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Integration of ICT in Classroom: Perception of University Teachers and Students

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Abstract

Information and Communication Technology plays a significant role in promoting educational sector including teaching and learning. Quality in education demands intensive use of ICT. The main objective of this study is to explore the perception of teachers and students regarding the use of ICT in teaching and learning. Besides, it attempts to identify the barriers and challenges faced by the teachers and the students in using ICT. Using qualitative methods of study, it gathers insights through interviews to explore their perceptions of ICT use in teaching and learning. The data have been analyzed to extract common themes and divergent viewpoints. The findings reveal that both teachers and students recognize the significant benefits of ICT in enhancing learning and teaching processes showing a significant disparity in ICT access and usage, influenced by factors like infrastructure, financial constraints, technical issues, training, and levels of ICT literacy. The study emphasizes the transformative potential of ICT in teaching and learning, alongside the necessity to enhance ICT infrastructure, training programs, and policy initiative to bridge the digital divide and promote equitable educational opportunities. This study offers practical implications for policymakers, educators, and technologists, enhance technology assisted environments effectively and inclusively.

Keywords: Classroom, digital skills, ICT, pedagogy, teaching and learning

Introduction

In recent years, the use of ICT in education has garnered significant attention globally. The emergence of digital tools has revolutionized traditional teaching methods, offering unique opportunities to improve educational outcomes. ICT encompasses a broad range of technologies such as computers, interactive whiteboards,

educational software, the internet, and mobile devices, all of them can transform classrooms into dynamic and interactive learning environments. The use of ICT is driven by the necessity to equip students with essential digital skills for the 21st century workforce. This shift corresponds with broader societal and economic changes that accentuate the importance of technological proficiency in contemporary life. Additionally, ICT facilitates access to vast information resources, supports personalized instruction attuned to individual learning needs, and nurtures collaborative learning experiences that extend beyond physical classrooms. Despite these benefits, the effective utilization of ICT in classrooms faces challenges. These include infrastructure issues like inadequate technology access and internet connectivity, as well as pedagogical challenges such as teachers' readiness to use ICT into their teaching practices. Furthermore, concerns about digital equity persist that indicate the need for equal access to technological resources regardless of students' socioeconomic backgrounds.

Despite the numerous benefits of using ICT in education, the effective utilization of ICT in classrooms especially in higher education is filled with a number of challenges. These include lack of resources, problems with digital divide and internet connectivity, as well as pedagogical challenges such as teachers' readiness to use ICT into their teaching practices. Furthermore, concerns about digital equity persist that indicate the need for equal access to technological resources regardless of students' socioeconomic backgrounds. The use of ICT in education has been restricted in many developing countries including Nepal by lack of funding, training for teachers and unbalanced access to technology. The objective of this study is to address the gap about how these variables affect the perceptions and experiences of university teachers and students while employing ICT for classroom teaching and learning.

Review of Literature

Passkey et al. (2018) show that ICT enables more personalized learning experiences making the learning technologies suitable for educational content to meet individual needs and learning paces, improving students' understanding and retention of information. ICT facilitates collaborative learning through online discussion forums, group projects, and shared digital workspaces. Chai et al. (2019) report that such platforms enhance communication and teamwork skills among students.

Likewise, ICT in classrooms has been linked to higher student engagement levels. Interactive and multimedia content captures students' attention more effectively than traditional teaching methods. Harris et al. (2016) state that students are more motivated and are found more participative when ICT tools are integrated into classrooms activities. Moreover, ICT provides diverse learning resources and activities that cater to different interests and learning styles. Yang and Kwok (2017) indicate that students find lessons more interesting and motivating when involving ICT.

The use of ICT in classroom is not devoid of challenges and barriers. A significant challenge is the lack of adequate infrastructure and access to ICT resources. Make (2020) highlights the issues such as insufficient access to computers,

unreliable internet connections, and lack of technical support, especially in rural and underfunded schools. Similarly, the high cost of acquiring and maintaining ICT equipment is a common barrier. Tondeur et al. (2017) point out that financial limitations prevent many schools from fully integrating ICT into their curricula. Furthermore, effective use of ICT in education requires teachers to be proficient in using digital tools. Fu (2013) emphasizes the need for ongoing professional development and training to enhance teachers' ICT skills and confidence.

