

# **Teachers' experiences of ICT training in Nepal: How teachers in rural primary schools learn and make progress in their ability to use ICT in classrooms**

## **Abstract**

This article reports on teachers' experiences of ICT training in rural areas of Nepal. It discusses aspects of policy documents to help understand the Nepali educational context, before highlighting the challenges of establishing and maintaining infrastructure and professional learning opportunities across a country with challenging terrain and extreme environmental conditions. It then examines teachers' perceptions in five rural primary schools about their experiences of training to use modern educational technologies in instructional activities. The findings indicate that none of the teachers received training in the use of ICT in their initial teacher education and that the Government has allowed non-governmental organisations (NGOs) to provide ICT infrastructure and training for rural schools and teachers. Although this is a small study, it offers insights into the gap between policy and practice and highlights the contextual challenges of Nepal's attempts to operate on a global educational level and the challenges for teachers.

## **Keywords:**

ICT training; Nepal education; rural education, teacher professional development; TPACK

## **Introduction**

In Western countries, access to technology in education is increasingly commonplace and research tends to focus on various aspects of how its utilisation can be made more effective. In developing countries, however, access to computers and to the Internet is not something that can be taken for granted. Although one of the targets of the Sustainable Development Goals in Education (United Nations, 2015) is to increase the 'proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes,' the practical attainment of such access is often precarious, especially in developing countries. The research reported here examines the case of Nepal, particularly focusing on the situation in its rural primary schools.

The Government of Nepal has explicitly adopted a policy of integrating Information and Communication Technology (ICT) into all levels of education and stresses the importance of the development of teachers' skills in using modern educational technologies (Ministry of Education [MoE], 2015). Despite explicit policy statements, the Nepali Government has not allocated resources for either developing ICT infrastructures or for training teachers in the use of ICT. As a result, both of these tasks have, to some extent, been undertaken by non-governmental organisations (NGOs) with funding from abroad.

This article reports a case study of a number of schools that have received both ICT resources and training from an NGO. In particular, it reports the teachers' perceptions of the training that they received and their experiences of trying to make use of ICT in their

classrooms. The article begins with a brief review of the context in which ICT is being introduced and the challenges of accessing ICT in rural areas of Nepal. It then considers the importance of ICT training as part of pre-service teacher education, before describing the research being reported here. The remainder of the article describes the findings of the research and discusses the challenges for ensuring that all teachers in Nepal are adequately prepared to embed ICTs into teaching and learning activities.

### **The context: challenges to implementing and accessing ICT in rural areas in Nepal**

The *ICT in Education Master Plan, 2013–2017* in Nepal (MoE, 2013) has identified the major infrastructures—such as availability of the Internet, a skilled workforce, digital curriculum content development and system enhancement—that are fundamental components to be considered when making policy on ICT in education. Dawadi and Shakya's (2016) study of cyber-centres, tele-centres and libraries reported that the rapid development of ICT and the extension of infrastructure in rural Nepal has increased the possibility of e-learning, while the Internet can enable school teachers to access the latest online information for facilitating the education of rural school students. However, the *School Sector Development Plan, 2016–2023* (MoE, 2016) states that funding for equipping primary schools with ICT infrastructure is not available. Although this is a concern, the *ICT Policy, 2015* (Ministry of Information and Communication, 2015) explicitly states that the Government of Nepal intends to create a public and private partnership to provide ICT infrastructure in government schools. There is a clear tension here between the aspirations and rhetoric of policy and the practicalities of funding and resources.

Part of the challenge for Nepal is the country's terrain. Building infrastructure across a county that is mountainous, has high altitudes and experiences extreme environmental conditions, including strong winds, ice-falls and earthquakes, is difficult (Dawadi & Shakya, 2016). Even though mobile phone access in Nepal has passed 90%, Internet access remains limited. Because Internet service providers are business-oriented, they are concentrated in cities and towns, rather than in villages and more remote areas. Although recent records of Internet and mobile data subscribers have indicated that 63% of the total population of Nepal has access, the majority (95%) are mobile data users (Neupane, 2018).

In schools, especially those in remote rural locations, the challenges around access to ICTs are significant. The teachers and the schools may not be able to afford the expensive facilities that are needed for general educational activities using ICT. In addition, teachers in rural community schools often have limited access to ICT support centres or to specialists, because these are situated in urban areas. Therefore, while it has become relatively easy to get some kind of computer technology into schools, keeping devices functional is, as Hawkins (2002) found, a considerable challenge. Rana (2018) investigated the strategic plans of the Government of Nepal for the execution of the policy to produce ICT skilled teachers, and how those plans are, or are not, translated into practice. Dhakal and Pant (2015) pointed out that ICT in education courses in teacher education at the universities in Nepal are oriented to developing computer programmes rather than to facilitating the general use of ICT in teaching. Smith (2009) highlighted that, although Schools of Education in the universities are responsible for improving the quality of initial teacher training and equipping prospective teachers with appropriate practices, teacher education programmes in Nepal do not cover ICT education and, overall, they seem to be fragile.

