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ICT Education at the Higher Level: Prospects and Opportunities in Geography Education

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Abstract

Information and Communication Technology (ICT) has great potential for changing teaching and learning practices, and specifically in geography, which is a subject with a strong reliance upon spatial information, maps, and human and environment analysis. The research methodology was a descriptive and qualitative approach, which made use of minutes of meetings, reports, and secondary sources to analyze the applications of ICT, specifically GIS, remote sensing, virtual simulation, and cartography, in facilitating and enhancing learning, virtual field work, and the establishment of spatial skills and competency. The application of ICT tools has been formulated on the basis of the ICT for Education Master Plan and the Digital Nepal Framework, though it has been hampered by the lack of infrastructure, lack of digital literacy, lack of staff with the right skill sets among the teaching staff, and lack of resources, particularly in the remote areas. The COVID-19 pandemic has greatly accelerated the adoption of distance learning; although it has also brought into focus the disparities and readiness of the institutions. The younger generation, however, has realized the significance of ICT applications in the future work context and is trying very hard to acquire them.

Introduction

The integration of Information and Communication Technology (ICT) in higher education has enormous potential in revolutionizing pedagogy and learning, in geography in particular, and in general (UNESCO, 2018; Mishra and Koehler, 2006). The subject of geography involves extensive use of spatial data, maps, and analysis of human and environment relationships, which are greatly assisted by ICT tools like Geographic Information Systems (GIS), remote sensing, and digital cartography techniques, respectively (Goodchild, 2004; Bednarz and Kemp, 2011). ICT enables students to explore, analyze, and interact with real-world phenomena in an interesting and effective manner (Baker et. al., 2015). Virtual field tours, remote sensing resources, and worldwide spatial databases mitigate limitations of time, space, and availability in geography education in general (Fuller et. al., 2006; De Miguel González et. al., 2019). ICT also enables simulation learning activities concerning climate change, planning, and disaster risk reduction, and at the same time, enables and promotes teamwork and converges on knowledge resources from various domains (IPCC, 2014; OECD, 2015). ICT, in turn, enables and promotes 21st-century competencies like spatial literacy, digital cartography, and analysis, which are essential for geography students obtaining employment in areas of urban planning, management, and sustainable planning, respectively (Partnership for 21st Century Skills, 2019). In Nepal, the integration of ICTs in higher education is an opportunity that also faces challenges. The Nepalese Government policies on ICT integration in education include the ICT in Education Master Plan, which is a strategic plan to achieve digital development; however, it is hampered by a lack of funding, a lack of coordination, and a lack of monitoring (Government of Nepal, 2013; Government of Nepal, 2019).

Infrastructure remains a problem, particularly in rural areas of the country, where insecure internet connections, unreliable electricity supply, and limited access to digital technologies widen the digital divide and hamper the delivery of equal opportunities for learning (UNESCO, 2009). Formal ICT education and digital literacy are two areas where students and teachers fall behind by huge figures (Paudel, 2022). Tradition-oriented practices running deep remain dominant and restrict the application of colorful, student-focusing approaches in spite of availability of primitive ICT infrastructure (Shakya et al., 2018; Kunwar, 2020). Change resistance as well as socio-cultural factors also restrains the pace of digitalization. The COVID-19 pandemic unveiled these systemic vulnerabilities but hastened digital uptake as well by bringing into sharp focus the potential of e-learning, distance learning, and ICT-based change. Organizations like Nepal Open University and projects like OLE Nepal and Nepal Wireless Networking Project have illustrated ICT's capability to open up rural learners. Nonetheless, socio-economic, geographical, and linguistic inequalities still hamper equal opportunities (Thapaliya et al., 2025). ICT's potential can become a tangible reality in Nepal only if it continues to invest in infrastructure development, curriculum redesign, teacher training, successful implementation of policies, and with the aid of public–private partnerships (College NP, 2025; KIST, 2025). In general, ICT is a powerful force that can improve the quality of higher education in Nepal. In geographical teaching and learning, it improves spatial awareness, data analysis, and fieldwork. In the entire educational structure, ICT facilitates new pedagogies founded on inclusivity, interactivity, and innovativeness. ICT, with

the right investment and deployment, can have a revolutionary effect in making higher education as accessible as high quality and preparing students to face global and domestic challenges.

Literature Review

In National Education Policy (NEHEP), the Digital Nepal Framework, and the ICT in Education Master Plan, the implementation of information and communication technology (ICT) in Nepalese higher education has never been low on the agenda. In Geography Education, it is especially so because the subject relies on spatial analysis, cartography, geographic information systems (GIS), and remote sensing software that are hugely ICT-reliant. Nonetheless, in spite of years of reform attempts, implementation has been slow and spasmodic, owing largely to poor coordination, poor finance, poor monitoring, and infrastructure collapse (Tripathi, 2024). All these deficiencies directly affect Geography departments in rural colleges and universities where digital mapping labs, GIS software, and reliable internet are unavailable (Kunwar, 2020). Systemic issues—such as poor power supply, little technical support, and poor infrastructure—have constrained ICT applications in Geography classrooms. As such, students resort to traditional maps and lectures rather than interactive GIS or virtual simulation environments. This constrains field-based virtual learning and reduces student-centered interaction (Paudel, 2022; Dulal, 2019; Timilsena et al., 2025).