ICT has enabled teachers to adopt innovative teaching methods. Sang et al. (2018) show that teachers who integrate ICT into their practices tend to use more student-centered approaches, promoting active learning, and critical thinking. ICT tools provide new ways to assess student learning and provide timely feedback. Redecker and Johannessen (2013) revealed that digital assessment tools help track student progress and identify areas for improvement more efficiently than traditional methods.

Researchers have shown mixed impacts of ICT on academic performance. While some studies, like those by Scherer et al. (2019) report significant improvements in student achievement due to ICT integration, others suggest that benefits are more pronounced when ICT is used effectively and complemented by good teaching practices. ICT use in education contributes to developing digital literacy skills, essential for students' future academic and professional success. Voogt and Roblin (2012) highlight that students who regularly use ICT in their studies are better prepared for the digital demands of the modern workforce.

The current status of ICT use in teaching and learning in Nepal shows a mix of progress and ongoing challenges. For the effective integration of ICT, into Nepali education, there is a need for continued investment in infrastructure, regular and practical professional development for teachers, and the development of localized digital learning materials. Leveraging available resources, such as mobile networks and free web applications, can help mitigate some of the current barriers.

The literature discussed above indicates that the use of ICT in education is increasing. Despite the increasing interest in the use of ICT in education, current research often lacks a detailed exploration of the specific narratives of both teachers and students. Previous studies have generally focused on either one group or provided a broad overview without inquiring the subtle perceptions and experiences that shape ICT integration in the classrooms. This research aims to address this gap by systematically exploring the perceptions of both teachers and students. Consequently, it seeks to expose the benefits, challenges, and barriers from multiple perspectives, ultimately providing a more comprehensive understanding the role of ICT in education. The findings will inform strategies for more effective use of ICT to meet the needs and overcome the challenges identified by the teachers and the students.

Methods and Procedures

This study has used a narrative inquiry approach to explore the perceptions of teachers and students regarding the use of ICT in classrooms. The participants in this study are selected purposively four teachers and five students from a public

campus of Myagdi district. The research participants are Bina, Sita, Nira, Juna and Muna (pseudonyms) representing the students and Arun, Maya, Manoj, and Hari (Pseudonyms) representing the teachers. Since the narrative study has allowed the researcher to study with a small number of participants. This type of rapport-building helps the interviewer and interviewees understand each other and gain trust (Chenail, 2011 and Kim, 2016). This study has used open-ended interview as the research instrument. The participants have felt comfortable telling their perceptions. Asking simple questions is the "beauty of qualitative inquiry" (Chenail, 1995). In depth interview has been conducted with nine participants-four teachers and five students teaching and studying in public campus of Myagdi district. The researcher has visited each participant personally and built a rapport. They have been clearly informed about the purpose and significance of the study. Moreover, the participants have been assured about their anonymity in the write-up and the confidentiality of the data. Then in-depth interview has been conducted with each participant on different dates while they are having leisure time during their working hours. The interview is recorded on a voice recorder. Then the interview data are transcribed listening to the audio- recording. After transcribing the audio recordings, the transcriptions have been read and re-read to get a thorough understanding. The narrative elements have been identified and the data have been coded labelling the key phrases and sentences. Following it, being based on the codes and categories, comprehensive narrative has been developed. Finally, the narrative has been synthesized into different themes as suggested by Clarke and Braun (2021).

Results and Discussion

Positive Attitude and Belief about Using ICT in the Classrooms

In order to explore the perception of the teachers, the participants were asked how frequently they use ICT tools, how do they feel about using ICT tools in their classroom, which ICT tools they use most often and if they believe ICT enhances teaching and learning process. Moreover, they were asked to describe a typical lesson in which they integrated ICT.

All the participants stated that they often use ICT in their classroom, they felt happy, willing and enthusiastic about using ICT in their classroom, they often use laptop and projectors and they believed that ICT enhances teaching and learning process. In this context, Arun, one of my research participants, shared his experience:

> As a teacher I enjoy using ICT tools. I employ a variety of ICT tools in my instructional activity. I was interested in ICT while I was a student. When my teachers used ICT in the class, it was so interesting and easy to learn and understand. The ICT resources I employ in classroom are laptops, projectors, and interactive board. . In addition, I have started utilizing mobile devices and AI tools. I believe 100% that ICT helps teaching and learning process.

The above narrative indicates that the teachers have a strong positive attitude and belief about using ICT in the classroom.