Some research about ICT in teacher training has been conducted in the Nepali context. Dixit (2009) reported how radio, an ICT tool, albeit an older variety of ICT, was integrated into initial teacher education in 1980 for the first time and was continued in all

training programmes for a number of years. He stated that in 1993 the government policy on the 10-month primary teacher training programme allocated two and half months for radio training. In recent times, the Nepali *National Curriculum Framework for School Education, 2005* (Ministry of Education and Sports, 2005) included ICT as ‘a proven tool for educational transformation’ and was to be used in instructional activities in schools. Two years later, the *National Curriculum Framework for School Education, 2007* (Ministry of Education and Sports, 2007) reiterated this objective. However, as Shields (2011) explained, although the integration of ICT is constituted to meet the Nepali national education goal of public service and quality education, the terms *proven* and *transformation* in the curriculum are vague. Shields argued that there is no empirical evidence to prove whether over a thousand private ICT training centres in the country provide training at the expected standard or whether they yield economic returns.

The National Centre for Education Development, the government’s teacher training agency, provides generic training for teachers, but it does not include ICT in its training programmes. Bhatta (2008) suggested that the generic teacher training module should be redesigned on the basis of ICT implementation, as this would enable teachers to stay up to date and to improve ICT practices in their teaching. He asserted that teachers’ technological knowledge helps them overcome their fear of computers, but the challenge lies in how they can integrate technologies and access digital content while teaching. He emphasised that teachers in the Nepali schools where the children have individual devices in a laboratory need to have a basic knowledge of teaching strategies and techniques related to child-oriented interactive education. However, as already noted, the teacher training on offer is limited in its approach to ICT.

## **Teacher education and ongoing professional development**

Many international studies have emphasised the importance of teacher professional development, to keep teachers up to date with social changes and emerging needs, especially in relation to the growing societal use of ICTs (Voogt et al., 2011). For example, Gibson et al. (2011), writing in a Canadian context, argued that school teachers need to learn skills in order to fix technical problems with computers, and they need to have more experiences of ICT and subject-specific pedagogies to enable them to blend ICT into teaching activities. They also emphasised that pre-service teachers should be provided with maximum opportunities to experiment with pedagogical techniques while they are learning to teach. According to Voogt et al. (2011), teachers need basic ICT skills, as well as knowledge about integrating ICT into their lessons and associated pedagogical knowledge. In addition, studies have found that the attitudes of teachers towards technology and its inclusion in classroom practice can be crucial to successful ICT usage in classrooms (Goktas et al., 2009; Gülbahar & Güven, 2008; Jimoyiannis & Komis, 2007; Tezci, 2009).

Some studies have highlighted the necessity of support for teachers who are using ICTs in their classrooms, both personal support and support *with* the use of ICT. During a study in British schools, Loveless (2011), for example, found that some teachers were using the virtual learning environment Moodle in their pedagogy with the support of their ICT specialists and they valued its contribution. Nevertheless, some teachers experienced a sense of physical isolation as a result of a reliance on digital communication. Vratulis et al. (2011), working in Canada, found that pre-service teachers preparing slow animations for use in their lessons were highly motivated to work collaboratively and were able to reflect their skills in their classroom teaching. These types of support can be achieved through both pre-service teacher education and in-service professional development.

Similar research, conducted in Singapore by Perkmen (2014), revealed that the motivation of pre-service teachers made a significant difference to their use of technology in education and their self-efficacy in integrating ICT, and this resulted in much better classroom practices. Goktas, Yildirim and Yildirim (2009) suggested that universities should establish laboratories for pre-service teachers to use ICT tools efficiently and to be able to later embed those tools into their classroom teaching. Similarly, Niemi (2003) argued that university teacher education programmes should be oriented to provide theoretical and practical knowledge of ICT so that teachers can apply this knowledge to new environments. Such studies have highlighted the importance of embedding ICT use into pre-service teacher education. In addition, some of the studies have indicated the challenges of helping pre-service teachers and in-service teachers become comfortable with ICTs. However, as Bhatta (2008) pointed out, in the Nepali context, the groundwork strategies for pre-service teachers, as illustrated in the international research, are not even on offer.

The international literature also suggests that teachers need to be consistently updated with information about emerging ICT facilities and e-pedagogies, thus highlighting the importance of ongoing professional development. For example, Kalogiannakis (2010) in Greece found that acceptance of ICT in teaching and learning remodels the role of the teacher beyond out-dated teaching strategies, while Kabakçi (2009) emphasised that training teachers to use ICT is to equip them with useful knowledge, attitude and skills for their profession. As Donaldson and Knupfer (2002) recognised, teachers must be well-trained to achieve the important role of computer technology in schools and to solve possible obstacles in its application. The study of Bradshaw, Twining and Walsh (2012) of a continuing professional development programme in England found that ICT practice in the classroom resulted in measurable change on teachers, schools and students. In addition, Bessenyei (2008) argued that formal ICT training in schools develops teachers' basic skills for working with students, as well as building advanced skills that can foster the learning of students outside the school. Thorburn (2004) stressed, however, that teachers should be trained in technology applications on a regular basis, with the focus on student learning rather than the technology.

