



The Digitalization of Education in Nepal

“A Critical Discussion of the Affordances of Digital Commons”

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| <p>Abstract:</p> <p>Digitalization has brought significant changes to education, particularly in the context of learning through various digital platforms and access to technology. This study entitled "The Digitalization of Education in Nepal: A Critical Discussion of the Affordances of Digital Commons" has aimed to find and explore more in the context of digitalization and the affordance of digital commons in Nepal. The research has applied a systematic literature review as methodology and has inquired more into the field of digitalization and education in Nepal. There are several requirements while using and applying digital resources which must be thought of by various levels and stakeholders. Collaboration, capacity-building, and awareness-raising initiatives are necessary to promote the use of digital commons in Nepal and the use of Open-sources in teaching-learning practices. The innovative use</p> | |

of open-source software in computer science education has the potential to enhance course resources, but the decision to use them should be considered for desired outcomes in learning.

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Introduction

Background of the Study

Modern society is transitioning into a new phase of socioeconomic growth known as the "digital economy" or simply "digitalization." All aspects of human existence, including the socio-educational sphere, are becoming digitalized globally as part of this stage. As the world continues to undergo rapid digital transformation, digitalization has become an increasingly important concept in the education sector.

In Nepal, efforts to digitalization in the education system have been ongoing for several years, and the COVID-19 pandemic has further accelerated this process in education and other sectors. Digitalization has brought significant changes to education, particularly in the context of online learning and digital platforms. Technology companies are responding to the growing demand for education technology in the global market by introducing relevant research-based tools and technologies (Devkota et al., 2021). However, in many parts of Nepal, there are still significant challenges that need to be addressed at various levels. For instance, access to quality internet for all learners and teachers is a critical concern, as is the need for educators to be prepared to effectively run online classes. Additionally, students and parents must be motivated and prepared to take advantage of the opportunities that digital learning presents, and must also be familiar with the available resources and technology. If we simply look at "the internet" it has caused a shift in people's perception, with the recognition that its impact goes beyond just changing lifestyles, and also affects the education system (Devkota et al., 2021). The integration of information and communication technologies (ICT) has led to the digitization of education sector.

While digitalization has brought significant benefits to education, including increased access to learning, enhanced opportunities for students, and improved teacher training, it has also

revealed significant challenges. Infrastructure limitations and a technological divide between urban and rural areas have made it difficult for many students to access digital learning materials.

The education professionals find the use of digital tools and technology challenging task due to difficulties in keeping students motivated and providing them with the practical and complex skills required in contemporary society even, graduates in the field often lack the skills expected by the ICT sectors, leading to a significant skills gap (Alasbali & Benatallah 2015). Despite these challenges, the Nepalese government has taken significant steps to promote digital education, including the creation of online platforms and digital learning materials. These efforts have been supported by policy, such as the National Information Technology policy (2015), which has aimed to position information and technology as a tool for development and growth. However, there are several aspects which needs to be inquires to implement various aspects of digitation in education system.

The utilization of digital technologies can offer new learning environment where students can engage in constructive learning and knowledge building which can makes digital tools and digitalization a valuable tool for education (Rana & Rana 2020). Despite the opportunities and benefits these tools and technology provides in education, many challenges still exist, even in developed countries. In addition to issues of funding, there are also concerns related to the integration of technology into the classroom as expressed by Rana and Rana (2020). For instance, there may be a lack of fundamental ICT infrastructure, an unskilled workforce, and inadequate funding for ICT resources, which can hamper the implementation of digitalization and necessary policy and plan in teaching and learning at the university and school levels.

Furthermore, while the benefits of digitalization are significant, it is important to remember that it is not a panacea for all educational problems. Since, countries with higher populations, such

as China and India, have initiated several online learning protocols by mobilizing the existing materials and resources at provincial and national platforms (Azzi-Huck & Shmis, 2020 as cited in Dawadi et al., 2020). It is still essential to provide students with a well-rounded education that includes practical skills, socialization, and critical thinking, among other things. Additionally, there is a need for ongoing research to assess the effectiveness of digitalization in education, and to identify the most effective ways of incorporating technology into the learning process.

How can digital commons promote the digitalization of education in Nepal? Also, the affordance of the digital tools remains a big question for us to explore more about the digitalization in education sector. These questions have been the central aspect of our research. Since the current status of digitalization in education in Nepal is moving forward but as there are several challenges to implement it in an effective and efficient ways. Studies done in the education and digitalization's have informed that it is essential to understand how they can be effectively used and that we need to know the new technology can enhance teaching and learning if it is used appropriately (Rana & Rana 2020); suggesting that there are many aspects that needs further research.

As found in the literature, Nepal is ranked has been 123rd in the world in terms of information communication and technology (ICT) service provision (Sharma & Kim, 2016), which directly impacts the effective delivery of online education of the nation. This also, raises a question if the open- sources can be used and integrated in the education system or not? Similarly, Shrestha et al., (2022) expresses that lack of digital skills, a lack of institutional support for technology, among other issues, are the main obstacles and hurdles they face while switching to online education. Thus, our research has been carried out with aim to explore more in the field of education and digitation and affordance of digital commons.

Research Questions

- “What are the affordances of digital commons in the digitalization of education in Nepal?”
- How has digitalization been implemented in education system of Nepal?
- What are the Opportunities and Challenges in Digitalizing the education system in Nepal?

Limitation of the Study

The study focuses on Nepal’s digitalization in education sectors. Academic researches, which were published on the journals, has been considered as the major source of the study as they are peer reviewed and more reliable- international journal papers. Thus, the major source of the data consists of published journal articles. Adding on, the research has focused on the spectrum of digitalization, emphasizing on the digitalization and affordance of digital commons. While the study does not discuss the impact of the digitalization in education sector as a whole, the research articles which were published after 2000, which had emphasized on the digitalization had been taken major source of data, which were relevant to the study.

Similarly, the aspect of affordance can exist between a “goal-oriented actor and any kind of object,” our research interest is delimited to affordances based on digital tools only, referred to as digital affordances. Henningsson et al., (2021) expressed that “specific digital affordances always exist in relation to a goal that the actor wants to achieve,” (p.4). From the epistemological

rooting of affordance theory in critical realism, affordance refers to the potential use instead of actual use (Volkoff & Strong, 2013 as cited in Henningsson et al., 2021), this research has focused on digital tools potential use as a digital affordance.

Also, focusing on Nepal's digitalization and affordance may limit the scope of the research, and the thesis may not address the global context of the digitalization of education and the development of digital commons.

Theoretical framework

Open- Source Theory

The Internet is creating, or, more specifically, helping to recreate, perceptions of the human mind as a developing universe of interconnecting ideas, extending concepts such as distributed cognition (Hollan, Hutchins, & Kirsch, 2000 as cited in Glassman, 2013). Open-source theory refers to the concept of making software, code, and knowledge freely available to everyone, without any restrictions or limitations. It suggests and promotes collaboration, transparency, and community-driven development. Similarly, the users' possibilities towards its use for productivity to its integration in education has also been evolving. Open Source began emerging through the use of the Internet as a tool in productive activity, serving as both a road map and a metaphor for non-linear communications that generate dynamic, web-like problem-solving systems.

Gigerenzer outlines a two-movement process for the emergence of cognitive psychology as a dominant theoretical perspective—serving as a model for theory development in general. Glassman (2013) expresses that the new innovations/tools are used and later “developing new concepts and metaphors out of their activity” (p. 677), which are developed by the individual(s)

and it's considered as the Gigerenzer first movement. Adding on, Gigerenzer's idea expresses that "the successful new tool in some way expands the ability of thinking to interconnect with other minds in the process of productive discovery" (p. 677). Similarly, the second movement refers to the broad acceptance of the new tools and innovation, including the larger scientific community.

