digital tools and resources to guide the students/respondents to achieve required standards.
4. Institutions should promote functional learning through ICT, including linguistic components, skills and communicative and learning strategies in an integrated way.
5. They should form Organization's Intersectoral Platform for ICT in education focusing on the issues through the joint work of three sectors: Communication & Information, Education and Science
6. Teachers are applying zoom, team, google meet and other software apps for interactive purposes. They are facing problems in preparing teaching-learning materials, sharing them with the students, giving and checking assignments. There is also a problem in assessing students' work. Thus, intensive and refresher trainings are required.

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Acknowledgement
We are grateful to Dr. Krishn Bista, associate professor of Morgan University for motivation to write this paper. Our sincere thanks goes to Pashupati Paudel, language editor in Nepal, editors and reviewers of this journal for their valuable feedbacks to complete this paper.