Professional development for teachers, however, needs to be undertaken over time, with opportunities for teachers to consider the relationship between ICTs and pedagogies. Indeed, Haddad and Draxler (2002) warned that one-shot training, no matter how effective, cannot be sufficient and that lifelong professional development is needed. This might consist of initial training, upgrading skills and continuous support. In addition, the form of professional development is also important. As Koehler, Mishra and Yahya (2007) reported, considerable research has argued that traditional methods of training in the use of technologies, such as courses, workshops and other stand-alone events, rarely develop the deep understandings that are required to assist teachers to become "intelligent users of technology for pedagogy" (p. 741).

Drent and Meelissen's (2008) study in the Netherlands found that a lack of competence in ICT was an obstacle for teachers' incorporation of ICT into their pedagogies, while Vesisenaho and Dillon (2013) argued that the inclusion of ICT into pedagogical practice opens up possibilities for learning across the boundaries of institutions, particularly through virtual learning environments. According to Tezci (2009), a higher level of experience with ICT can mean that teachers develop more positive attitudes towards ICT and, in turn, teachers' knowledge about how to use ICT in teaching and learning processes can impact on their use of technology.

These international studies suggest that the development of ICT skills during teacher education and as part of continuing professional development is important. They offer ideas about how Nepal might adapt to changes that are evident globally.

## Access to online information in Nepal

Although access to the Internet is limited in Nepal, particularly in rural areas, some organisations support schools, students and teachers with digital resources, distance learning materials and distance support for learning. For example, the Open Learning Exchange, an NGO which signed a memorandum of understanding with the Ministry of Education in 2007 to develop ICT infrastructure in rural primary schools and train the teachers of those schools, has provided an open access base on its website, offering access to e-library and digital resources for primary level courses (Nepal Republic Media, 2017). Another project (Mason, 2017) launched a distance learning course using a Massive Open Online Course (MOOC). This reached schools in ten different cities in Nepal. In another project, as part of the work of the Applied Scholastics Training Centre in Nepal, a teacher has built a network of over 1600 technology teachers who are working to transform their classrooms (Church of Scientology International, 2018).

The use of the Internet has enabled both teachers and students to share their ideas and materials beyond the physical classroom (Rana et al., 2019). Earlier, Pangenji (2016) had reported that the rapid growth of Internet facilities in Nepal has provided the current generation of university-aged learners with the options of doing distant university courses and accessing the MOOCs of several local and international training institutes from their homes. A study by Shields (2011) revealed that private computing institutes, even in small towns in Nepal, have helped to develop ICT literacy and computer skills, although Bhatta (2008) identified that teachers in rural primary schools needed to develop computer literacy to rid themselves of a fear of computers. Nevertheless, Thapa and Saebo (2011) reported that the teachers and students in rural schools in Nepal would often stay at school until midnight in the beginning days, thus cultivating their interest to work on computers.

However, the majority of studies cited here indicate how online resources for educational purposes in Nepal are oriented towards urban areas where there is Internet access. Although the online resources are accessible and open for all, Rana (2018) found that the means to utilise such resources in remote rural villages, where there is no infrastructure, currently seem unavailable, or they are at least very limited.

## Research design and procedures

The research project was designed as a case study and was conducted in five Nepali primary schools, here given pseudonyms. The schools were selected on the basis of their reported use of technology in teaching and how they reflected a range of degrees of impact of the 2015 earthquake which had caused extensive damage to infrastructure, including schools, across Nepal. The damage to infrastructure raised important issues about ICT, particularly in rural areas. The schools that participated in the study are listed in Table 1, with the teachers who agreed to participate. Information has been included about the teachers' gender, to assist readers who might not recognise some of the pseudonyms that have been used.

INSERT TABLE 1 HERE

The data were collected through participant observations in classrooms, semi-structured interviews with teachers who volunteered to participate in the project, and the collection of government and NGO reports, national policy statements, school reform plans, education acts and other official documents. In this article, however, the examination of

official documents has provided useful contextual information, while the interviews and classroom observations contribute to the discussion of data.

In the first three schools in Table 1, teacher interviews and classroom observations took place over a four-week period at each site. Semi-structured interviews were conducted with each teacher, to explore their experiences of the ICT training that they received from the organisation which supported their schools with ICT infrastructure. The interviews were audio-recorded, and participants agreed to the recording of further informal conversations both inside and outside school. At least seven of each teachers' classes were observed during the lead author's visit to the schools. Observation focused on the provision of resources, the strategies teachers used to introduce curriculum topics, the activities students engaged with, and the relationships that were evident within the classroom. Classroom observation notes were made daily.

In the other two schools, two teachers from each were interviewed, but their classes were not observed. One school had lost its ICT infrastructure in the 2015 earthquake and, in the other, digital devices were unused and kept in a locked laboratory. Of necessity, the focus in these two schools was teachers' recall of their previous experiences with the use of digital devices and the training they had received.

The audio-recordings of the interviews and the informal conversations were transcribed, translated into English and coded initially using NVivo. This process identified recurring themes. Interpretative phenomenological analysis, as described by Smith, Larkin and Flowers (2009), was then used to refine the analysis, allowing common themes to be recognised as well as accentuating participants' personal experiences and perceptions.

## **Findings**

This section presents findings from the analysis of the rural primary teachers' perceptions about their experiences of ICT training in Nepal and the first author's observations in classrooms. In particular, three themes were evident. These related to teachers learning to use ICT, the available support for teachers, and their use of technological and pedagogical knowledge relating to ICT use in the classroom.