In context of Nepal, the literatures on the topic of digitalization from the perspective of challenges and opportunities are present. Many studies have focused on the what possible advantages are there, while digitalizing the education process, focusing on the aspects of policy, infrastructure, teacher's perspectives and so on. From the perspective of "Open-Source Theory," the digitalization needs to be analyzed to explore more aspects of Digitalization of Education in Nepal. Thus, this study has tried to explore the aspects of the affordance of the digitalization with theoretical stand point of Open-Source Theory, which is a "a perspective, a process, a movement, and a social phenomenon, originally based on activities of a small group of computer hackers, but growing in impact and scope along with the Internet and its applications. Open Source has the potential of developing into a socio-cognitive theory in the tradition of early Pragmatism recombining psychology, sociology, anthropology, education, and political science" (Glassman & Kang, 2010 as cited in Glassman, 2013 p. 676).

Open-Source Developing learning Experience

The Open- source can support in the learning experiences in various subjects as a medium to enhance better learning for the students. The study conducted by Alasbali and Benatallah (2015), which had focused on advantages and challenges of using Open-Source communities in "computer science education," particularly impacting the areas of course design and delivery. This study has found that incorporating operating systems (OS) in computer science education can result in multiple advantages. These benefits include improved support for learning within a specific

context, the acquisition of a broader range of skills, enhanced student motivation, better support for courses that prioritize student-centered learning, and more detailed data on course performance. Similarly, choosing the right operating system for computer science education can have a significant impact on the success of the learning process. There are many OS projects available, each with their own strengths and weaknesses, and selecting the most appropriate one is important. For example, if the goal is to teach students about computer security, a Linux distribution such as Kali Linux might be a good choice because it is designed specifically for penetration testing and ethical hacking. On the other hand, if the focus is on mobile app development, an OS like iOS or Android might be more suitable.

Another factor to consider is the level of technical expertise of the students. For beginners, an OS with a user-friendly interface such as Windows or macOS might be better, while more advanced users may prefer a more customizable and flexible system such as Arch Linux. Ultimately, the choice of operating system should be based on the specific goals and needs of the computer science education program, as well as the level and experience of the students. Additionally, O'Hara and Kay (2003) express that Open-source software (OSS) can be used as a means, approach, and tool for educating and learning computer science. OSS has the capability to extend collaborative work beyond the confines of the classroom, allowing for more expansive projects and more dispersed teams. Moreover, OSS can be leveraged to acquaint our students with the broader computer science community and the concept of peer review.

Sulisworo and Sudarmiyati, E. (2016) emphasized that the open-source can also support in the cooperative learning too. While teaching physics teaching in secondary schools shows that cooperative learning has the potential to improve student performance- using Moodle (a learning management system that has open sources platform modules that can be customized according to

user needs) (Sulisworo & Sudarmiyati, 2016). It offers opportunities to create meaningful learning, interactive, inspiring, fun, challenging, and motivating learners to participate actively, and even support in a cooperative learning. The study pointed that the success of students' independent online learning is greatly influenced by their literacy level on digital commons, while teachers should combine this with the students' interests to promote online learning strategies that increase enthusiasm. Also, the study argues that in cooperative-blended learning, has been better than traditional face-to-face classroom learning because it allows students to take control over their own learning and decide when to start, when to finish, and which parts of the material to learn first. Learners can start with the interesting topics and pass only the parts they have mastered, while they can repeat the difficult parts until they understand or discuss them with other group members. The flexibility of e-learning provides opportunities for students to take control of their learning and become experts in their subject matter using various open sources.

Method

The design, structure, and strategy of the inquiry developed to address the research question or test the research hypothesis is known as the research methodology (Wolff & Panta, 1999). This research has used systematic literature review (SLR) method to find relevant studies particularly highlighting affordance and digitalization in education sector of Nepal. The procedures employed in the Systematic Literature Review (SLR) are deliberately structured to reduce partiality, enhance clarity, and simplify the review process for future replication (Alasbali, & Benatallah 2015).

Literature review is a one of the ways to summarize research results in order to demonstrate evidence on an overall basis and identify areas in which additional research is required, which is

an essential step in developing theoretical frameworks and conceptual models (Snyder,2019). The literature review is considered one of the methodologies which consist of several process and types of review. There are some ways for conducting literature reviews that suggest different types of reviews, such as narrative or integrative reviews, systematic reviews, and meta-analysis (Snyder, 2019). However, with proper steps taken on the research on the findings and synthesizing these different types of literature reviews can only take the study in a broader view. Further, Snyder (2019) states that “a literature review to become a proper research methodology, as with any other research, follow proper steps need to be followed and action taken to ensure the review is accurate, precise, and trustworthy” (p. 334); which emphasizes on the research needs to be carried out. The approaches such as integrative reviews, systematic reviews, and meta-analysis are some of the ways the research can be conducted on the basis of previous literature but the right selection of the literature review process in the literature review can help and support to answer the research questions.

The purpose of our study, is the analysis of the affordances of digital commons (tools and technologies) in Nepal’s education system. In order to consider its substantial parts and necessary information, previous studies which were carried out were referred to and used as major materials of the study. So, systematic literature review has been selected as methodology for the study. The systematic or narrative review approach is used for topics that have been understood differently, researched by numerous groups of researchers across several disciplines (Wong et al., 2013). Consequently, for the study systematic approach has been selected to explore and find how the aspects of certain topic, in this case the digitation and education in Nepal, have progressed to carry out the analysis using narratives – by synthesizing the findings of past research. The study has focuses on the theoretical aspects of Open- source theory as it implies that aspect of the social,

educational, and cognitive for successful learning experience are necessary for the learning experience.

To comprehend certain aspects of digitalization presented in the scientific literature: challenges and opportunities in the process of digitalization, Nepal's policy in Digitalization, Education and digitalization, and other similar keywords (digitize, ICT, digital tools, Digital commons etc.,) were used to select the materials online. The thematic i.e. content analysis was done as a part of the study. As Ward, House and Hamer, (2009) expressed that such analysis supports on "detecting themes, theoretical perspectives, or common issues within a specific research discipline or methodology or for identifying components of a theoretical concepts" (p. 335). Adding on in order to carry forward the study the certain criteria were set such as selecting the research articles which were related to our topic and relevant to the research questions. The selection of the terms, appropriate databases and deciding on inclusion and exclusion criteria were taken into consideration; such as digitization and education were prioritized while searching the literature online. On the other hand, published journals and research articles were kept at upmost for the search. For instance, research published journals after 2000 were prioritized to narrow down the literature review process; as mentioned before the papers relevant to the topic were only prioritized. On the other hand, the relevant findings and results were selected and brought to the result, analysis and discussion part- the findings that were related to research questions. For this in the finding section several thematized topic were created which brought the major finding of the previous research in our study. The results and the finding of the previous studies were accumulated at the beginning and then they were thematized on the basis of the results – this helped in the research process for further discussion and for readers to comprehend and understand the context.

The published journal articles were selected to answer the research questions, however, the articles which were not relevant to the study were discarded. Databases for searching for articles consisted of Google scholar, Springer Link, SAGE etc., Similarly, the search key the articles consisted of key words such as digitalization and education, communication technology, digital technology, digitalization and education, digital learning in Nepal, remote learning, pandemic and Nepal's education etc. The literatures, as a part of literature review consists the aspect of digital commons, digitalization of education, opportunities, e-learning in Nepal, pandemic and digitalization and affordance of digital commons.