The lack of adequate digital literacy on the part of both students and instructors has been a significant limitation to effective use of ICTs for geography-specific applications, such as spatial data analysis, geographic visualization, and interpretation (Thapaliya et al., 2025; Kandel & Kaphle, 2021). Given that Geography as a discipline entails the use of high-resolution satellite images, GIS software, online map-making tools, and real-time spatial datasets, technical knowledge levels need to be higher compared to other subjects too. Nepal's digital divide, whereby only 53% of the population has access to the internet, widens inequities for Geography learning, given that access barriers, as a function of geographical, socioeconomic, and age-related factors, directly impede access to core geospatial resources (Shakya et al., 2018). Additionally, these inequalities are more significant within the field of Geography because of the intensive and pictorial nature of the technologies required by the subject such as Google Earth and GIS maps. Nevertheless, the creation of the Nepal Open University has enabled the increased utilization of ICTs within geography education such as virtual field trips and geospatial education of students away from urban areas (Jha, 2020). Other forms of initiatives like OLE Nepal and the Nepal Wireless Networking Project are significant because they alleviate the distance limitations of ICT within the geography education of students through the utilization of ICTs such as digital maps. Various studies on digital pedagogies have pointed the importance of having the right governance dynamics, support at the institutional level, positive attitudes on the part of the teachers, or training as key deciding elements defining the adoption levels of ICT in the classroom setting (Adhikari, 2021). In terms of Geography, the implementation dynamics of GIS, spatial simulations, or the usage of map applications are directly affected by the training acquired by the lecturers. Once the lecturers attain the right training, the support role of ICT in enabling autonomy among the learners includes allowing them to analyze spatial patterns on their own or interpret data on the environment-people nexus (Jha, 2020). The COVID-19 pandemic has further

fueled the use of online platforms for spatial analysis, mapping, and geography-oriented projects, while at the same time revealing their readiness gaps online (Pokhrel and Pokhrel, 2023; Thapaliya et al., 2025). Discipline-specific vocabulary gaps remain a challenge, where the requirement to be bilingual for comprehending GIS, Cartography, or Environmental Analysis technical terms, to some extent, needs to have both English and Nepali education materials (Paudel, 2022; Khadka, 2021). The potential of ICT in Geography education will be realized if there are changes in the education systems, such as changes in curriculums, research, and the involvement of the government and the private sector in the development of GIS (CollegeNP, 2024; Timilsena et al., 2025). ICT-related factors such as cybersecurity, local content development, and quality are among the elements that should not be ignored (Barik & Karforma, 2012).

On the whole, in spite of structural and contextual constraints, it has been found in the literature that the integration of ICT in Geography learning improves spatial learning, motivational levels, and equal access to higher education. Community-based innovation and commitment in geography learning with the aid of ICT in Nepal can be significantly reinforced with subject-based planning.

Methodology

In this study, a qualitative research paradigm and a descriptive research design were employed to explore the potentials and challenges associated with the implementation of ICT in higher-level learning. A qualitative research design and approach were chosen because of the highly context-sensitive nature of ICT integration in the field of learning and education, involving factors like the competence of teachers and learners that cannot be measured by mere statistical indicators. Also, with a descriptive research design and approach, this research work investigated the realities of the use of ICT in learning environments. Two colleges were purposely sampled, one from Bhaktapur and the other from Kathmandu. This was aimed at ensuring diversity in the study of the different availability and capabilities of the two.

This study used 17 participants, including two campus chiefs, two ICT subject mentors, twelve students, and one key informant. These participants were sampled purposely because of their direct engagement with the teaching, learning, and management of ICTs. This approach aimed to ensure the study consisted of the perspectives of participants who were especially relevant to the study. Data was gathered over a period of seven months, utilizing primary and secondary sources. The primary source involved interaction and interviews aimed at understanding participants' experiences as well as their challenges regarding the use of Information and Communication Technology. Secondary sources involve documents such as policy files, as well as literature to put findings into context. The evidence available revealed that most colleges, particularly those located away from the major urban areas and thus lacking access to the best infrastructure resources, often experience structural challenges and difficulties, some of which include inconsistent electricity supplies, poor and unreliable internet speeds, and a lack of access to elementary computer infrastructure resources like computers and multimedia projectors and e-library facilities. Consequently, the embedding of ICT into the normal learning context is not a prevailing trend but rather the ad-hoc usage of the facility as an “add-on.” The methodology adopted should have been qualitative because

it would have been very difficult to obtain this information via a large scale quantitative study.