### ***Teachers learning to use ICT***

In all five schools that participated in the research, generic in-service teacher training was conducted through a government-operated resource centre, but this training did not include ICT training. To learn about ICTs, the 12 participants from Annapurna, Buddha and Chadani Schools had completed ICT-integrated training conducted by the Open Learning Exchange, an international NGO. The other research participants learned about ICTs privately or through family members. Interviews with the participants identified that the NGO, which supported their schools with laptops, a server, an e-library and curriculum-based digital content, trained them to use the new technology in their classroom activities. The participants also explained that the purpose of the formal ICT training was to develop basic as well as advanced skills, with the aim of motivating teachers, as well as students, to learn with these technologies outside the school.

Although the participants from Dhaulagiri School had received regular in-service training, they were provided with only an initial three-hour orientation on how to search for digital content using the digital devices that had been provided for the school laboratory. At Ekata School, the participants stated that they learned to use the digital technology from their colleagues in the school as well as from refresher training that was provided by the Open

Learning Exchange. In other words, the training that the teachers received had been partial, rather than extensive. This probably explains why many of the teachers said that they did not feel confident about teaching with ICTs. Even the participants who had basic computer skills before the intensive ICT training indicated that they still did not feel confident to use ICTs in some subject classes. As has been reported in other studies, teachers' attitudes towards ICTs can be a significant determiner of their willingness to engage with technology in their classrooms (Goktas et al., 2009; Gülbahar & Güven, 2008; Jimoyiannis & Komis, 2007; Tezci, 2009).

When the participants in this study shared their experiences of learning to use ICT in their teaching, several themes recurred. These related to their understandings of the need for ICT, their experience of government-provided teacher training and NGO-provided ICT training, and their perceptions of trainers. It was evident from what the participants said that the government initially responded to the perceived need for teachers to receive ICT training by directing them towards courses in private institutes. When attending university, the participants in this study had not received ICT training as part of their pre-service teacher study, and currently, in-service training is being provided by the government and NGOs. Some of this training was introductory and sometimes it was on-going.

In many parts of the world, teachers learn to use ICT in their personal lives (Leask & Meadows, 2000), just as other people do in the community. The history of information technology development in Nepal, however, shows that the people who are ICT literate have gained their ICT skills and knowledge from private institutes (Rana, 2018). Since the mid-1990s, the number of private training centres in Nepal has increased and more people are now able to access training. Gradually, private schools are adopting computers for official work as well as for teaching basic skills (Rana, 2018).

As can be seen in Table 2, half of the 16 participants in the study did not have computer skills before they received intensive ICT training from the NGO which supported their schools with ICT infrastructure.

INSERT TABLE 2 HERE

The participants' comments also revealed that most of the teachers who learned computer skills for the first time from the ICT training were reluctant to accept the offer of digital devices. However, those who had already been familiar with computers stated that there was a real need to accept the digital devices. For instance, Chandra from Chadani School recounted his experience of visitors from the supporting organisation coming to his school:

When the people from OLE [Open Learning Exchange] visited our school the second time, they called us into our office to talk about this technology.

They asked us, 'Can you give time for a week?'

We said, 'Yes.' They didn't actually mention technology. At first, they just asked for time. When they explained about the computers and teaching with them, we didn't reply straight away. We said, 'This is new for us. Can we use them? It may be very difficult for us. We don't know what there is.'

Then they convinced us: 'We'll make you perfect in seven days and send you back to your school knowing how to use them.'

Chandra's statement reflected how he and his colleagues were initially daunted by their lack of technological literacy, and how they had felt as if they were being manipulated by the obliqueness of the communication from the Open Learning Exchange. He

acknowledged that they had felt some pressure to accept the technology and had been swayed by the promise that they would learn everything they needed in the seven-day course.

However, those who had prior computer skills before the intensive ICT training had a different attitude towards the digital technology. For instance, Binod, who had completed three-months computer training before he received the technology in his school, said:

We got general information from the people. Simply, they said it is just a computer. We already had solar energy. They were happy to provide this technology and we were happy too.

His statement indicated that his prior computer training from a private institute had given him confidence to accept the technology to incorporate into his teaching activities.

As has already been explained, the participants had not received ICT training as part of their pre-service training. Indeed, several participants criticised the pre-service teacher training programmes. For example, Anuj complained: ‘There was nothing about ICT in the campus course. There was nothing about it.’ His complaint implied his belief that teacher education should cover the use of ICT in teaching and learning. He then further argued that teachers need to have basic technical computer skills to know how to operate programmes, practical experience in manipulating ICT, and pedagogical knowledge to know how to teach with ICT. He expressed appreciation that his training course had covered classroom management, strategies for motivating children, and various teaching methods and techniques. When talking about their experiences of ICT, the teachers indicated that the training they received was teaching them how to use ICTs. That is, in terms of Koehler, Mishra and Cain’s (2013) TPACK model, the in-service training was assisting them to develop technological knowledge. However, the teachers explained that they wanted to develop pedagogical knowledge that would enable them to use ICTs in their classrooms as part of the curriculum. Although the teachers did not specifically talk about content knowledge, that aspect of TPACK seemed to be taken-for-granted. The teachers’ discussions of their experiences, however, suggested that the integration of ICTs into their teaching was rather limited.