Likewise, Manoj, one of my other participants, also felt strongly that ICT

should be used in the classroom. He revealed:

> Even though I am not very good at using technology because I am 56 years old and did not have the opportunity to learn how to use it in time, I firmly believe that ICTs should be used in classrooms. Without a doubt, ICT improves the teaching and learning process in the classroom, and ICT-assisted teaching tactics should take the place of conventional teaching approaches. ICT in education has the power to transform teaching and learning practices.

Similarly, Maya, one of my participants who teaches English at the bachelor's and master's levels, had a similar statement on the usage of ICT: "Using ICT really motivates teachers and students too. In a short amount of time, we can teach more lessons. Thus, it is incredibly productive, efficient, and decent. Adopting it in the classroom is highly beneficial in language teaching." In response to whether she could describe a typical lesson where she used ICT, she mentioned:

> Yes, I taught the first lesson of master first semester using ICT. I invested four or five hours preparing the materials before beginning the ICT session so that I could instruct my students extremely well. I could provide them with more advice in the hour that we shared together. Using ICT has been much better and taken less time because I was able to provide them with more information in a shorter period of time, so my experience in using ICT is far better and less time consuming. It assists to complete the course in time.

Effectiveness of ICT Use in Classroom

Effectiveness of ICT use in classrooms is greatly influenced by the mastery of skills and competencies of the teachers. Unless the teachers themselves are not equipped with the ICT skills and competencies, the successful application of ICTs is not possible. In order to identify the skills and competencies of the teachers about using ICT in their classrooms, the participants were asked how they access themselves regarding their ICT skills and competencies, how proficient they are in using basic office software. Further they were asked to describe their experience with using educational technology tool LMS, Moodle Google classroom etc. 32-year-old, Arun, an assistant instructor at a community college, responded to the questions above by saying that:

> ICT is too extensive. It is full of different elements and skills. When it comes to ICT, there is still a lot to learn. I am over the intermediate and almost advanced level when judging myself based on the fundamental information and skills needed for my discipline and profession. Basic office software, like Word, Excel, PowerPoint, and so forth, don't confuse me. In particular, I used Zoom, Microsoft Teams, and Google Classroom during COVID-19. Furthermore, I assessed the students' abilities using MCQs using Moodle schedule.

Likewise, the other participant, Maya said:

> Regarding the ICT skills and competencies, I evaluate myself as a literate. I can use word, excel, and PowerPoint comfortably, but I am not confident enough in using other

> skills. Once I used Google classroom at the time of COVID-19. I found it fruitful and effective. I sometimes use Google classroom.

Access and acceptability is a prerequisite for the application of ICT in classrooms. To explore the access and acceptability condition of the ICT tools and devices the participants were asked what the necessary ICT tools available to them are and what technical support is available in their institution.

All the participants said that computer, laptop projector and mobile are the basic ICT tools available to them in their classroom. Some modern ICT tools like interactive board were not available. Regarding the access and accessibility of the ICT tools, one participant Arun said:

> ICT tools basic for classroom are projector and computer. Moreover, what we require is interactive whiteboard where digital apps can be installed and operated. Besides, there should be easy access of internet in each class. We have technical system in our institution but not enough.

The above narrative indicates that there is still lack of modern digital devices like interactive board in our classroom. Moreover, the internet is not equally strong in each class. Support system is not strong and updated though the provision has been made.

Transformation of Classroom Environment through ICT

Transformation of classroom environment can occur if the teachers are convinced of the perceived benefits of use of ICT in the classroom. Perceived benefits represents the extent to which the teachers believe that using a particular technology would enhance their job performance. If teachers feel there is no need to question or change their professional practice, then they are unlikely to adopt the use of ICT tools. In contrast to it, if they perceive ICT to be useful to them, they use ICT in their teaching and the students learning then according to the empirical evidence of previous studies (core, Preston, and cox 1999) they are more likely to have a positive attitude in using ICT in the classroom. To explore the perceived benefits of ICT, the participants were asked what the main benefits were, they observed from using ICT in teaching, how ICT impacted student engagement and learning outcomes in the classroom and how motivated they found their students while using ICT in the class.

All the participant in this study were confirmed of positive consequences the use of ICT would bring in their teaching. Regarding the benefits of ICT in the classroom, Arun, one of the participants, shared:

> First of all, it affects perception of students. When we show our students something rather than saying it becomes image in their mind and lasts longer. We can give more with lesser effort. When we teach using ICT, it affects their engagement making the class more interactive. The students are highly motivated while using ICT tools because the tools can attract the whole attention of students if we create the content invitingly.

