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Research Article

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Effectiveness of online training on digital pedagogical skills of remote area teachers in Nepal

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ABSTRACT

Pedagogical skills are fundamental requirements for all teachers for the pedagogical shift in day-to-day teaching and learning activities. Therefore, the digital pedagogical skills training was organized for enhancing the pedagogical skill of the teachers. The aim of this research was to find the effect of that virtual training on the digital pedagogical skills provided to teachers. The quasi-experimental research design was employed among 44 school teachers in Karnali Province. Mean, standard deviation, t-test, ANOVA, and linear regression were major statistical techniques used in the research. The finding indicates that the intervention was highly effective to enhance the digital pedagogical skills of the teachers in remote areas. Gender, qualification, and teaching level are contributing factors to determine the digital pedagogical skills of teachers. The training was found to be more effective in the use of writing tools, email, file sharing, internet surfing, subject-related mobile applications and online resources, and video conferencing tools.

Keywords: experimental design, digital pedagogical skills, remote area, online training, Nepal

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INTRODUCTION

Technology in education has been advocated over the past 25 years as having the ability to improve teaching and learning (Laurillard, 2008). However, virtual training on digital pedagogical skills and the use of techniques practiced in classrooms has increased worldwide as a result of the COVID-19 pandemic (Korkmaz & Toraman, 2020). Technology makes teaching effective, one of the most important aspects of technology-based teaching and learning is instructors' well-equipped preparation with İnformation and communication technology (ICT) tools and facilities (Ghavifekr & Rosdy, 2015). During the COVID-19 pandemic, most of the educational institutions selected online platforms for teaching learning activities (Mishra et al., 2020) and those teachers who refused to work on the online platform were left behind as they did not want to take the extra burden. However, the condition created for teachers neither to choose their retirement nor leave for other professions, but they were unhappy with their teaching styles and their teaching method due to less interesting and ineffective with comparing to other teachers who is perfect with technology. The situation created by the pandemic proved that technology cannot replace teachers but those teachers who did not use technology will be replaced soon, however, there are multiple challenges in teaching online in the context of Nepal (Adhikari et al., 2022). For the successful deployment of educational technologies, teachers' attitudes and approaches to teaching with technology are essential (Englund et al., 2017) and hence the importance of digital technology in education has risen dramatically at all levels of school (Umek et al., 2015). As a consequence, the adaptability of digital learning management systems has recently become a requirement, affecting the behaviors of educational institutions, educators, and students (Aristovnik, 2014; Raza et al., 2021). This shows the necessity of professional development training programs for teachers, which play a key role in enhancing students' quality learning (Ghavifekr & Rosdy, 2015). Monterroso and Escutia (2011) indicate higher education would be impossible to imagine without the usage of technology in the twenty-first century. It is a challenge for teachers to integrate educational innovations, to make the benefits they provide to optimize learning, promote collaborative and cooperative learning, and help students to gain new skills and cognitive abilities as they prepare for their future careers. Similarly, the teachers from remote area of Karnali and Sudurpaschim Provinces, where the study was conducted have challenges due to the limitation of access to technology, poor digital literacy and remoteness.

Online learning platforms are effective for teaching and learning both in and out of the classroom. As Wu et al. (2017) expressed, virtual learning tools have the capability to increase students' academic

performance, enhance collaborative learning through peer participation, and hold teachers accountable for the learning of their students. In addition to these benefits, the interactivity of students and researchers with supervisors will be improved with their academic performance by utilizing social media (Al-Rahmi et al., 2015). ICT tools and digital pedagogical skills appear to be an ultimate solution of learning since they allow students to communicate, edit, annotate, arrange, and generate texts fast and freely (Njoku, 2015). Also, the result of the study conducted by Zamora-Antuñano et al. (2022) shows that 60% of higher education institutions allowed to use virtual learning platforms, where 60% of respondents had experience using Moodle, Google Classroom, and Blackboard; 80% teachers had received training from their institution for the use of virtual platforms. Google Classroom is an important tool for promoting blended learning and professional development (Iftakhar, 2016). Google Classroom is an option that can help save time and paper by distributing work and communicating on a regular basis (Fitriningtiyas et al., 2019). Google Classroom links and facilitates the use of other Google apps, such as docs, slides, and spreadsheets, whereas the process of distributing documents, grading, formative assessment, and feedback is streamlined and simplified (Bayarmaa, 2018; Iftakhar, 2016).