In a similar vein, Deepa valued aspects of her pre-service teacher training: ‘It teaches how to teach, how to make plans and prepare materials according to the level and interest of the learners.’ However, she criticised it for not covering ICT integration in teaching and learning:

When we brought a computer to our school, I bought a smart mobile. My brother was far better in technology. I learned how to use a computer from him. There was nothing about it in my college course.

She expected that her university course should have taught her how to design her lessons with ICT, and she considered she would have performed better in her classroom teaching if it had. Dinesh reported a similar experience in his pre-service training: ‘I learned to use a computer from a private institute. That helped me to explore digital content on our school server. There was nothing about ICT in our college course.’ He said that, given the expectation on teachers to use technology, he would have expected his training to have helped him develop a high-level efficiency in using ICT for his daily classroom teaching.

Participants talked about the pedagogy and the psychological learning theories they had learned in their teacher training. Several made connections between the general principles of learning and teaching and the use of ICT in teaching activities. For instance, Dinesh emphasised that ‘no matter what subject you teach, teachers must understand the child



psychology while teaching. It is a mental job.’ Elisha reflected on her initial teacher training and remarked that teachers with a background of teacher education had been taught skills for involving students in different learning activities. However, she recollected her initial unpleasant experience of using digital devices. She had struggled to understand the technology and integrate it into her classroom teaching. She wished that she would have gained knowledge and skills for using ICT from her pre-service teacher training course as she believed this would have supported her in using digital devices in her classes to fulfil the needs of the students. Elisha’s comments align with Tezci (2009), who suggested that teachers need to have knowledge of pedagogy and skills to engage children in learning activities, including how to use ICT to enhance teaching and learning.

All the participants from Buddha and Chadani Schools were trained to use digital devices in their various subjects before digital technology was installed into their schools. Similarly, the participants from Annapurna School, except for Asha who had just attended refresher training the previous year, attended training before receiving the technology into their school. In contrast, the participants from Dhaulagiri School only received a one-day orientation from the Open Learning Exchange trainers. Elisha from Ekata School had received computer skill training from the District Education Office several years before she was interviewed. However, Ekendra, also from Ekata School, explained that he learned to use the digital devices by watching the activities of his students and by self-practice:

When I came in this school, every child used to take their devices home. Even I was surprised and I had a curiosity how to use them in my teaching. I used to ask my students to work on their devices and I used to watch what they did. Then I started to use the device and learned. I used to carry one with me.

Ekendra’s comment provided insights into how some of the teachers involved in this study learned to use the available ICT facilities. As Ekendra indicated, the students were learning to use particular devices at home and he then learned from them at school. The traditional flow of information from teacher to student seemed to have been turned around, with the teacher learning from his students.

### ***Support for teachers***

Participants in this study reported that they had two means of getting support from the IT/ICT specialists who had provided the computer equipment for their schools. Firstly, they could use their mobile phones to communicate any problems to the trouble-shooters and possibly resolve the technical difficulties they were facing in their classroom teaching through instruction over the phone. Secondly, the specialists would visit the schools according to a pre-arranged schedule and this offered a face-to-face opportunity for problem-solving.

A majority of participants stated that they expected professional development programmes to be comprehensive in covering the types of problems that school teachers can face in relation to ICT, and to provide them with continuing support as required. However, the extent to which participants were satisfied or dissatisfied with the support they were receiving varied considerably, depending on their school and location. Generally, though, the participants reported that they were receiving consistent support from the specialists of the sponsoring organisations. For example, Anuj said: ‘We’re expecting more support from OLE Nepal. They’re supporting our school a lot. They repair devices and update programmes.’ Similarly, Anita expressed: ‘Most of the time we call the office and get some ideas. Other teachers solve minor problems.’ Likewise, Bhupal shared that:

After the training, two volunteers stayed with us here a couple of weeks to support us in the class. They helped us fix technical problems with the devices. When we get more problems, we talk to technicians over the phone and get help. If that doesn't work, they come to help here.

These responses from participants indicated that, although the schools did not have ICT specialists, the organisation which provided the new technology provided extensive service to the schools. The participants' satisfaction finds a resonance in the studies by Donaldson and Knupfer (2002) and Jong (2012) in a different context, who found that support from experts created a comfortable environment for teachers using technologies in their regular teaching and learning. However, in the case of Dhaulagiri School, the participants were critical. They complained that they did not receive support from the organisation which provided the digital content programmes for their school. Although teachers from other schools reported that they had been receiving distance as well as in-person support, Deepa expressed her frustration at not getting sufficient ICT training or further technical assistance to use the new technology effectively. She complained that, although her school had requested the trainers who had given the first three-hour induction to return, they never returned to her school, despite saying that they would return later. Deepa's interview responses, which consistently expressed her frustration with what she saw as a lack of technological support, are consistent with the findings of Dawes (2001) and Ertmer et al. (2012), who found that an absence of training and regular support for teachers in the practice of ICT in the classroom leads to a decline in teachers' interest in using technologies. The teachers from Dhaulagiri School felt they had been neglected, while most of the other participants in this study stated that the organisational support had enabled them to use the available digital technology in their instructional activities consistently.