Results and Discussion

Campus Chief Perspectives of ICT for Higher Education

Public and community college campus chiefs were optimistic but cautious in their perceptions of the application of ICT in higher education. They both agreed in its potential to improve teaching, increase student engagement, increase access, and automate institutional processes. ICT was regarded as an innovative platform, particularly in geography instruction, where the application of digital mapping, GIS computer applications, and virtual simulation could improve spatial learning. They also stressed, however, that ICT needs to be built into pedagogy in a strategic rather than an optional technical add-on (Kozma, 2005; Selwyn, 2012). On this point Campus Chief said *"Integrating ICT in Geography education is hampered by weak infrastructure, unreliable internet, tight budgets, and untrained staff. Even though there are some resources available, weak policies and support render ICT and add-on as opposed to a sustainable way of teaching."*

In conclusion Campus administrators regarded ICT as a revolution in higher education, especially in Geography through the application of GIS and simulations, but noted that poor infrastructure, weak policy, and untrained personnel make it not sustainable as an add-on but not core pedagogy.

Campus Institutional Challenges in Integrating ICT

Campus administrators cited one of the major challenges as a lack of adequate infrastructure. With the exception of some urban campuses, most colleges, particularly rural colleges, continue to face frequent power outages, poor connectivity of the internet, and absence of basic digital equipment such as computers, projectors, and e-libraries. ICT is not embedded in education and learning but employed as an "add-on" module in such a context. This is in agreement with Adhikari (2021) that infrastructural shortages are still the biggest hindrance to the incorporation of digital learning programs in Nepal's rural schools. The second challenge involves faculty readiness and training. It is that some of the teachers, and indeed more of the older ones, did not possess the requisite knowledge to use digital tools like Moodle and Google Classroom productively. Where training did take place, it was fragmented, too academic, and hardly related to practice in the classroom. Besides, inadequate campus-level follow-up ensured inconsistent use of ICT in the classroom.

These findings support Kozma's (2005) argument that technology infusion into instruction is best achieved by the longest, practice-intensive professional development. Budgetary constraints were also mentioned as a constant problem. Most campuses had limited funds and lacked the mandate to commit finances, hence it became hard to roll out ICT infrastructure or hire qualified technical personnel. Chiefs further indicated that the government support was intermittent and at times inadequate, particularly for institutions in rural and semi-urban areas. Therefore, most institutions wholly depended on community donations or local fundraising to cater for even minimal ICT costs. These are requirements that are called for Farrell and Isaacs' (2007) discovery that in addition to sufficient funding, effective ICT development for education requires de-centralized control over funds in terms of decision-making. On this way, one of the campus chief reported, "*Students are eager and interested*

in using ICT in Geography, facilitating student participation and engagement. Disadvantaged and rural students, however, face inequalities of access, and it is with equal support that everyone can benefit from ICT-enabled learning." Overall, Campus leaders itemized that inadequate infrastructure, scarce funds, and the absence of faculty training prevent the implementation of ICT, which, as a result, becomes an add-on. Despite this, students are eager and active, yet rural and disadvantaged students also need equal facilitation for meaningful participation.

Student Readiness and Engagement

Irrespective of concerns over infrastructure, faculty readiness, and budget limitations, campus leaders indicated a highly strong level of digital preparedness and student interest. Undergraduate students, in particular, had greater exposure to smartphones, social networking websites, and other computer-mediated technologies and thus greater receptiveness to web-based and blended learning compared to their graduate-level counterparts. This high digital literacy among young people was seen as a solid foundation for the eventual mainstreaming of ICT in higher education. This is in line with Pew Research Center (2018), which noted that young adults in most developing countries are bound to adopt new technologies before the very institutions that are intended to assist them. In the process, the campus chief indicated that "*the COVID-19 pandemic forced ICT integration in Geography education, accelerating digital learning while revealing inequalities of access. It highlighted ICT's continuity potential and the necessity for its strategic, irreversible embedding in education.*" Overall, Students, especially undergrads, are digitally well-prepared, providing a sound platform for ICT in higher education. In short COVID-19 pandemic accelerated ICT uptake in higher education, exposing digital readiness gaps and access inequalities.

Recommendations for the Future

The various challenges and opportunities identified for ICT application in higher education hence evinced a number of strategic recommendations from university administrators and institutional heads. These included calls for more ICT infrastructure in both rural and less advantaged areas, peripheries, and the creation of shared regional ICT centers to provide technical support and services around digitalization to different institutions. This could help solve the existing resource gaps and enhance the efficiency of the system as a whole. The administrators further suggested the development of contextual open educational resources and professional development programs with a focus on practice to improve the capacity of the teacher educators regarding the integrative use of ICT in teaching. Most importantly, there was a call for greater autonomy of institutions to enable informed decisions regarding planning and implementing ICT. This recommendation is, however, in line with the call by UNESCO 2020 for inclusive, scalable, and responsive ICT solutions as a way out toward addressing the needs of the most marginalized institutions and communities. While acknowledging the transformational role of ICT in Nepalese higher education—and particularly in Geography education—administrators emphasized that integration could be effective only if inherent systemic weaknesses were minimized on variables of infrastructure, finance, and digital capacity. Critical barriers identified include unstable electricity supply, poor internet connectivity, inadequate digital equipment, low levels of digital literacy, and restricted institutional autonomy, particularly at the campus level. Future initiatives in ICT should, therefore, be based on equity-oriented and institution-

specific strategies in a manner that will make the use of ICT an integrated pedagogical tool and not an "add-on." University authorities should, through conscious investment in infrastructure, faculty training, curriculum revision, contextually responsive digital resources, and universal access for all students, emphasize embedding ICT as a core feature of tertiary education-especially in Geography.