To move forward with the research question, with the central idea of affordance of digitalization and digitalization in education, the literature which were available online, specifically published journals were referred. In order to use time wisely, the literature review, through online resource was more convenient for both of us- giving us digital space for discussion of the papers and sharing ideas with one another. In the study, the aspects of digitalization and its significance on education, including its opportunities and challenges were selected. Since the study explores the aspects and affordances of the digital commons in Nepal, the literature which involved the aspects of affordance or relevant aspects were selected as the source of data.

Literature Review

Digital Commons

Murdock (2005) states that “the Internet, and more particularly the World Wide Web, holds the prospect of addressing public broadcasting's historic limitations in more fundamental ways” (p. 223); which in today's context where people have access to smart phones and internet

than ever. In most of the sectors the internet has now taken a vital space to increase the efficiency and effectiveness. The advantage of the digital commons is that it allows the users to use the internet via cellphones, computers, and other mediums. On the other hand, the Internet's accessibility via personal computers is significantly affected by income, age, and education. Many impoverished households, elderly individuals, and those who dropped out of school face the possibility of permanent exclusion, even if they obtain basic connectivity. Furthermore, they may not have access to the constant high-speed broadband and wireless connections necessary to utilize the complete range of emerging Internet resources (Murdock, 2005). For instance, income inequality creates a disparity in access to the tools and technology of individuals. The notion of "digital commons," commons have become increasingly important in the digital age, as they provide a means for people to collaborate, share knowledge, and collectively create and manage resources that are accessible to all, however, the challenges such as cost, access to digital tools and technology are also significant factors to effectively implement the idea of digital commons

The general understanding is that the publicly accessible digital infrastructure and resources a "digital commons." In Nepal, implementing several plans and policies to accelerate the digitalization in education and other sectors. For example, a study by Devkota and Bhattarai (2018) on "The Digital Commons in Nepal: An Overview" provides an overview of the current state of the digital commons in Nepal. The study stated that the digital commons in Nepal are underdeveloped, and there is limited awareness about the concept among the general public. The study identified several challenges to the development of digital commons in Nepal, such as limited infrastructure, lack of government support, and low levels of digital literacy among the population. Similarly, a study by Shrestha et al. (2020) on "Digital Commons in Nepal: Challenges and Opportunities" identified several challenges to the development of digital commons in Nepal.

The study found that there is a lack of institutional support and inadequate legal frameworks to promote the development of digital commons in Nepal. The study also highlighted the need for capacity-building and awareness-raising initiatives to promote the use of digital commons in Nepal.

A study by Sapkota et al. (2021) on "Digital Commons and the Role of Community Networks in Nepal" highlighted the potential of community networks in promoting the development of digital commons in Nepal. The study found that community networks can play a significant role in providing access to digital resources and infrastructure, particularly in rural areas. The study also emphasized the need for community-driven initiatives to promote the development of digital commons in Nepal. "Digital commons" generally is understood as a shared online space where members of a community can access and share digital resources and information. These resources might include things like academic papers, research data, teaching materials, and other types of digital content. The use of digital commons (tools or online space) in education appears to be vital and significant for nations to develop in the education sector. Consequently, in Nepal the majority of private colleges and schools already have internet facilities for professors and students, but the government universities and schools are still waiting for funding support to incorporate digitalization (Information Communication and Technology), in the teaching and learning activities (Rana & Rana, 2020). Most educators and students, especially those who live in cities, have access to internet services in their daily lives. The government does not have a clear strategy for providing government institutions with ICT infrastructure and for training teachers to use digital technologies, even though private colleges and schools have their own plans to manage facilities and to train their teachers to use the new technology – digitalizing and using the technologies.

Digital commons in Nepal are underdeveloped, and there is limited awareness of the concept among the general public and facilitators. As expressed in the study by Dhakal, and Bhandari (2019), when the teachers shift to online teaching, they face a range of challenges, including how to moderate online discussions, establish a social presence, transition students to virtual environments, and provide feedback online. Furthermore, some online courses have been criticized for providing limited opportunities for interaction and engagement among students and between students and instructors. There are several challenges to the development of digital commons in Nepal, such as limited infrastructure, lack of government support, and low levels of digital literacy among the population. The studies suggest that capacity-building and awareness-raising initiatives are necessary to promote the use of digital commons in Nepal. Community networks can play a significant role in providing access to digital resources and infrastructure, particularly in rural areas. The objective of e-learning technology is to guarantee that all learners have equitable access to the greatest tools and materials, and adopting this technology can make it easier for educational institutions to use remote learning and provide educational services to students because they can access the internet to learn or gather information.

Digitalization and Education

In general, the term digitalization refers to leveraging the digital tools and technologies for various purpose. Modern society is transitioning into a new phase of socioeconomic growth known as the "digital economy" or simply "digitalization." Most aspect of human life, including the socio-educational sphere, connected with digitalized world globally one way or another. The use of digital educational resources, information, and systems to address various professional aspects by employees in the educational system, including managers, educators, and teachers, is

the most important attribute of "digitalization of education"(Karakozov & Ryzhova2019). Similarly, digitalization and the aspects of digital tools have been considered vital elements of the education system in most of the world. During the time of Covid, remote learning had become the best option for students to learn at all levels. Despite the notion of remote learning was present in many universities and schools its significance was higher during the time of the pandemic. As Edwards (2010) noted that “digital technologies are part of a new knowledge infrastructure that is now steadily integrated into everyday life” (p. 341); this "reliable network of people, artifacts, and institutions that generate and maintain the informational resources necessary for humans" is also known as the knowledge infrastructure. In a study, Chimomo (2005) as cited in Panthi and Belbase (2017) if we take Nepal's urban and rural areas into consideration, the distribution of resources at schools is not equal or equitable. Additionally, compared to rural schools, urban schools appear to have a higher possibility to have facilities for current technology, physical infrastructure, qualified teachers, etc.

Affordance of Digital Commons

Markus and Silver (2008) define affordances as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (p. 622). The term affordance exists as a relationship between an actor and an artifact; and it is relative to the “actor's action capabilities” and “reflects possible actions” (Henningsson et al., 2021 p.4). Open-source knowledge and technology has been considered as a promising start (Neupane, 2014), as establishing a library can serve as a valuable method for enhancing the gradually developing science education in rural Nepal. Using a computer-based digital library is a more cost-effective and easily transportable option than traditional books. The study further emphasized and pointed that availability of e-library resources in English is a challenge for Nepali-speaking communities- even if they are affordable or

accessible in rural area. Some efforts have been made to translate resources into Nepali, for instance the video resources translated in Nepali with the help of volunteer. This was a case of public school in Jhimpa in 2012, located in a remote western village of Baglung, Nepal. The study further suggested, in line of digitalization, that, students can still benefit from using a combination of English and translated resources. Students can also become sources of knowledge transfer by translating English content into Nepali and training others.

In terms of affordance the economic status of the developing nation is also one of the factors which influences the digitalization and use of digital common. The developing countries face fundamental challenges, such as poor economic conditions and high levels of unemployment, which make it difficult for members of the public to afford expensive technology. Moreover, governments have not been able to provide adequate funding for digital infrastructure and teacher training on the technology in education sector (Malapile & Keengwe, 2014). Similarly, Ramorola (2013) emphasizes that a lack of clear ICT policy, insufficient technology resources in classrooms, shortage of teachers skilled to use the digital tools, inadequate maintenance of existing technology resources, and lack of ongoing support for teachers are major challenges affecting the integration of technology in schools. Rana and Rana (2020) expressed the view that Faculty of Education, Nepal has successfully set up a computer laboratory, purchased projectors, and provided internet access for both teachers and students through the help of international organizations. However, the study also indicates that the project's sustainability and its ability to bring changes to the existing traditional education system are unlikely without systematic investment from the government and the university, as foreign support is typically temporary.