Although ongoing support was available for some of the teachers, they were often frustrated by the type of support on offer. Sometimes the support was in the form of repair work on the ICT hardware, rather than providing professional development for the teachers. While such support was not ideal, professional development was not going to be useful when the ICTs were not operational. It was also evident that the support was not facilitating the development of the full gamut of technological, pedagogical and content knowledge and the combinations and relations amongst them (Koehler et al., 2013). This had also been the case in the initial training received by the teachers, as the focus had generally been limited to technological knowledge.

### ***Technological and pedagogical knowledge for ICT use in classroom practice***

The teachers had received training in relation to the use of ICT in their classrooms, but that training was sometimes intermittent, partial rather than extensive, and limited in terms of developing teachers' knowledges of technological and pedagogical knowledge. Although most of the teachers had annual refresher training, they explained that the training was highly focused on the classroom management issues they had been facing, rather than boosting their technological skills. Indeed, observations in the computer laboratories indicated why management issues were important to the teachers. Because classes had to move to a laboratory, time was taken up in moving from one location to another within the school and accessing and returning the devices which were stored in a charging stand. The laboratories were small and the teachers were trying to manage over 30 students in a crowded space. This meant it was difficult for the teachers to move around their classes and to provide individual support.

With the training focus on management strategies, it appeared that pedagogy may have, at times, been forgotten. Observations of the teachers' classroom practices suggested that they would habitually walk into the laboratory, wait for the children to get their digital devices ready, then start to deliver their lessons. Often, considerable time had been taken up with arranging the children at the beginning of the lesson, a time-consuming and seemingly random task, but one that dominated over teaching activities. In fact, the teachers seemed unable to provide more than initial instruction followed by student individual access to the digital devices. In addition, the furniture appeared to lock students into position and this meant that the students were not organised in ways that would facilitate active and interactional group learning. The teachers, however, were satisfied with the operation of the laboratory, as it allowed them to manage the behaviour of students and to ensure they were actively occupied in working with their devices.

This suggested that the pedagogies being used by teachers were focused exclusively on practice exercises. In fact, the teachers expressed appreciation that the digital devices were a means for managing their large-sized classes. They commented that the individual digital devices for the children made their teaching more productive than textbooks in the regular classes. However, observations of the classes suggested that the teachers were mostly concerned with how to engage the children with digital devices and to provide maximum opportunities for skills practice. Their preference for digital devices and the resulting limited use of pen and paper suggested that the use of digital technology reduced the need for teachers to look at and correct children's work and it freed them to plan further lessons. As Anuj explained:

We teach a lesson in regular class, and then we take our students to the lab for the practice of the lesson. We have to shout in the normal classroom. There is no time to check their homework and classwork. But in the lab, students can learn themselves when they get individual devices. Teachers just facilitate them when they need. There are several exercises on these devices, and they provide a lot of practice.

Similarly, Bhupal noted: "In the lab, the teacher is just a facilitator. We support them [students] when they have a problem, help them with what they cannot do and where they are confused, and check: Is he doing it or not?" Bhupal's comment indicated that the provision of individual devices to the children in the laboratory engaged the children in practice activities and minimised the teachers' stress of needing to carry out student evaluations, because the devices gave feedback about whether the students' responses were correct or incorrect. The first author's observations, however, noted that the teachers struggled to reach the students sitting in the corners of the laboratory or along rows which held a number of students. Although most of the students were engaged in the tasks prescribed by their teacher, some were watching videos, playing games or listening to music and were thus ignoring the lesson tasks.

Pedagogically, the teachers seemed to be setting skill-and-drill type exercises for their students. While these are important activities for consolidating learning and helping to develop skill automaticity, researchers generally agree that 21<sup>st</sup> century learning should involve other types of learning as well, including a range of constructivist approaches, such as problem-solving, cooperative learning, experiential learning and learning that builds adaptability and flexibility for transferring learning to new situations (Lehtinen et al., 2017; Liu et al., 2014; Voogt et al., 2013). There was little evidence of these in the classroom observations.

According to the teachers, there was a continuing challenge in making ICT-supported teacher professional development productive and meeting their needs. In particular, the

teachers identified pedagogical knowledge (Koehler et al., 2013) as a missing element of the professional development on offer. However, the classroom observations suggested that the teachers were often operating at a very basic level of technological knowledge and their usual teaching practices were often traditional, direct teaching strategies. According to Elisha, a teacher from Ekata School, teachers in her school often “speak too much and ask the children to go through books. They even write the answer on the blackboard. That’s their way of teaching.” As suggested by Gülbahar and Güven (2008), attempts to change practices and use ICT as a tool for learning should incorporate a range of change strategies and collaborative projects. Indeed, the types of professional development on offer to the teachers in the rural Nepali schools, and the challenges of maintaining the necessary infrastructure, were unlikely to result in pedagogical change.