Perceptions of ICT Class Teachers in Higher Education

Nepali urban ICT teachers provided thought-provoking perceptions of using ICT in tertiary education. They knew that ICT is not another classroom pedagogical technology but a change agent in a location to improve learner interaction, interactive learning, and education coverage within Nepal's geographical diversity. Along with this, they also identified contextual barriers, such as inadequate infrastructure, no training, and asymmetric institution readiness that prevent the productive utilization of ICT. These are supported by more detailed analyses of the significance of not only possessing ICT but also utilizing it strategically to engender changes in the learning process (Kozma, 2005; Selwyn, 2012).

The Transformative Potential of ICT in Higher Education

Although most instructors envision the potential and revolutionary effect of ICT in the business of university education, they also witnessed infrastructural-related breakdowns of monumental proportions. In the universities in rural areas, these are even more so, with a situation where there are campuses without even projectors, non-functional computer labs, and even a stable supply of electricity. The effect is that ICT courses are usually completed through the old-fashioned chalkboard, undermining the purpose of digital learning. Problems were also reported by urban college instructors, such as old computer hardware, regular power disruptions, and slow internet. This is consistent with Adhikari (2021), who further stated that inadequate infrastructure is one of the biggest hurdles to good quality digital learning in rural Nepal. Despite these constraints, ICT can still provide enhanced teaching, learning, and outreach in tertiary education, such as geography, for example, since GIS, web-based mapping, and virtual simulation can transform spatial analysis and learning. Within this context, the teacher explained, "*As a Geography teacher, I find ICT revolutionary, enabling interactive maps, simulation, and student-directed inquiry. It combines learning, creativity, and problem-solving, enabling students to succeed academically and in their career in an information age."*

Generally, ICT is revolutionary for tertiary education, especially in Geography, in facilitating interactive, student-directed learning. Its successful implementation is, however, hampered by inadequate infrastructure—like erratic electricity, outdated equipment, and inadequate internet—especially in rural institutions of higher learning.

Issues with the Infrastructure

Academics, in acknowledgment of the significance of ICT in tertiary education, identified main issues with infrastructure that face the effective use of ICT. Urban school teachers bemoaned old computer hardware, constant power outages, and unstable internet connectivity. It was worse for their counterparts in rural schools, who lacked computer laboratories, projectors, and a constant power supply. Consequently, ICT lessons in such schools are typically conducted on chalkboards, undermining the

entire point of e-learning. This is in agreement with Adhikari (2021), who quoted the lack of infrastructure as one of the major obstacles to the integration of digital learning in rural Nepal. In this way, the teacher provided evidence,

One of the greatest frustrations I face is the challenges of the deplorable state of infrastructure. Most classrooms lack stable internet, functional projectors, or updated computers. Where there is hardware, maintenance is not a priority, so we are left with equipment that cannot be used to its full potential. The lack of ICT resources sometimes forces me to resort to traditional methods, which frustrates the full actualization of ICT in Geography instruction.

Overall, ICT is worth utilizing in tertiary education, especially for Geography, but poor infrastructure—such as outdated equipment, erratic electricity, and lack of maintenance—requires the use of traditional methods, limiting its effective use and e-learning possibilities.

Faculty Preparedness and Dispositions for ICT

Staff indicated that there was a generation gap in ICT use, with younger lecturers most likely to utilize ICT such as Moodle, Zoom, and Google Classroom. On the other hand, older researchers are opposed to using ICT since they have poor digital literacy, a lack of institutional support, and a lack of motivation. Resistance is also increased by a lack of culture of innovation, particularly in rural campuses, which further discourages the use of technology. This was echoed by Kozma (2005), who stressed that teacher preparedness is an important prerequisite in ascertaining the success of ICT initiatives in universities. Likewise, the teacher stated,

Faculty readiness for ICT integration is uneven, with some resisting due to lack of familiarity or extra effort. Ongoing training and institutional support are needed to build confidence and competence, rendering ICT a usual, effective component of teaching rather than voluntary."

Overall a young scholar readily adopts ICT, yet older faculty opposes due to a lack of digital literacy, motivation, and support. Building confidence through training and institutional support is required for ICT to be a regular, effective aspect of teaching.