Digital tools such as software applications, platforms or technologies that can be used to create, edit, organize, share or collaborate on digital content. They are often used in educational,

professional, and personal contexts to enhance productivity, communication, creativity, and learning. Examples of digital tools include word processors, spreadsheets, presentation software, video conferencing platforms, social media, graphic design software, digital whiteboards, and learning management systems.

Digital tools can be web-based or installed on a computer or mobile device, and they can be free or paid. Educational institutions that have sufficient financial resources can easily purchase and utilize any advanced technology for teaching and learning. On the other hand, educational institutions that have limited budgets and resources face difficulties in acquiring expensive technologies that come with advanced learning features (Mucundanyi & Woodley, 2021). The financial capabilities of educational institutions play a crucial role in determining the type of technology they can adopt for teaching and learning purposes. While well-resourced institutions can easily invest in advanced and expensive technologies, institutions with limited budgets and resources face constraints in acquiring such technologies. Mucundanyi and Woodley (2021) further emphasized that to facilitate continuous learning beyond traditional and virtual classrooms, teachers should compile and update a list of their favorite free digital tools as technology evolves. While there are many digital tools available for instructional designers, teachers, and students, the authors of their study suggested educators can explore new tools and learn from each other's experiences. This approach allows teachers to prioritize free digital tools, providing equal opportunities for students to access and use these tools for their education. However, as expressed before the cost remains a vital factor before the use and implementation of these tools. In order to tackle such a problem, it requires cost minimization of the digital tools seems to be necessary.

Neupane (2014) expressed that to promote digitalization in a rural part of Nepal the cost must be minimized by using the open-source medium at schools. The study was conducted in

Nepal's Baglung district revealed a significant lack of funding for science education in two schools. The affordable computing technology, such as Raspberry Pi, and open-source electronic library resources from Khan Academy and Wikipedia were currently underutilized resources in the country. Furthermore, to decrease dependence on external educational aid and promote ownership and progress of online educational platforms within communities seemed to be necessary.

In facts the potential benefits of building a computer-based electronic library in rural Nepal can support learning of students, as a means of improving science education. The cost and logistics of transporting physical books to rural areas can make an electronic library, built using low-cost single board computers like Raspberry Pi, an appealing option. The e-library could incorporate free educational resources like Wikipedia, Khan Academy, and WOW lab. Although building an e-library may seem challenging without support from a donor agency, Raspberry Pi's low cost and focus on promoting education make it a viable solution. As an assist to physical books, a computer-based library built with low-cost single-board computers like Raspberry Pi and incorporating free educational resources like Wikipedia and Khan Academy could be a cost-effective and accessible solution in Nepal.

Opportunities and Challenges of Digitalizing Education in Nepal

According to Marchenko et al (2021), younger students encounter greater difficulties in distance learning, including challenges in comprehending new concepts, struggles with maintaining focus, and issues with technology. Conversely, high school students are better equipped to handle these challenges. These findings can inform efforts to improve the educational experience for students, particularly for younger children in primary school, by implementing measures that make distance learning more accessible and comprehensible. Marchenko et al (2021) express that many countries are undergoing significant changes, influenced by both deliberate

pedagogical measures and the spontaneous impact of new technologies. Nowadays, students and pupils spend more time studying using personal computers, such as electronic textbooks, online curriculum resources, electronic library materials, and the Internet. It is essential to acknowledge these changes in order to adequately train competent professionals. Additionally, the concept of literacy has evolved to include both traditional teaching methods and information technologies. Education now encompasses virtual, visual, mass media, and multimedia forms of literacy. Developing an individual's information competence has a positive impact on their level of information culture and is an essential component of professional culture, as evidenced by various contemporary studies.

According to Rana (2018), the private colleges and schools of Nepal have their own methods for handling digital tools and resources, and training their teachers and staffs as the government does not have a distinct plan in place to supply government institutions with digital infrastructure or to train teachers in the use of digital technologies. In the study carried out by Rana (2017), it was found that the University Grants Commission plays a significant role in the development of universities, as it establishes policies, provides funding for resourcing colleges, recruiting staff, and training the staff. The opportunities which lie in the use of digital tools and technology are interconnected to the plans and policies of Nepal. According to Gulati (2008), the rapid advancement and adoption of digital technology has globalized and commercialized higher education, resulting in a range of flexible learning options including part-time and distance learning. The dynamic capabilities of information and communication technology (ICT) provide opportunities for both teachers and learners to generate open, autonomous, and convenient educational possibilities. Gulati (2008) further emphasizes that web-based technology has enabled the sharing of challenges associated with educational inequality and social exclusion, as well as

ideas for resolving such issues. As a result, the utilization of digital technology has progressively transformed teaching and learning approaches.

Thapa (2011) expresses that in Nepal, there is a lack of participation by school teachers in rural areas of Nepal in online communities, where they can share their problems and ideas. One of the primary challenges hindering this participation is the cost of accessing information and communication technology (ICT) resources. While the Nepal Wireless Network Project has made strides in improving access to ICT in rural communities for various sectors such as health, education, and micro-level businesses, the high cost of digital technology remains a significant barrier for the majority of the population.

Sharma and Kim (2016) pointed out that to ensure successful implementation of e-learning, it is essential to have adequate physical resources such as reliable internet connectivity and electronic devices. However, students from economically disadvantaged backgrounds, those residing in remote areas, and those attending schools with poor infrastructure often face challenges in accessing these resources. Similarly, the study conducted by Acharya et al., (2021) about 28.8% of respondents reported online education as unappealing. The study pointed out that Nepal should focus on infrastructure development (for online learning platform and digitalization) in higher education towards online facilities with adequate knowledge of new technology, organizing various motivational programs, provide training to faculties and students, increase collaboration with funding agencies, and so on. Moreover, from the student's side, the access and affordance also play a significance role. The World Bank (2020) expresses that access to electronic devices is a significant barrier for both teachers and students to participate in online and virtual classes- using the digital tools. Further The World Bank (2020) points that in order to engage in such classes, a suitable electronic device, such as a laptop, is a basic requirement. However, the high cost of such

devices can pose challenges for many learners who cannot afford it, particularly in low-income countries like Nepal, where the per capita income is \$1155.143.

The teachers' limited knowledge and skills in information and communication technology (ICT) appeared to be a significant obstacle to the effective utilization of available ICT resources in teacher education (Rana & Rana, 2020). Further the study, pointed that the lack of adequate technology skills was discovered to be the reason for their insufficient use of ICT in the classroom. The roles and skills of instructors in online learning serve as a framework for the creation of programs for teacher training and preparation. The disadvantage of online education is that these issues—empowering online teachers, encouraging critical reflection, and incorporating technology into pedagogical inquiry—are not adequately addressed. Another viewpoint views instructors as lifelong learners who continuously alter the importance of the structures associated with online instruction through a continuous process of reflection and action (Baran et al., 2011).

Digitization and Curriculum in Nepal

Apart from infrastructure and funding, the implementation of ICT education in Nepal is faced with several other challenges. Lack of training and opportunities for teachers, a reliance on NGOs for support, and the absence of an appropriate curriculum are some major problems for digitalization process (Dhital, 2018). Even schools with basic infrastructure may face a lack of qualified teachers, and those teachers who possess minimal knowledge of ICT often lack opportunities for professional development through training. Furthermore, there is no standardized criteria or documentation for ICT-specific training for public school teachers, with the exception of training programs provided by Open Learning Exchange Nepal. These challenges call for a comprehensive approach to address the limitations of ICT education in Nepal, including the need for investment in teacher training, the development of relevant curricula, and a sustainable funding

model that ensures equitable access and affordance in education across all schools (Anwar et al., 2020).