The above narrative elucidates the benefit of using ICT in the classroom. Regarding the same, the other participant, Manoj said, “There are so many benefits of using ICT in teaching. The most

interesting fact is that the use of ICT motivates the learners, we can search and bring varieties of materials and content in our subject. It is a good source of learning." As skills and training exist together, training is essential for teachers to develop their ICT skills. To explore the status of training and support, the participants were asked if they had received any trainings on how to use ICT in teaching. If they had received the training, what kind of training they had received and what kind of support system was available to them in using ICT.

Most of the participants said that they had taken some kind of training on how to use ICT in teaching. Regarding the training and support, one of the participants, Hari said, "I have taken TOT level training on teaching with ICT tools. I have attended the training on how to work on LMS organized by Tribhuvan University." Regarding the same, another participant Maya shared her experience: "Time and again I have taken such type of training but still more training is necessary because it is more practical work, short trainings held once or twice are not sufficient. Though there is technical support available it is not sufficient." The above statements clearly show that short-term trainings organized once or twice over years are not sufficient. Such trainings should be organized regularly by the concerned institution.

Challenges and Barriers

Using ICT in the classroom is not devoid of challenges and barriers, as in other fields of life. There may be a bunch of difficulties. Regarding the challenges and barriers the participants were asked what challenges they had faced while incorporating ICT into their lessons and how they overcame the challenges. They were also asked to describe a challenging situation they faced while using ICT in the classroom. Finally, they were requested to suggest some strategies or support system to overcome those challenges.

All the participants were of the view that they were some challenges and barriers in using ICT in the classroom. Regarding it, Arun shared:

> Power-failure, lack of device and updating with the technology as they keep on emerging are some of the problems. He further said, 'I was teaching mathematical concepts by using PAD, suddenly it did not function and the class was heavily disturbed. As it was COVID period it was not possible to go outside and get it repaired.

Similarly, another participant, Maya shared her experience: "There is not smooth flow of internet sometimes there's disturbance due to electricity cut. If such type of problems occurs, they kill our time and it's difficult to control the class as well." Describing a challenging situation, she faced, she added:

> Once I had prepared a lot in my laptop for M.ED. Class presentation, when I came here the classroom for the class, the projector did not work. My whole content was in laptop. At that time I was not good at operating laptop, I was just a beginner. I lost my confidence a little bit. I put the laptop aside and started my class.

Other participants also shared similar views as they experienced lack of power supply, slow internet or limited technical

support and lack of training. They further added that they felt humiliated when they were not able to solve the technical problems themselves immediately in the class. The participants suggested the strategies to overcome the challenges. Suggesting the strategies one participant Arun stated:

> First of all policy makers or management committee in an institution should realize the fact that teaching and learning can be made effective by using ICT. They should manage ICT infrastructure with the provision of alternative devices. Frequent training should be organized for the students and teachers so that they can be updated with the recent development in the field of ICT. Such training should be conducted not only locally but also nationally and internationally by the experts. Those who used the technology earlier. So there should be sharing of experiences. Where there are challenges there are solutions, too.

Putting forward her suggestions another participant Maya said, “First of all the teachers should be given more training. Besides, there should be proper devices with the students. It needs more funding. The government should allocate more budget for ICT infrastructure. Moreover, encouragement and boost-up for both students and teachers are equally important.” Regarding the same, Manoj shared, “The state should form the policy to adopt ICT fully in education. Besides, the state should bring rapid and radical change in educational policy including ICT.”

Students' Narrative: Thematic Analysis

Theme 1: ICT is a boon for teaching most participants (students). In the study they said that ICT is a boon for learning. It has facilitated their learning in a number of ways. It has made their classes more interactive and engaging: For example one participant of the study, B.Ed. student shared:

> We could hardly understand the lesson, when our teachers used only chalk and talk method. But when our teacher taught us the lesson of health by showing digestion system of the body using videos with the help of laptop and projector we grasped the concept immediately. We could watch the lesson at home to when the teachers put it in our messenger group. I was absent in the classroom but I caught my content.

Theme 2: Information at the tip of fingers. Because of ICT, we can immediately get information from any corner of the world on the topic we are interested to. Regarding the same one participant said: "As a senior member of the family I have to teach my nephew and niece. When I find something difficult in their course I use the search and I get the information I need. It’s easy for me to teach them all the subjects of junior classes."

Theme 3: Self place learning. Because of ICT, students can learn at their own pace. They are not compelled to learn in group. Regarding it Nira pointed out: "I collect the audio, video PowerPoint and other contents when our teacher gives them. I collect the content from the available sources and I go through them

at my own pace. I don't have to follow the pace of teacher or friends."