The Student Digital Divide

Although educators have noted common interest in digital technologies and extensive use of cellphones among students, they have observed a continual digital divide. Poor students, and even worse, students in rural universities do not have proper equipment like computers, good internet, and a quiet place to study. The inequality showed its ugliest form during the COVID-19 pandemic and hit female students and students from marginal groups the hardest. These results support Dhital (2021), which identified the disproportionate impact of online learning on poor and rural students. In this regard, the teacher opinion, "*There is a definite digital divide among students, with disadvantaged and rural students lacking access and ICT skills, which restricts participation and learning outcomes.* It is necessary to fill this gap in order to attain equitable benefits from the use of ICT-based education." Briefly, there is a massive digital divide where rural, economically disadvantaged, and marginalized learners have no access to computers, the internet, and study space. This limits learning and access, requiring equalization interventions in ICT-based learning.

Institutional and Policy Gaps

The national education policies of Nepal promote the use of ICT in higher education, but in practice, its adoption at the institutional level is patchy and sporadic. From the teachers' point of view, ICT activities rely almost on individual faculty members' personal initiative or donor-sponsored short-term projects. The rural teachers mentioned a lack of ICT policies at their institutions, whereas urban teachers pointed to the necessity for greater inter-departmental coordination and resource sharing. The issues are similar to those raised by Farrell and Isaacs (2007), which stated that without institutional continuity and alignment ICT interventions never result in sustained change in educational practice. .In this regard, the teacher said, "*In my experience, institutional and policy support for ICT integration is inconsistent. Although policies stress the importance of ICT, in practice there is minimal monitoring or resource allocation.". Institutions lack specific guidelines on the incorporation of ICT into the curriculum. Without a stable policy framework, ICT remains underutilized, and lecturers such as myself must manage with little support*" In conclusion, although national policies support ICT in higher education, institutional practice remains uneven. Lack of proper clear guidelines, coordination, and resources see teachers handling ICT on their own, precluding its coherent integration and long-term impact on teaching practice.

Recommendations for Improvement

Both ICT faculty members offered some practical suggestions to surmount the existing problems in higher education, drawing upon their experience. They stressed subject-specific, structured ICT capacity-building programs grounded in the needs of the faculty and enhanced ICT infrastructure with priority to rural campuses. They also recommended sending technical experts to facilitate online learning and debug digital issues, and the development of digital content at the national level in Nepali to enhance inclusivity. They also suggested initiating government-funded models of blended learning that utilize online and offline learning, and incentives to permit creativity and appropriate implementation of ICT in education. These are in agreement with UNESCO (2020) in the view that teacher-centered, context-sensitive, and inclusive multilateral digital learning policies need to be implemented. In these matters, the educator expressed, "*Institutions have to invest in infrastructure, reliable internet, modernized labs, and technical support, and provide continuous training for teachers and students. Curriculum change and incentives for successful ICT implementation can promote integration of digital activities in Geography education."* Lastly, ICT staff recommends upgrading infrastructure, providing ongoing training, developing local digital content, adopting blended learning, and providing incentives to enable inclusive, teacher-led, and effective integration of ICT in Geography and higher education.

Future Prospects and Opportunities

Educationalists, administrators, and students in Nepal view ICT in higher education with cautious optimism. They believe ICT can reduce learning disparities and improve outcomes but with the assistance of governmental policies, instructor training, and institutional planning. There remain issues, however, including the absence of infrastructure in rural areas, low budgets, low digital literacy among the staff, and unequal access by vulnerable groups of students. The COVID-19 pandemic hastened ICT adoption but also highlighted systemic vulnerabilities. Whereas students are motivated and younger staffs learn ICT effortlessly, older staff is not skilled and supported. Existing ICT adoption

is intermittent, donor-dependent, and much of an add-on rather than an integral pedagogical tool. Investment in strategic infrastructure, local content creation, teacher capacity building, and regular technical assistance has to be made so that ICT is usable for inclusive, scalable, and interactive education in Nepal. In this context, the teacher believed that "*the future of ICT in Geography education is promising*. *ICT tools like GIS, Google Earth, and virtual reality enhance learning, critical thinking, and digital literacy, but accessibility, sustainability, and proper training are essential."* Overall, ICT in Nepalese universities, specifically Geography, is poised to enhance learning, critical thinking, and digital literacy. Inadequate infrastructure, low investment, poor staff capacity, and unequal access are, however, constraints to its effective, sustainable, and equitable integration.

Students' Attitudes towards ICT and Its Importance

Information and Communication Technology (ICT) is found to be extremely important to both rural community college students and urban public college students for their work environment as well as for the growth of their country. The environment concurs with broader literature highlighting ICT potential for transforming education, particularly in the Third World, where internet literacy continues to spur socio-economic development (UNESCO, 2022; World Bank, 2020). Though aware of its importance, students complain their learning environments hardly include effective and budget-friendly ICT training. Theirs is mostly typical of lessons full of theory, with little experience of actual ICT tool and platform use, e.g., Google Classroom, Zoom, and Learning Management Systems—a trend which is more common in rural areas. These remarks validate Karki and Pant (2020), who remarked that ICT teaching in Nepal is behind practice training as well as not fully merged with everyday practice. Here the student remarked, "*As students, we find ICT makes Geography interesting and relevant. Digital maps, satellite images, and digital resources make complicated things simpler, making ICT crucial for learning, academic development, and future prospects, without which Geography feels incomplete*." In short, students acknowledge ICT as fundamental to learning, work, and national development, but decry education being largely theoretical with little practical training, especially in rural areas. They stress ICT makes Geography interesting and beneficial for school and future application.