The School Sector Development Plan, SSDP 2016–2023 has some focus on digitization, and access to digital tools. Also, improving the capability in the teaching-learning process focusing on capacity development and appropriate development access to learning materials for incorporating these in the curriculum are focused in the plan. Adding on, SSDP's strategies emphasized the importance of ICT infrastructure, pedagogical teaching-learning resources, and ICT prerequisites as enabling elements in government schools.

The objectives of the SSDP 2016–2023 have been concentrated on areas that address issues with insufficient finance, a lack of secondary infrastructure, a shortage of skilled staff, and a lack of policy formulation and implementation that impede the idea of digitalization (Ministry of Education, 2016). For instance, one of the objectives specifically mentions creating an atmosphere by adding Digital requirements as enabling circumstances in government schools as well as the supply of technological facilities and teaching-learning resources for pedagogy. However, Transcend Vision Nepal (2016) argues that ICTs are not used in an effective manner for acquiring new knowledge due to the inadequacy of the curriculum. Similarly, inadequate infrastructure, the digital divide, and competent instructors who can uphold the government's vision for ICTs are some of the factors that have an impact on implementation, which has an impact on how ICT is integrated into the curriculum as well.

Policies and Plans for Digitation in Nepal

Nepal has prioritized the digitalization in education sector for the past decade. The National IT Policy (2010, 2015), 10th Plan (2002-2007), Three Years Interim Plan (TYIP, 2007-2010, 2010-2013), and School Sector Reform Plan (SSRP, 2009-2015) are just a few of the policies and

programs that Nepal has designed and executed that place a significant emphasis on ICT in education. The policies and plans had tried to integrate digital tools and technologies in various schools, colleges, and universities. To realize the objective of education in Nepal, the Ministry of Education (MOE) of the Government of Nepal (GON) has implemented a number of interventions to better the education system through digitation (Dhital, 2018). For instance, some of the projects -projects are launched in schools in our country with non-governmental initiatives were Open Learning Exchange (OLE-Nepal), OLPC (One Laptop Per Child), Nepal Wireless Networking Project (NWNP), Information Technology Society Nepal (ITSN), etc., (Dhital, 2018).

The School Sector Development Plan, or SSDP (2016-2023), was one of numerous plans and strategies the government had developed to enhance access to ICT resources. It placed particular emphasis on computers and printers being accessible to lower and secondary schools. enabling schools to take advantage of this ICT Support initiative, which includes both lower and secondary schools (Ministry of Education, 2016). Such a strategy by the government demonstrates that it places a high priority on expanding access. The use of Information and Communication Technologies (ICT) in education has been considered one of the strategies to achieve the broader goals of education for betterment in the quality of education. Furthermore, in the recent Education Sector Plan (ESP) 2021- 2030, the emphasis on the integration of ICT for the quality of education has been focused on. On the other hand, due to the fact that so many universities in Nepal now provide distance learning using Internet technology, students have more choices for flexible study options. In contrast, the country's rural areas continue to lack access to additional educational resources, which presents significant obstacles to learning (Shakhya et.al., 2017). The pressing need for leadership, management, and development in the infrastructure, allocation of human

resources to the community schools, etc., are prioritized in the plan which is some of the vital elements in the affordance of digital tools in the education sector.

On the other hand, Rana and Rana (2020), states that there exists a disparity between the educational policy, in terms of digital tools and technology at school, and the actual state of teacher education in Nepal. While the policy aims to provide teachers with up-to-date pedagogical and technological knowledge and skills, the current teaching and learning practices in the education system are conventional and outdated. The study concluded that “the lack of clear educational policy in ICT, strategic document and institutional plan are found to be major initial problems to effectively integrate ICT in planning and teaching activities in the universities. The limited ICT infrastructure and teachers’ poor ICT knowledge and skills have impacted the expected efficient practice of available digital technology” (Rana & Rana, 2020 p. 44). Despite the importance of digitalization, increasing the affordance, and accessibility of digital tools and technologies are prioritized by the government at the policy level, there exists several challenges which hinders the efficient use of digital technology in teaching learning process in Nepal.

The article "Opportunities and Challenges to Use ICT in Government School Education of Nepal," the national education plan School Sector Development Plan (2016–2023), which integrates and focuses on the use of ICT in government schools, is not in a stable position because the journey has been well-mapped out but still takes a while. The opportunities when the education system shifts or integrates digital tools, and digitalization, several opportunities can be experienced by learners and facilitators. Shakya et.al., (2017) expresses that the interactions between peers and instructors can "activate learners," and e-learning leverages learning tools to help students and trainees learn. Through e-learning, students are exposed to data from the actual world, saving them

time while looking for information and facilitating their analysis of vast data sets. A more in-depth learning experience is offered by e-learning. On the other hand, the limitation in e-learning has been experienced in Nepal. E-learning is particularly appropriate for remote learning because the resources are more adaptable where the accessibility of the resources and capability to use these resources are in play. As 80% of Nepal's population resides in rural areas, there aren't many institutions of higher learning in the country. Students in remote areas also struggle with schooling due to a lack of teachers and educational resources (Shakhya et al., 2017). Adding on, Higher education institutions, in Nepal, have faced more challenges over the last few decades as a result of the environment's growing globalization, digitization, and dynamic nature. These days, there are some obstacles that come with e-learning, and removing them is the main challenge. In fact, growing competition in higher education has prompted educators to broaden the breadth of their programs and use newly developing technology and inadequate human resources. Despite the opportunities and advantages such as benefits for educators and teachers in terms of efficiency and delivery- their lessons can be accessed and shared from various locations. This allows fewer instructors to travel and even when the course material may change over time which can be “cost-effectively,” changed and shared in less time than books and other materials.

E-Learning in Nepal

The idea of E-learning was something thought before the pandemic in many nations including Nepal. Kathmandu University and Tribhuvan University in Nepal are leading the way in offering distance education and MOOCs, and learning management systems are being broadly adopted by universities. As a result of increasing use of E-learning, the E-learning market is growing rapidly, and higher education institutes are adopting E-learning strategies more widely.

The notion of E-learning is different than conventional learning, where students learn the same topics at the same or different times provided by the teacher. Adding on, E-learning is a learner-centered approach where students have access to a wide range of content and have the flexibility to choose their desired topics for self-paced learning. Compared to conventional learning, E-learning has no limitations on accessing information, making it a more effective distance learning option. Many universities have upgraded their educational systems to include E-learning, which utilizes advanced technology to create educational materials with text, images, audio, and video (Shakya et al., 2017). These tools are helping educators to create a better learning environment, improve communication, and interact with students more effectively. Furthermore, students and teachers of today use information and communication technologies as learning aids in both their daily lives and academic endeavors. As a result, when compared to traditional learning, students get more knowledge both formally and informally through E-learning. When compared to E-learning, traditional classroom instruction is a distinct way of learning because it is teacher-centered and requires all students to study the same subject at the same time using the teacher's provided reading materials. Shakya et al., (2017) argued that E-learning is a desirable, effective, and affordable tool that offers learners more resources and access to information. With the advancement of technology, many educational institutes are offering online or distance education through E-learning materials. This has made learning more accessible for those who are unable to attend traditional institutions.

Digital commons can provide a platform for sharing digital resources via e-books, educational content, videos, and, among students, teachers, and educational institutions. These sharing of resources can help bridge the digital divide and ensure that students and teachers have access to relevant and high-quality digital resources. On the other hand, the lack of direct face-to-

face interaction tactics in online mode with high-class sizes, in the opinion of parents, hinders learning on the online platform. Many parents and teachers lack the necessary online training, which has led to technological issues. Poor connectivity and a lack of family-sized devices are further problems in underdeveloped nations. challenges with online appointments, technological aspects, enthusiastic learners, parental involvement, and social contact in synchronous online learning (Ametova & Mustafoeva, 2020).