Theme 4: Technical problems. Technical issues like slow internet, lack of wife, power cut-up and problem with the devices often emerge and hinder the learning process. Regarding the technical issue, a participant, Sita mentioned:

> Mostly I have problem with network. Wi-Fi is slow and it is expensive to purchase data of NTC or Ncell. Power-cut also frequently disturbs us. Sometimes I plan to study and make notes on the Saturdays. But mostly there is power cut on Saturday as the electricity office conducts repairing of the line on Saturday.

Theme 5: Lack of good devices. Most of the students do not have access to good technical devices as the digital gap exists among them. Most of them have mobile only.

Regarding it, Muna mentioned: "I use mobile for learning purpose. I cannot afford for experience technical device like laptop or computer. When I'll have a job and earn myself, I will buy a laptop otherwise I cannot tell my parents because they can't." The above narratives show that all the students have positive attitude and belief regarding the use of ICT in the classroom. They say that ICT is a boon for learning due to which quick access to information has been possible. Besides, it has contributed to the clear understanding of the complex concepts in all the disciplines.

Despite a number of advantages of ICT use, it has some challenges too which include slow-network, expensive data of NTC or Ncell, frequent electricity power cut-off, problem with the devices etc. Moreover, because of the poverty, most of the students cannot afford for good technical devices; As a result, digital divide exists between the rich and the poor.

Discussion

The findings of this study reveal a generally positive perception of both teachers and students about the use of ICT in classrooms. This corresponds with the broader body of literature that emphasizes the transformative potential of ICT in enhancing educational experiences. The positive attitudes towards ICT observed in this study are consistent with the previous research by Hatlevik et al. (2018), which highlighted that both students and teachers recognize the potential of ICT to facilitate more engaging and effective learning environments.

ICT is a valuable tool in the educational process, echoing findings from previous studies that have shown similar trends. For instance, research by Drent and Meelissen (2008) found that teachers who are comfortable with technology are more likely to integrate it into their teaching practices, leading to more dynamic and interactive classrooms. Similarly, the study by Tondeur et al. (2017) emphasized the positive impact of ICT on student engagement and motivation. The enthusiasm for ICT among participants is notable. Teachers and students both view ICT as a boon for teaching and learning.

The study also found that most participants consider themselves literate or of average proficiency in using ICT. This level of self-reported competency suggests that there is a foundational level of comfort with technology among

both teachers and students, which is crucial for the successful integration of ICT in education. According to Voogt et al. (2013), technological literacy among educators is a critical factor that influences the extent and effectiveness of ICT use in classrooms. However, despite this basic level of literacy, the participants indicated a need for continuous professional development to keep up with emerging technologies - a sentiment echoed in research by Hsu (2010), which highlighted the necessity of ongoing training to enhance teachers' ICT skills and pedagogical competencies.

A significant barrier identified in this study is the limited access to ICT resources due to financial constraints. This finding is consistent with numerous studies that have pointed out the digital divide in education. For example, Warschauer and Matuchniak (2010) discuss how socioeconomic factors significantly impact access to technology, leading to disparities in educational opportunities. The limited availability of ICT devices and infrastructure, as reported by participants, highlights a critical challenge that needs to be addressed to ensure equitable access to technology in education.

Participants in this study unanimously acknowledged the benefits of ICT in teaching and learning. They cited various advantages, such as enhanced engagement, improved access to information, and the ability to facilitate differentiated instruction. These benefits are well-documented in the literature. For instance, a study by Bebell and O'Dwyer (2010) found that ICT integration leads to improved student outcomes and a more personalized learning experience. Additionally, the use of multimedia resources and interactive platforms can cater to diverse learning styles, as noted by Koehler and Mishra (2009) in their Technological Pedagogical Content Knowledge (TPACK) framework.

The need for frequent practical training emerged as a critical theme in this study. Participants emphasized the importance of ongoing professional development to stay updated with the latest technological advancements and to effectively integrate them into pedagogical practices. This is in line with research by Inan and Lowther (2010), which highlights the importance of sustained professional development in promoting effective ICT use in education. Continuous training helps teachers not only improve their technical skills but also develop innovative teaching strategies that leverage technology to enhance learning outcomes.