Infrastructural Shortfalls and the Rural-Urban Divide

Infrastructural shortages are both common among urban and rural universities in Nepal, albeit more frequently in rural colleges. Rural university students report some of the most important gaps in electronic infrastructure as irregular power supply, lack of computer laboratories, and unpredictable internet connectivity. Even though the urban students to experience a similar set of issues like outdated equipment and few practical exercises, it is comparatively less severe. This is underpinned by previous research conducted by Adhikari (2018) and Gurung and Parajuli (2021), which reported the prevailing digital divide in Nepal, where rural colleges and schools are far less technologically advanced than those from urban areas. The economic divide further expands the gap since most students do not have the capacity to afford personal devices or mobile data fees (Ghimire & Aryal, 2019). Therefore, the student complained, "Because I am from a rural background, I often face difficulties in ICT facility access. The internet is slow, old computers, and electricity itself is sometimes not reliable. When I compare my

situation with my urban campus colleagues, I feel disadvantaged." This rural-urban dichotomy undermines our confidence in ICT-based work, and we believe it will affect our career aspirations in the future." Total Information and Communication Technology (ICT) is viewed as crucial by rural community college students as well as urban public college students for their employers and for the development of their country. The setting concurs with wider literature that foregrounds ICT learning potentiality for transformation, particularly in the Third World, where internet literacy continues to propel socio-economic development (World Bank, 2020; UNESCO, 2022). Students complain even when they know its importance that their learning environment hardly integrates valuable and accessible ICT training. Theirs is dominated mainly by theory-loaded classes with less exposure to practice application of ICT tools and platforms, such as Google Classroom, Zoom, and Learning Management Systems—a trend prevalent more in villages. These remarks agree with Karki and Pant (2020), who also noted that ICT instruction in Nepal is still behind practice-based training and also is not entirely an integral part of routine practice. According to this, student said, "*For us as students, we think ICT makes Geography come alive and meaningful. Satellite images, digital maps, and online information make complex topics easy to comprehend, thus making ICT a learning necessity, academic progress, and career opportunities, without which Geography is not complete*." Overall Students recognize ICT as an essential tool for educational learning, professional employment, and national development, but practical training is limited, especially in rural universities. In Geography, computer facilities promote involvement and understanding, reflecting the need for practical, convergent ICT training.

Pedagogical Restraints and Faculty Shortfalls

Most teaching is theoretical, with minimal student-teacher interaction, and minimal exposure to industry experience or applied projects. Trainers are largely not computer literate and no training is provided on how to incorporate ICT into class. These problems reflect broader ICT integration criticism in tertiary learning. Shrestha (2021) describes how despite national policy plans like Nepal's ICT in Education Master Plan (2013–2017) making teacher training a priority, implementation at an institutional level has been gradual and patchy. The staff are not provided the support, the infrastructure, or the incentives that they require to optimize their own digital pedagogic capacity (Pokhrel & Chhetri, 2021). To this purpose, the student submitted, "*Even if ICT facilities are available, teachers prefer to continue with traditional lecturing or use PowerPoint only. Teacher training with ICT techniques must increase to make learning interactive, as students lack knowledge of how to operate ICT effectively without instruction.*" Overall, the majority of the education in Nepal's tertiary education is theoretical with little practice and untrained teachers utilizing digital technology. Despite national policies, ICT integration is not consistent and thus training of the teachers has become crucial to enable interactive and efficient learning among students.

Student Aspirations and Personal Development

Students demonstrate agency and optimism in being capable of managing ICT learning challenges despite institutional constraints. They complement outside resources on their own, learn from one another, and use free web-based learning resources to bridge knowledge gaps. Under conditions of minimal formal infrastructure and assistance, these non-curricular activities demonstrate

learners' capacity and resourcefulness for self-directed learning (Tadesse & Gillies, 2015). Further, students are not merely passive ICT recipients but also provide pragmatic recommendations on how to enhance learning outcomes. They include: digital infrastructure building, designing inclusive and localized ICT curricula, partnership with industry, and staff professional development. This student feedback suggests the necessity of bottom-up perspectives in informing sound ICT practice and moulding education policy. In this case, the student *reported ICT gives us a sense of empowerment. It makes us learn to operate GIS, online mapping tools, and digital materials.* It not only makes us effective in Geography but also ready for a professional life and higher studies. It makes us creative, able to solve problems easily, and confident. We believe ICT is a bridge of book learning and real practice, and it allows us to think beyond books. Last but not least, students are resilient in that they utilize peer learning, open platforms, and external resources to fill ICT gaps. They propose better infrastructure, localized curricula, industry links, and teacher training, with ICT perceived as enabling knowledge, skills, and application in the real world.