In fact, when some of the teachers were interviewed, they gave insights into the focus of their training. Bikash, for example, reported that the initial one-week training that he had attended had emphasised the skills of collating content from two different sources: the printed textbook and the digital device. In applying the training to his teaching, he acknowledged that he found himself teaching the same content twice. He tended to teach a topic from the textbook first and then he would find learning activities on the device and teach the same content again. In approaches such as this, there certainly seemed to be little integration of technology, pedagogy and content, as recommended by TPACK (Koehler et al., 2013). After all, the teachers were developing, and sometimes even beginning, their knowledge of technology, and they were working in schools where traditional teacher-centred pedagogy was accepted.

The teachers’ training was generally focused on developing technological knowledge within the teachers’ current knowledge of pedagogies and curriculum. New pedagogical knowledge was not on the agenda. In effect, this meant that the teachers were not exposed to opportunities for developing new pedagogical approaches which, according to Voogt et al. (2013), are essential for supporting 21<sup>st</sup> century learning. At the same time, their technological knowledge was not always keeping up with recent developments or innovations.

## **Discussion: implications for pre-service and in-service education in Nepal**

This study has shown that the Nepali teachers who were interviewed viewed ICT training as essential to the future use and inclusion of ICT in their schools. They regarded such training as not only an essential part of pre-service teacher training, but also as an essential component of ongoing in-service professional learning. Research has demonstrated that it is important for teacher educators to commence the process of preparing prospective teachers to navigate technology, pedagogy and content in multicultural, transnational and heterogeneous classrooms in the 21<sup>st</sup> century (Liu et al., 2014). Voogt et al. (2013) stressed that the trend towards globalisation makes it important for teacher education programmes to incorporate the integration of ICT as preparation for the 21<sup>st</sup> century digital world. They also argued that teachers need to be prepared for new pedagogical approaches appropriate to an innovative society and they need to understand how ICT and pedagogy interrelate to facilitate student learning.

However, in this study, it became evident in the teachers’ descriptions of their experiences of ICT training that they relied on either informal ICT training they received from private computing institutes or NGO-provided short-term training. There had been no ICT training at all in their pre-service teacher education to develop minimal technological and pedagogical knowledge. Although they received ICT training as in-service professional

development, it was often brief and partial, and it was generally not targeted to pedagogical considerations (Rana, 2018; Rana et al., 2018; Rana et al., 2019). Furthermore, for many of the teachers, access to ICT was limited in their lives outside of school. Even when NGOs supplied digital devices for their use, many of the teachers were wary of such offers, and the provision of ongoing support was impacted by the challenging terrain and environmental conditions. Many of the teachers lacked confidence, which was probably not surprising in view of the challenges they experienced.

The research participants' comments indicated that private training centres have played a significant role in developing the digital and technological skills of teachers. However, in Nepal there are limited numbers of private computer training centres and rural teachers have little access to them. Indeed, access is a significant issue. The participants' perceptions of ICT training thus seem to align with the finding of Pelgrum's (2001) global study that there can be broad gaps between what might be an ideal training situation and the localised reality of what is possible. For teachers in Nepal, gaining access to training can be difficult.

Being able to access ICT and understanding its uses are interrelated and interdependent. The participants' comments suggested that, while many were very willing to utilise the digital devices and the digital content that were provided, they had very limited knowledge of how to utilise the resources and, in some cases, were still cautious about experimenting with them. In South Africa, Czerniewicz and Brown (2005) found that teachers who have had limited personal access to ICT are not as confident and are thus less ready to use it in teaching and learning activities. It might be argued that, unless teachers in rural Nepal are enabled to use ICT for their own activities, they may not develop confidence for using it in their classrooms. If teachers' attitudes towards the inclusion of ICT into their teaching is negative, then that too can be a challenge that has to be overcome (Goktas et al., 2009; Gülbahar & Güven, 2008).

In the opinions of the research participants, their experiences of needing and wanting to learn how to use ICT in their classroom instructional activities suggested that the existing pre-service teacher training programmes might need some revision, so as to include the uses of technology and ways of applying ICTs to teaching and learning activities. Jimoyiannis and Komis (2007) argued that pre-service teacher education must develop a culture where the use of ICT becomes one of the daily practices of teachers. In the schools in this study, however, this was not always possible. A number of other studies, such as Goktas et al. (2009) and Gülbahar and Güven (2008), emphasised that teachers' attitudes determine the successful integration of technologies into teaching and learning. This highlights the important role of universities in facilitating the use of ICT by prospective future teachers. However, pre-service teacher education courses in Nepali universities are not yet providing an environment where digital technology is used. Instead, teachers learn to use digital technology from private training centres and NGOs.

The findings also indicated that there was a gap between the teacher training programmes, including government-provided in-service teacher training, and the actual practices of ICT in classrooms. Although Nepali ICT education policy emphasises the importance of preparing a skilled workforce to transform traditional pedagogy with the integration of modern technology, neither teacher education at the universities nor the in-service teacher professional development training includes how to integrate ICT into teaching and learning activities. With responsibility for the provision of ICT training sitting with NGOs, such as the Open Learning Exchange, it seems that the government may be unprepared, or perhaps unable, to invest in and implement an ICT in education project. Unfortunately, the NGOs are unable to invest in all schools in Nepal and the government training agency and the NGOs run their training programmes independently, even though

their common aim is to meet the national Nepali goal for ICT in education. This suggests that there is a genuine need for collaborative training programmes between the government training agency and NGOs.