In spite of the positive attitudes and identification of the benefits of ICT, several challenges hinder its effective use into the classrooms. Participants identified issues such as inadequate devices, poor infrastructure, weak network connectivity, expensive mobile data, frequent power cuts, and a fear of technology stemming from incompetency. These challenges are not unique to this study and have been widely reported in the literature. For example, Pelgrum (2001) identified similar barriers in his international study on ICT in education, noting that infrastructure and access issues are prevalent obstacles in many educational contexts.

The fear of technology and the feeling of incompetency among some teachers is another significant challenge. This matches with findings by Ertmer and Ottenbreit-Leftwich (2010), who argued that teachers' beliefs and self-efficacy

play a crucial role in the adoption of ICT. Overcoming this fear requires targeted professional development that not only enhances technical skills but also builds confidence in using technology effectively.

Conclusion

The purpose of the study is to find out how educators and learners view the application of ICT in the classrooms. Participants during the interviews indicated that most people had positive opinions toward ICT and acknowledged its advantages for the progress in education. Nonetheless, a number of obstacles were noted, such as limited funding, a dearth of devices, infrastructural concerns like power outages and network disruptions, costly mobile data, and a lack of training opportunities. Participants acknowledged that ICT has the potential to improve teaching and learning outcomes despite these obstacles.

In order to properly integrate ICT into their teaching practices, teachers stressed the importance of regular training. They believed that access to educational resources, interactive learning opportunities, and student participation could all be facilitated by ICT. Students noted differences in access to devices and the internet, despite their overall positive attitude toward ICT use in education. The participants' levels of technological literacy varied overall as many felt comfortable using basic technologies but some needed more assistance to properly employ ICT tools in their classrooms.

The study emphasizes how crucial it is to deal with infrastructural constraints and give teachers continual training and support in order to optimize the potential advantages of ICT in the classrooms. In order to guarantee that every student and teacher has fair access to technology, future initiatives should concentrate on removing financial and practical obstacles.

References

Bebell, D., & O'Dwyer, L. M. (2010). Educational outcomes and research from 1:1 computing settings. *The Journal of Technology, Learning, and Assessment,* 9(1), 5-15.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2019). A review of technological pedagogical content knowledge. *Educational Technology & Society,* 12(3), 31-40.

Chenail, R. J. (2011). Interviewing the investigator: Strategies for addressing instrumentation and researcher bias concerns in qualitative research. *The Qualitative Report*, 16(1), 255-262.

Clarke, V., & Braun, V. (2021). *Thematic analysis: A practical guide*. SAGE Publications.

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, 51(1), 187-199.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284.

Fu, J. S. (2013). ICT in education: A critical literature review and its implications. *International Journal of Education and Development using Information and Communication Technology,* 9(1), 112-125.

Harris, J., Mishra, P., & Koehler, M. (2016). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, 41(4), 393-416.

Hatlevik, O. E., Scherer, R., & Christophersen, K. A. (2018). Digital competence at the beginning of upper secondary school: Identifying factors explaining digital inclusion. *Computers & Education,* 63, 240-252.

Hsu, S. (2010). Developing and evaluating an educational game-based learning environment for improving student motivation and learning achievement. *Educational Technology & Society,* 11(4), 88-100.

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development,* 58(2), 137-154.

Kim, J.-H. (2016*). Understanding narrative inquiry: The crafting and analysis of stories as research.* SAGE Publications.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

Makoe, M. (2020). The pedagogical use of ICTs for teaching and learning within higher education in South Africa. *Education and Information Technologies, 25*(1), 557-575.

Passey, D., Rogers, C., Machell, J., & McHugh, G. (2018). The motivational effect of ICT on pupils *(Research Report RR523*). Department for Education and Skills.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education,* 37(2), 163-178.

Redecker, C., & Johannessen, Ø. (2013). Changing assessment—Towards a new assessment paradigm using ICT. *European Journal of Education*, 48(1), 79-96.

Rana, K., & Rana, K. (2020). ICT in education in Nepal: Current status and future directions. *Education and Information Technologies*, 25(1), 467-488.

Sang, G., Valcke, M., van Braak, J., & Tondeur, J. (2018). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education*, 54(1), 103-112.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education,* 128, 13-35

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2017). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Review*

of Educational Research, 82(1), 204-256.

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies,* 44(3), 299-321.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning,* 29(5), 403-413.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education, 34(1), 179-225.*

Yang, Y., & Kwok, R. (2017). The effects of technology-enhanced active learning (TEAL) on student learning outcomes. *Educational Technology Research and Development*, 63(1), 91-102.