Differences in the Practice of ICT

Nepal has also developed country-level ICT policies, such as the School Sector Development Plan (2016–2023) and Digital Nepal Framework (2019), to enable digital learning but campus-level adoption is in its nascent stages. National policy agenda-local adoption mismatch is another widespread phenomenon in higher education. Development agencies worldwide have experienced the same extent of mismatch between policy intent and ground realities. For example, the Asian Development Bank (2020) finds that poor coordination, poor local ownership, and absence of monitoring facilities are disincentives to Nepal's ICT goal attainment. Student experiences on urban and rural campuses reflect mutual consciousness of ICT capability but also enormous differences in access and quality. Rural students, more than any others, are confronted with severe infrastructure constraints, fiscal challenges, and low faculty preparedness, thereby ICT education in such environments is usually ineffective. Such types of student enthusiasm and active learning methods, however, hold promise for transformation. Closing the rural-urban digital divide is not just about technology investment; it's about structural changes in the form of inclusive curriculum design, local digital content, quality teacher training, and robust academia-industry interfaces. Without these, ICT shall become an unfulfilled promise in Nepal's dream of transformatory higher education. In this context, the student quoted, *"Students observe major differences in ICT use across classes." Some teachers prefer using interactive tools while others employ slides only. This inconsistency generates uneven competencies. Equal ICT application is required for equal learning opportunities."* In conclusion we observe inconsistent ICT practice in institutions: some teachers use online platforms, projects, and mapping tools while others employ just slides. The difference generates wide skill gaps; equal ICT practices are required for equal learning opportunities.

Conclusion

There is unmatched transformal ICT potential in Nepali higher education and more specifically in geography education in terms of enhanced spatial literacy, collaborative learning, and research skill transfer Students are infrastructural disadvantaged and structurally disadvantaged by socio-economic constraints, teacher capacity, availability of resources, and infrastructure, all of which discourage unproblematic integration of

ICT, especially in the rural setting. The COVID-19 pandemic highlighted underlying inequalities and accentuated ways in which ICT was able to enable increased access and learning continuity.—University managers, ICT educators, and students all agreed that ICT is able to deliver access, teaching, and learning. But recurring problems—unreliable connections, power outages, poor-quality connections, outdated equipment, and poor-quality technical support—causes barriers to take-up, worst on rural campuses. Staff development is in most cases inadequate, with the knowledge, training, or enthusiasm of teachers to utilize ICT in the classroom nowhere near optimal. Financial and managerial challenges, such as unpredictable state budgets and restricted autonomy to hire technical staff, further hinder development. The students are IT literate, but spatial and economic disparities continue to push the digital divide higher, restricting access to hardware, connectivity, and hands-on training. ICT training is predominantly theoretical with limited exposure to shop work, internship, and industry liaison. Yet, the COVID-19 pandemic accelerated ICT integration, highlighting its significance in maintaining education alive. The recommendations of the stakeholders are strategic investment in infrastructure, particularly on rural campuses, occasional context-specific faculty development, content development and dissemination localized digital, and setup of public ICT support centers and technical networks. Master ICT policies and campus master plans with long-term, inclusive, and context-sensitive institutional reforms have the ability to overcome the urban–rural digital divide. Through collective efforts on the part of the government, institutions, and society, ICT has the ability to re-engineer higher education in Nepal to equip students with the competencies for national development and the uncertainties of the world.

References

Adhikari, R. (2018). ICT integration in Nepalese education: Issues and challenges. *International Journal of Educational Development, 62*, 1–6.

Adhikari, R. (2021). *Determinants of ICT adoption in higher education: Governance, training, and social media use*. Journal of Education and Technology, 15(2), 55–70.

Asian Development Bank. (2020). *Digital education in South Asia: Opportunities and challenges*. https://www.adb.org

Baker, T. R., Battersby, S., Bednarz, S. W., Bodzin, A. M., Kolvoord, B., Moore, S., Sinton, D., & Uttal, D. (2015). *A research agenda for geospatial technologies and learning*. Journal of Geography, 114(3), 118–130.

Barik, N., & Karforma, S. (2012). Risks and remedies in e-learning system. *International Journal of Network Security & Its Applications, 4*(1), 51–59. https://doi.org/10.5121/ijnsa.2012.4105

Bednarz, S. W., & Kemp, K. (2011). *Understanding and nurturing spatial thinking*. Procedia – Social and Behavioral Sciences, 21, 18–23.

College NP. (2025). *ICT in higher education: Opportunities and challenges in Nepal*. College Nepal Publications.

CollegeNP. (2024). *ICT reforms in Nepalese higher education: Policy, practice and prospects*. Kathmandu: College Nepal Research Center.

De Miguel González, R., Donert, K., & Koutsopoulos, K. (2019). *Innovative learning geography*. Springer.

Dhital, M. (2021). Digital transformation in Nepali higher education during COVID-19: Opportunities and barriers.

Journal of Educational Development, 11(2), 45–58.

Dulal, D. (2019). Teacher competency and application of ICT in community schools in Nepal. *International Journal of Educational Researchers, 10*(3), 37–48.