RESULT

Digital commons

The concept of digital commons and has potential for promoting collaboration, knowledge sharing, and open access to information. While private schools in Nepal have already incorporated digital technologies, the government institutions lack a clear strategy for providing digital infrastructure and training teachers to use digital technologies. The development of digital commons in Nepal faces challenges such as limited infrastructure, lack of government support, and low levels of digital literacy among the population. Capacity-building and awareness-raising initiatives are necessary to promote the use of digital commons, and community networks can play a significant role in providing access to digital resources and infrastructure, particularly in rural areas.

The literatures suggests that the notion of digitalization is the use of digital tools and technologies for various purposes, and it is becoming increasingly important in today's education system. In education sector, digitalization involves the use of digital resources and systems by educators, administrative, students and teachers. The Covid-19 pandemic has highlighted the significance of remote learning, which relies heavily on digital tools in Nepal. However, there are

disparities in the distribution of digital resources between urban and rural schools which has been still been a challenge for the digitalization process. Nepal faces challenges in infrastructure development, teacher training, and access to technology, hindering the implementation of e-learning. While using the existing digital commons students have encounter difficulties in distance learning, teaching learning process and satisfaction level. Similarly, lack of participation by school teachers in rural areas in online communities, using the open-source resources, due to the high cost of accessing information and communication technology. Teachers' limited knowledge and skills in digital tools are significant obstacles to effective utilization of available resources in teacher education. The literatures had pointed out that to ensure successful implementation of e-learning, it is essential to have adequate physical resources and provide training to faculties and students. Additionally, teachers must be empowered, encouraged to reflect critically and incorporate technology into pedagogical inquiry through a continuous process of reflection and action.

Access to reliable internet connectivity and electronic devices is essential for successful implementation of e-learning. However, economically disadvantaged students, those in remote areas, and schools with poor infrastructure face challenges in accessing these resources. A study in Nepal recommended infrastructure development, training, motivational programs, and collaboration with funding agencies to improve online learning facilities. The high cost of electronic devices like laptops can pose a challenge for learners who cannot afford them in Nepal.

Digitalization and Education

It was found that the notion of "Digitalization" was referred with to the use of digital tools and technologies for various purposes, and it is becoming increasingly important in modern society as we transition into a new phase of socioeconomic growth known as the "digital economy." In terms of education the "Digitalization" has become an essential element of the education system

globally, including the use of digital educational resources, information, and systems by employees in the educational system. Remote learning became more significant during the COVID-19 pandemic, and it was noted that digital technologies are part of a new knowledge infrastructure that is steadily integrated into everyday life. While, Nepal is not equal or equitable, with urban schools having a higher possibility of having facilities for current technology, physical infrastructure, and qualified teachers than rural schools. While in urban areas some private school had taken steps by them self to empower teachers and students through various training and programmers.

Opportunities and Challenges of Digital Commons

While doing research several article and journals were found on this heading. In the literature various studies on the challenges and opportunities of digital technology in education in Nepal were found. This literature suggested that younger students struggle more with distance learning/ use of technology, while of government support for digital infrastructure and teacher training also lacked to use the digital tools efficiently. Despite there lies a tremendous possibility of digital technology on higher education, the cost remains as a barrier to access and access to digital commons. The importance of reliable internet connectivity and electronic devices for successful e-learning, infrastructures and training programs for effective online education are necessary factors to mitigate the challenges in digitalization process.

Affordance of Digital Commons

It was found that the use and integration of digital tools in education face challenges in developing countries due to poor economic conditions, insufficient government funding, lack of skilled teachers, and inadequate technology resources. In terms of affordance the economic status

of developing nations is a significant factor that affects the adoption and use of digital technology. These countries encounter obstacles such as financial constraints and high unemployment rates, making it challenging for individuals to purchase expensive technological devices. Educational institutions with limited budgets have difficulty acquiring expensive technologies with advanced learning features, making cost minimization necessary. To promote digitalization in rural areas, open-source technologies like Raspberry Pi and free educational resources like Wikipedia and Khan Academy can be utilized to build a cost-effective computer-based electronic library that improves science education. Such initiatives require systematic investment from the government and the university to ensure sustainability and bring changes to the existing traditional education system.

DISCUSSION

The concept of digital commons is relatively new in Nepal, and the current state of digital commons is underdeveloped, with limited awareness among the general public. Despite several plans and policies, limited infrastructure, lack of government support, and low levels of digital literacy among the population are some of the challenges hindering the development of digital commons in Nepal. The use of digital commons in education is vital and significant for developing countries like Nepal, where access to information and digital resources can enhance educational opportunities for learners. E-learning technology can help ensure equitable access to the greatest tools and materials, making it easier for educational institutions to provide educational services to students, especially in remote areas. It was found that there are various factors which comes into play when, any individuals or intuitions are integrating or implementing the digital tools for

efficient use. In the study it was found that the cost, capacity of individuals, financial planning, access to tools, etc., appears to be significant for “Digitalization of Education in Nepal.”

On the other hand, from other’s research finding several aspects were pointed to make the digitalization process effective. Murdock (2005) and pointed out that income inequality can create a gap in access to digital tools and technology among individuals, leading to disparities in opportunities for learning and growth. This is particularly relevant in the context of Nepal, where a large portion of the population lives with average income, and may not have access to the necessary digital tools and resources for learning. Furthermore, the concept of digital commons is also important in Nepal, where collaboration and collective knowledge-sharing can be key to overcoming the challenges of limited access to resources. However, in order to effectively implement the digital commons in Nepal, there are several challenges that need to be addressed. These include the cost of accessing digital tools and technologies, the need for greater knowledge and skills in using and applying digital resources, and the issue of limited access to technology and infrastructure in certain areas. Despite these challenges, the digital commons can be a powerful tool for promoting equity and access in education in Nepal. By creating a shared space for learning and collaboration, individuals and communities can work together to overcome the barriers to access and create a more equitable and inclusive learning environment. This requires not only the availability of digital tools and resources, but also a commitment to fostering a culture of collaboration and knowledge-sharing that values the contributions of all members of the community.

For instance, capacity-building and awareness-raising initiatives are necessary to promote the use of digital commons in Nepal. Community networks can play a significant role in providing

access to digital resources and infrastructure, particularly where the digitalization process is happening. This is because when ICT or new innovation are integrated it passes through the sociocultural setting of the school, environment, perception of the school staff members, and capability implement can reciprocally have an impact on the usage (Salomon, 1993). Therefore, collaborative efforts are required to overcome the challenges hindering the development of digital commons in Nepal. Digital commons can offer a means for people to collaborate, share knowledge, and collectively create and manage resources that are accessible to all. For Nepal, the development of digital commons can enhance educational opportunities and contribute to the overall socio-economic growth of the country.

The innovative use of open-source (OS) software in computer science education has the potential to affect course resources by introducing the challenge of selecting the appropriate OS project as a course resource at school and high schools of Nepal. However, the decision should consider the desired outcomes and overall context of the course who understands how to use the available resources to achieve the concepts or objectives of curriculums. Additionally, Sulisworo and Sudarmiyati (2016) had expressed that open source supports cooperative learning using Moodle, an open-source learning management system, but in several literatures, it was found that access, affordance and capability to use the digital tools were major problem for implementing the digital tool and technologies in Nepal. In addition to physical resources, an appropriate curriculum and teaching methodology are also crucial for effective e-learning. Without a well-designed exercise plan and delivery system, online classes, use of technology may fail to engage students and achieve desired learning outcomes. Therefore, educators need to incorporate innovative teaching strategies and use various multimedia tools to make e-learning more interactive and engaging for students.