The participant teachers in this study complained about the way that in-service teacher training did not cover how to use ICT in teaching and learning activities. However, although they had to rely on NGO-provided initial short training on ICT, they appreciated the training and further ongoing support of the organisations. Teachers' responses and classroom observations indicated that the NGO-provided training developed their confidence with using digital devices with digital content in the classroom. However, some of the teachers expressed their dissatisfaction with the limited nature of the training they were offered. The development of pedagogical knowledge (Koehler et al., 2013) was rarely a consideration. Moreover, the observations conducted as part of this research indicated that, when the teachers were beginning to learn how to blend digital technology into their teaching activities, the teachers often needed more training support than their students did. In the words of González-Lloret and Ortega (2014) and Haddad and Draxler (2002), one-shot training, regardless of how effective it is, cannot be sufficient and teachers require continuous professional development about how to embed modern technology into their pedagogy, as well as ongoing support to upgrade their skills and keep them current with the latest technological developments.

In terms of the types of training that would benefit the teachers, it seemed that they required more extensive technological knowledge as well as pedagogical knowledge, even though they only mentioned wanting more training on pedagogies. Koehler et al. (2007) highlighted that teacher knowledge for the successful integration of technology has to be able to work with the technology, with pedagogy and with content, because of way these three elements mutually reinforce each other. For the teachers in this study, their location in remote rural locations limited their access to training, but it also meant that their training was often truncated and that follow-up support or training was not on offer. This limited the opportunities for ongoing professional development that would enable them to work with technological pedagogical knowledge and thus to understand how teaching and learning might be different with the use of technology (Koehler et al., 2013).

The remote rural locations of the Nepali schools further exacerbated the challenges of introducing and using ICT in classrooms, and being able to access training and support. This parallels Gaible and Burns' (2005) finding that a challenge lies in schools where there is a lack of adequate electricity, classrooms and textbooks. Even the situation in two of the data collection schools, where digital devices were not being used, indicated the precariousness of ICT usage in remote locations. Another issue of ICT-integrated professional development of teachers is that it often relies on the teacher being in part a *digital native*, to use Prensky's term (2001; see also Selwyn et al., 2010) and therefore being already familiar with various forms of ICT beyond school classrooms. However, the majority of participants' responses in this study, as well as the field observations, indicated that the teachers had very limited access to digital technologies both inside and outside their schools and, therefore, they had few opportunities to learn and to use ICT in their everyday lives.

## Conclusion

There is always a challenge when implementing educational policy and this is definitely the case with ensuring that ICTs are used in Nepali schools. Teachers in this study expressed concerns about teacher education and government teacher training which did not

cover ICT use. Although the majority of teachers appreciated the initial NGO-provided one-week ICT training, some of them expressed their dissatisfaction that the training was oriented towards providing basic skills of operating digital devices and accessing digital content, rather than learning how to embed the use of ICTs into daily teaching. For many of the teachers in this study, however, developing technological knowledge was important and essential. Nevertheless, knowing how to integrate technological knowledge with pedagogical and content knowledge (Koehler et al., 2013) was necessary to ensure application to the classroom and to ensure that the technology made a difference to student learning (Thorburn, 2004).

Nevertheless, in Nepal, NGOs remain vulnerable as they have no guarantee of on-going operations. A lack of government plans for robust and relevant training for teachers in ICT does not indicate a sustainable implementation process for achieving policy goals. Indeed, there is still a lot of work to be done in providing the means for rich and effective uses of ICT in Nepali education, especially in rural primary schools. It is important to remember, however, that the terrain and environmental conditions of Nepal, including the mountainous landscape and the devastating earthquakes of recent years, provide a range of challenges, some of which seem, at times, insurmountable. As a result, equipping over 35,000 primary and secondary schools (Dilas et al., 2018) with technology and providing professional learning opportunities for teachers across the country is a complex and expensive undertaking.

It has to be acknowledged that a study of five schools as presented in this article does not offer a comprehensive and generalisable depiction of the practices of all rural primary schools in Nepal. However, by identifying the possibilities and limitations that were evident in those schools, it indicates directions that might be explored in further research. It also allows recognition of some of the gaps between policy and practice and the challenges of a country like Nepal attempting to operate in the globalised educational world of today.

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Table 1: Participant Schools and Teachers

<b>School</b>	<b>Participant (pseudonym)</b>	<b>Gender</b>
Annapurna School	Anuj	Male
	Ananda	Male
	Anita	Female
	Asha	Female
Buddha School	Binod	Male
	Bijen	Male
	Bhupal	Male
	Bikash	Male
Chadani School	Chandra	Male
	Chiran	Male
	Chitra	Male
	Chetan	Male
Dhaulagiri School	Deepa	Female
	Dinesh	Male
Ekata School	Ekendra	Male
	Elisha	Female

Table 2: Participants' Computer Training Prior to the Intensive NGO In-service Training

Participant	Prior Computer training
Anuj	Yes
Ananda	No
Anita	Yes
Asha	Yes
Binod	Yes
Bijen	No
Bhupal	No
Bikash	No
Chandra	No
Chiran	No
Chitra	No
Chetan	No
Deepa	Yes
Dinesh	Yes
Ekendra	Yes
Elisha	Yes