Farrell, G., & Isaacs, S. (2007). *Survey of ICT and education in Africa: A summary report based on 53 country surveys*. infoDev/World Bank.

Fuller, I. C., Gaskin, S., & Scott, I. (2006). *Student perceptions of geography and environmental fieldwork*. Journal of Geography in Higher Education, 30(1), 161–179.

Ghimire, B., & Aryal, S. (2019). Digital divide and educational inequalities in Nepal. *Nepalese Journal of Educational Studies, 4*(1), 23–35.

Goodchild, M. F. (2004). *GIScience, geography, form, and process*. Annals of the Association of American Geographers, 94(4), 709–714.

Government of Nepal. (2013). *ICT in Education Master Plan (2013–2017)*. Ministry of Education.

Government of Nepal. (2019). *Digital Nepal Framework*. Ministry of Communication and Information Technology.

Gurung, A., & Parajuli, M. (2021). ICT access and use in rural Nepal: A comparative study. *Journal of Education and Research, 11*(1), 45–61.

IPCC. (2014). *Climate Change 2014: Impacts, adaptation, and vulnerability*. Cambridge University Press.

Jha, R. (2020). Open and distance learning in Nepal: Prospects of ICT in higher education. *International Journal of Open Learning, 9*(3), 14–29.

Kandel, P., & Kaphle, R. (2021). Traditional pedagogy and ICT in higher education: A Nepalese perspective. *Asian Journal of Education and e-Learning, 9*(2), 100–112.

Karki, S., & Pant, B. (2020). Teachers' readiness in ICT integration in Nepalese higher education. *Educational Perspectives in Nepal, 8*(2), 12–20.

Khadka, S. (2021). Teaching English and ICT challenges in higher education in Nepal. *Journal of Education and Practice, 12*(4), 45–53.

KIST. (2025). *Digital education and higher learning in Nepal: Policy and practice*. Kathmandu Institute of Science and Technology.

Kozma, R. B. (2005). National policies that connect ICT-based education reform to economic and social development. *Human Technology, 1*(2), 117–156.

Kunwar, R. (2020). ICT and rural education: Challenges of infrastructure in Nepal. *Educational Innovations, 8*(1), 67–80.

Kunwar, R. (2020). Impact of ICT on adopting online education at higher education in Nepal. *Education and Development, 30*(1), 69–83. https://doi.org/10.3126/ed.v30i1.49511

Mishra, P., & Koehler, M. J. (2006). *Technological pedagogical content knowledge: A framework for teacher knowledge*. Teachers College Record, 108(6), 1017–1054.

OECD. (2015). *Students, computers and learning: Making the connection*. OECD Publishing.

Partnership for 21st Century Skills. (2019). *Framework for 21st century learning*.

Paudel, P. (2022). Digital literacy and ICT integration in Nepalese higher education. *Asian Journal of Education and Social Studies, 34*(2), 22–34. https://doi.org/10.9734/ajess/2022/v34i230829

Pew Research Center. (2018). *Social media use continues to rise in developing countries*. https://www.pewresearch.org

Pokhrel, R., & Pokhrel, A. (2023). ICT for online classes in economics education in TU. *Surkhet Journal, 2*(1), 31–40.

Pokhrel, S., & Chhetri, R. (2021). Online education during COVID-19 in Nepal: Challenges and possibilities. *Asian Journal of Distance Education, 16*(1), 92–103.

Selwyn, N. (2012). *Education in a digital world: Global perspectives on technology and education*. Routledge.

Shakya, S., Shrestha, M., & Adhikari, T. (2018). ICT use in higher education: Practices and challenges in Nepal. *International Journal of Education Development, 58*(4), 112–120. https://doi.org/10.1016/j.ijedudev.2017.11.003

Shrestha, P. (2021). ICT in education policy in Nepal: An analysis. *Journal of Education and Society, 5*(2), 70–85.

Tadesse, S., & Gillies, R. M. (2015). The role of student agency in online learning in developing countries. *International Journal of Educational Technology in Higher Education, 12*(1), 1–15.

Thapaliya, B., Koirala, P., & Singh, R. (2025). Digital divide and equity issues in Nepalese higher education. *Nepal Journal of Educational Studies, 15*(2), 67–83.

Timilsena, P., Ghimire, B., & Adhikari, K. (2025). ICT integration in Nepalese higher education: Systemic challenges and future directions. *Nepal Journal of Educational Review, 20*(1), 1–15.

UNESCO. (2009). Innovative approaches for teaching: ICT in higher education – opportunities and challenges. *Bhatter College Journal of Multidisciplinary Studies*. https://bcjms.bhattercollege.ac.in

UNESCO. (2018). *ICT in education: A critical literature review and its implications*. UNESCO.

UNESCO. (2020). *Education in a post COVID world: Nine ideas for public action*. UNESCO.

UNESCO. (2022). *ICT in education: A global perspective*. https://www.unesco.org

Unlocking Nepal's growth potential. https://mocit.gov.

World Bank. (2020). *Reimagining education: The role of digital technology*. https://www.worldbank.org