Open-sources and its theory expressed that concept of making software, code, and knowledge should be freely available to everyone, without any restrictions or limitations. The limitation, such as affordance, capability to use and propriety by the government to use can hinder the use of opens-source resources in Nepal. Neupane (2014) expressed that to promote digitalization in a rural part of Nepal the cost must be minimized by using the open-source medium at schools. Indeed, if the cost of the digital tools is higher, despite its tremendous possibilities the digitalization process could be affected.

Further the open-source suggests on the promotes collaboration, transparency, and community-driven development. Rana and Rana (2020) expressed, the view that Faculty of Education, Nepal has successfully set up a computer laboratory, purchased projectors, and provided internet access for both teachers and students through the help of international organizations. However, the project's sustainability and its ability to bring changes to the existing traditional education system are unlikely without systematic investment from the government and the university, as foreign support is typically temporary. Without the systematic investment from the government on the digital commons and digitalization process in Nepal, the public school, higher schools and universities are unlikely to use potential of open-sources resources.

The open-source theory also suggests for the promotion of collaboration, transparency, and community-driven development. By this it means that the users can use the available resources, open sources, and even modify as per need and even share it with larger community of users. Nevertheless, while using the open sources the educators can also collaborate with educators and address the specific needs and concerns of individual students, thereby promoting inclusive and equitable e-learning practices- even use the existing digital tools.

There lie more factors apart from the affordance of the digital commons. For instance, for effective implementation of digital tools requires not only physical resources such as internet connectivity and electronic devices but also a well-designed curriculum, innovative teaching strategies, and parental involvement. By addressing these factors, the digitization in education can ensure that e-learning, use of the open source, applications and other digital commons in Nepal.

Since, the digitalization in education is a complex and dynamic issue that has been gaining significant attention in recent years, particularly during the COVID-19 pandemic. As the use of digital tools and technologies becomes increasingly prevalent in education, it is important to examine the ways in which these changes are affecting the field of education at present too. Before the pandemic, in Nepal, e-learning had the potential to bridge the gap between urban and rural areas and provide equal opportunities for students to access education. As open-source began emerging through the use of the Internet as a tool in productive activity, serving as both a road map and a metaphor for non-linear communications that generate dynamic, web-like problem-solving systems. It is, and continues to be, an illustration of tools to theory heuristic—but because tools and theory are moving so fast and in such transparent fashion one that can be captured in real time Gigerenzer's (1991). Similarly, as Shakya et.al., (2017) point out, e-learning can activate learners by promoting peer-to-peer and instructor-to-learner interactions, and it can also provide access to data from the real world, saving time and enabling analysis of vast data sets.

There are limitations to digital commons and affordance of these digital tools in Nepal, particularly from the perspective of accessibility and capability to use digital resources. As 80% of Nepal's population resides in rural areas, access to institutions of higher learning is limited, and students in remote areas face challenges due to a lack of teachers and educational resources. The lack of infrastructure, such as reliable internet connections, also hinders the implementation of e-

learning in Nepal. To address these challenges, it is important to develop strategies that promote equal access to digital resources and build the capability of students and educators to effectively use these resources. This could include providing training and support for educators and students on the use of digital tools, developing infrastructure to support e-learning in remote areas, and promoting partnerships between institutions and organizations to share resources and expertise. Furthermore, e-learning can also create new opportunities for personalized and adaptive learning experiences. Through the use of data analytics and artificial intelligence, e-learning platforms can provide customized learning experiences tailored to the individual needs and preferences of learners. This could be particularly beneficial in Nepal, where students face a range of challenges in accessing education and require personalized support to succeed. Overall, the integration of digital tools and e-learning in education has the potential to transform the education landscape in Nepal and create new opportunities for learners and educators

One area of concern is the impact of digitalization on traditional modes of teaching and learning. While there are many potential benefits to incorporating digital resources into education, such as increased access to information and more flexible learning options, there are also risks associated with over-reliance on technology.

Rana and Rana (2020), states that there exists a disparity between the educational policy, in terms of digital tools and technology at school, and the actual state of teacher education in Nepal. The students may become too reliant on digital resources and lose critical thinking skills or the ability to engage in face-to-face communication. To elaborate on this more integration of digital tools and technology in education is becoming increasingly important in today's world. However, as pointed out by Rana and Rana (2020) there is often a disparity between educational policy and the actual state of teacher education in Nepal. This can result in students and teachers not receiving

the necessary coaching, and guidance on the effective use of digital resources, potentially leading to negative consequences such as over-reliance on technology and a decline possibility of effective use of various resources.

While the use of digital tools and technology in education can be beneficial, it is important to recognize that they are not a replacement for face-to-face communication and other traditional methods of learning. As students become more reliant on digital resources, there is a risk that they may lose the ability to engage in face-to-face communication, collaboration, and problem-solving. This can have long-term negative consequences for their personal and professional development too. E-learning attitudes of students thought to affect their desire for continuing education. High-quality learning experience of students does not only result from the efforts of teachers in e-learning (Haznedar & Baran, 2012). Similarly, online learning is believed to be a more sustainable option for faculty, students, and lecturers (Akcil & Bastas, 2020). However, in order to take advantage of this potential, it's important to explore the challenges that have arisen during the pandemic and transform them into opportunities for hybrid instructional activities. To do this, lecturers and university managers must improve their technology usage capabilities with regard to e-learning, especially in the context of distance education. By doing so, they can ensure that students have access to high-quality education regardless of their location or circumstances. It seems to be necessary for digitation process in Nepal, since the “teaching presence,” which refers to the degree to which instructors or facilitators in an online learning environment are able to design and guide the learning process can happen only if the digital tool are in use by the educators for the teaching learning process- at school or universities.

Therefore, it is crucial to ensure that students receive a well-rounded education that integrates both digital tools and traditional methods of learning. This requires effective teacher

education programs that provide teachers with the necessary skills and knowledge to effectively integrate digital tools and technology in their teaching practices. This includes training on how to use digital resources in a way that enhances critical thinking and problem-solving skills, rather than replacing them. Moreover, it is important to establish clear policies and guidelines for the use of digital tools and technology in education. This can include measures to prevent over-reliance on digital resources and promote a balanced approach to learning. For instance, schools can implement policies that require a certain amount of face-to-face communication and collaboration in group projects, or that limit the use of digital tools during certain periods of the day.

Neupane (2014) expressed that to promote digitalization in a rural part of Nepal the cost must be minimized by using the open-source medium at schools. The affordable computing technology, such as Raspberry Pi, and open-source electronic library resources from Khan Academy and Wikipedia were currently underutilized resources in the country- in accord to the study done by Neupane. However, to decrease dependence on external educational aid and promote ownership and progress of online educational platforms within communities seemed to be necessary. By this, we mean to say that there are online resources, which are free, but having a group or community which takes the resources further more to use in efficient ways seems to be necessary in Nepal.

On the one hand transporting physical books to rural areas can make an electronic library, built using low-cost single board computers like Raspberry Pi, an appealing option. Also, the e-library could incorporate free educational resources like Wikipedia, Khan Academy, and WOW lab. On the other hand, physical resources, an appropriate curriculum and teaching methodology are also crucial for effective e-learning. Without a well-designed exercise plan and delivery system, online classes may fail to engage students and achieve desired learning outcomes. Therefore,

educators need to incorporate innovative teaching strategies and use various multimedia tools to make e-learning more interactive and engaging for students. Educators' can also collaboration with experts, exploring right approach and trainings, needs and concerns of individual students, thereby promoting inclusive and equitable e-learning practices are also some considerations that needs to attention.

While digital tools can provide greater access to information and resources, they can also exacerbate existing inequalities if students do not have equal access to technology or if certain populations are excluded from digital resources (Barger, 2020). In order to promote access to educational opportunities for all social groups, it's necessary to address issues of inequality and social justice. Some challenges such as high barriers to entry in OS projects, difficulties related to student support, assessments, grouping of students and choice of an adequate OS project are the potential challenges (Alasbali & Benatallah, 2015). Also, teaching and learning about power relations and providing materials that highlight the voices of marginalized groups remains another question- from equity and equality perspective.

The noton of access to digital tools and technology should also be kept in consideration from the point of equity which affirms the access to education that involves digital tools and technology, physical, material, emotional, social, and spiritual well-being of both individuals and society as a whole. Barger, (2020) has put forward the idea that “the use of internet platforms would lead to the democratization of education by enabling access to education for everyone” (p. 40). The use of internet platforms has revolutionized the way education is delivered and accessed, leading to a democratization of education in today's world. With the increasing availability of online resources and e-learning platforms, people from all walks of life can now access educational opportunities that were previously limited to a select few. The internet has made education more

accessible and convenient, providing learners with the flexibility to learn at their own pace and on their own terms- excluding the aspects of access and affordability.

Technology is defined as the making, modifying, using, and knowing of tools, machines, techniques, crafts, systems, and methods of organizing them to solve problems, improve pre-existing solutions, achieve goals, handle applied input/output relations, or perform specific functions (Aithal & Aithal, 2015). As Nepal moves towards a more technology-integrated education system, it is important to keep in mind the importance of designing effective pedagogies and learning experiences that make the most of available technology while also addressing the needs of all learners.

There has been a discussion on integrating information and communication technology (ICT) into the education system at the school and university level in Nepal as a part of Digitalization in Education. The government has developed a master plan aimed at promoting the widespread use of ICT in the education sector to improve access and quality of education for all. The plan also aims to address the digital divide by providing ICT-integrated teaching and learning environments. Several pilot programs have been initiated to evaluate the effectiveness of ICT in education. Additionally, both Tribhuvan University (TU) and Kathmandu University (KU) have policies in place to promote the use of ICT in their respective institutions (Parajuli, 2016) but it seems to be necessary to evaluate and rethink the major challenges for implementing online teaching and learning practices.

In the context of Nepal, where access to education has long been a challenge, the democratization of education through Internet platforms has the potential to address the issue of educational inequality. In Nepal's rural population (having less access to digital platforms and

other aspects of digital commons), many students do not have access to quality educational resources due to a lack of infrastructure and resources. Neupane (2014) suggested that in rural areas of Nepal, promoting digitalization would require cost reduction through the use of open-source tools in schools. Neupane (2014) had recommended for utilizing affordable computing technology like Raspberry Pi and open-source electronic library resources like Khan Academy and Wikipedia, which were currently not being used effectively. The study also emphasized the need to reduce reliance on external educational aid and promote community ownership and the development of online educational platforms focusing on community development in the process of digitalization. However, the use of digital tools and technology has the potential to bridge this gap by providing access to educational resources regardless of physical location.

Online learning platforms such as MOOCs (Massive Open Online Courses) and e-learning platforms are increasingly being used in Nepal to provide access to educational opportunities. The government of Nepal has also launched initiatives such as the National E-learning Center to promote e-learning and improve access to education. These initiatives are helping to democratize education in Nepal by providing educational opportunities to people from all walks of life, regardless of their physical location or socio-economic background.

Moreover, the democratization of education through Internet platforms can also help in promoting digital literacy and skills in Nepal, which is becoming increasingly important in the modern world. It can also provide opportunities for marginalized groups, including women and girls, to access education and improve their socio-economic status. The democratization of education through Internet platforms has the potential to transform education in Nepal, improving access and promoting equity in education. This lack of access to electronic devices can result in unequal opportunities for education, with students who cannot afford the required technology

falling behind their peers who have access to these devices. Furthermore, there are additional costs associated with maintaining and repairing electronic devices, which can pose further financial burdens on low-income households. Efforts to improve access to electronic devices can be facilitated through various means, such as government subsidies, partnerships with private organizations, and funding support from international aid agencies. Additionally, initiatives to provide refurbished or second-hand electronic devices can help make such technology more affordable and accessible to low-income households. However, there is a need to ensure that access to these platforms is equitable and that students have the necessary digital skills to effectively utilize them. Additionally, measures need to be taken to address the challenges of infrastructure and resource limitations to ensure that students from all areas of Nepal can benefit from the democratization of education through Internet platforms.

Access to electronic devices is a significant barrier for both faculties and students to participate in online and virtual classes. In order to engage in such classes, a suitable electronic device, such as a laptop, is a basic requirement. However, the high cost of such devices can pose challenges for many learners who cannot afford it, particularly in low-income countries like Nepal, where the per capita income is \$1155.143 (The World Bank, 2020). Consequently, in addition to addressing the affordability of electronic devices, digital literacy programs can be implemented to enhance the skills of faculties and students in using digital technology effectively. This can potentially reduce the barriers to participation in online and virtual classes, increase engagement, and promote more inclusive and equitable education opportunities.

The digitalization of education in Nepal is still in its early phases, but it has already shown some potential benefits, such as increased access to education for isolated or disadvantaged students and the ability to personalize learning. However, there are also significant challenges,

such as a lack of resources and technical support for students and educators, and a digital divide among students. The emergence of online teaching and learning or e-learning technology has brought up various issues related to operating different learning platforms, creating materials, sharing, designing, developing, and communicating with others. Orlando and Attard (2015) suggest that teaching with technology is not a one-size-fits-all approach because it depends on the types of technology being used and the curriculum content being taught. This indicates that the integration of ICT in teaching requires careful consideration of teaching pedagogy and the construction of learning experiences. Despite this, it is often assumed that technologies can enhance learning (Kirkwood & Price, 2014).

In Nepal, where there is still a digital divide and limited access to technology, the integration of ICT in teaching and learning faces additional challenges. Teachers need to be proficient in using technology and designing effective online learning experiences. Students need to have access to technology and the skills to use it effectively for learning. However, technological knowledge can also support isolated students by providing social support, interaction, and skill development (Gillett-Swan, 2017).

Conclusions

In conclusion, the development of digital commons in Nepal has several challenges, including limited infrastructure, lack of government support, and low levels of digital literacy. It was found that affordance and accessibility are equally important with skills and users (teachers and learners). For a developing, Nepal, several plans and policies, limited infrastructure, lack of

government support, and low levels of digital literacy among the population are some of the challenges hindering the development of digital commons in Nepal. Consequently, the use of digital commons in education can enhance educational opportunities for learners and teachers if challenges such as the cost of accessing digital tools and technologies are considered by government form policy level. There are several requirements while using and applying digital resource which must be thought from various levels and stakeholders. Collaboration, capacity-building, and awareness-raising initiatives are necessary to promote the use of digital commons in Nepal and use of Open-sources in teaching learning practices. The innovative use of open-source software in computer science education has the potential to enhance course resources, but the decision to use it should consider the desired outcomes and overall context of the course- which Nepal can also implement effectively.

Affordance of digital commons has various factors for efficient use in education, on the other hand effective implementation of digital tools requires not only physical resources such as internet connectivity and electronic devices but also a well-designed curriculum, innovative teaching strategies, and parental involvement. Most literatures suggests that there exists tremendous possibility of digital technology on higher education but cost, investment, skills, capability to use the technologies remains as a barrier in digital commons.

Lastly, the promotion of digitalization in Nepal needs systematic investment from the government and the university to bring sustainable changes to the existing traditional education system.

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