Google Docs is an excellent tool for encouraging student-student and student-teacher collaboration. Furthermore, it was discovered that Google Docs has the potential to increase student-content and student-interface interactions by utilizing the application's resources and features (Ishtaiwa & Aburezeq, 2015) as so many of today's students worldwide often expect technology to be integrated into their daily lives. Mobile devices provide new opportunities to help teaching and learning in the classroom (Evans, 2008; Wu et al., 2012). Mobile device applications promote individual and independent learning, as well as learning by doing, sharing, and peer review, all of which help to improve teaching effectiveness (Wong, 2012). Furthermore, it helps to design teaching materials (Gedik et al., 2012; Martin & Ertzberger, 2013) to the teachers. According to recent records, 63% of Nepal's population has internet and mobile data access, with 95% being mobile users(Neupane, 2018). Hence, in the context of Nepal, mobile devices are useful for teaching learning activities. The settings, on the other hand, are only developed once mobile devices have been successfully introduced into classrooms and incorporated into teaching on a long-term basis (Sung et al., 2016). On the other hand, Mendeley reference management software aids students in producing papers and theses by providing citation writing accuracy and a large reference list. It aids citation correctness, bibliography accuracy, citation and bibliography synchronization, easy synchronization with digital object identifier features, and bibliographical data (Iskandar & Patak, 2019).

Teachers require fundamental ICT abilities, as well as knowledge on how to integrate ICT into classrooms and related pedagogical knowledge (Voogt et al., 2013). Furthermore, studies have revealed that teachers' attitudes about technology and its integration into classroom practice can be critical to successful ICT implementation (Goktas et al., 2009). Kabakci (2009) emphasizes that in order to provide teachers with appropriate knowledge, attitudes, and skills for their vocation, they must be trained to use ICT. Teachers must be well-trained in order to achieve the critical function of computer technology in schools and to overcome potential barriers to its implementation (Reddy, 2015). Bradshaw et al. (2012) showed that using ICT in the classroom resulted in measurable changes in teachers, schools, and students in their research of a continuing professional development program in England. Teachers should give regular training in digital applications, with the goal of focusing on student learning rather than the technology (Ruggiero & Mong, 2015). The Government of Nepal has declared ICT policy that ICT will be integrated into all levels of education, and it also emphasizes the importance of teachers' ability to use current educational technologies (MoIC, 2015). However, it has not shown in practice because of the Nepali government has not allocated required resources for either developing ICT infrastructure or ICT training for teacher. School sector development plan, 2016-2023 (MoE, 2016) states that funding for equipping schools with Infrastructure is not available. This statement and ICT policies are shown to be contradictory to each other. Conducting online learning in the context of Nepal is challenging (Adhikari et al., 2022; Joshi & Rawal, 2021; Khanal et al., 2022a, 2022b). Rana et al. (2018) reports on their article that access to ICT in and outside of the classroom is frequently insufficient, and that pre-service teacher education and government-provided in-service training do not cover the use of ICT in instructional activities. Further they argued that non-governmental organizations provide infrastructure and training in the usage of digital gadgets. In these contexts, virtual training is necessary for teacher to make sustainable digital pedagogies and current study focused to find answer to research question–What is effect of five-days digital pedagogical training on digital pedagogical skills of teachers?

METHODOLOGY

The research was based on five-day teachers' participation in training on digital pedagogical skills organized by Everest Club in Dailekh District of Nepal in the support of the Save the Children from February 25 to March 1, 2022 through Google Meet. In total, there were 79 school teachers (teaching at class one to 12) who actively participated in the training, but only 44 teachers participated in the pretest-posttest quasi experimental research as questionnaires were sent online using Google Form. Participation of teachers in this research was voluntary.

The training program was implemented to the school level teachers, which was not limited to any level and subject. The teachers' groups were formulated by the organization for the purpose of giving digital skill related trainings consisting not more than 30 teachers in each group. The training was carried out because the teaching learning was stopped due to the limited possibility of face-to-face class. So, it was intended to ensure learning continuity through the virtual learning practice making the teachers from the remote part of Nepal able to practice digital pedagogical skills.

Everest Club in the partnership with Save the Children and in collaboration with the local level implements an integrated project with the thematic areas of education, child protection, livelihood and community-based disaster risk reduction. In education, the project has the focus on enrolling out of school children at schools, increasing regularity of students and improving learning performance. Due to the long shutdowns during the COVID-19 pandemic, the children were at home, and they were not receiving the opportunity of learning continuity and their academic activities were entirely disturbed (Joshi et al., 2023). Hence, Save the Children initiated digital skill training to the teachers by which the teachers and children can be connected with each other for learning continuity and organized the virtual classes during the COVID-19 pandemic. In addition to this, the organization

Table 1. Detail activities & outcomes of the program

Learning outcomes	Activities
First session	
Develop concept of 21st century learning & teaching practices, necessary digital skills, & familiar with digital resources.	Presentation on 21st century skills of teachers, developing trend of technology in instructional practices, 21st century learning, necessary skills of teachers for using digital resources, & types of learning like flipped learning, blended learning, artificial intelligence. Also, some important links of digital resources were shared through presentation for practices of teachers.
Second session	
Participants were able to develop & manage document setup, formatting, making presentations, & basic result analysis on Excel.	Session was started using MS Word & worked on basic & useful features of MS Word, Excel, & PowerPoint.
Third session	
Participants were able to handle & use necessary google apps for their instructional practices & use of Google Drive for collaboration.	Session was started by revision of second-day session & experiences of participants. Contents like use of Google Sheets, Slides, Forms, Meet, Calendar, Translate, & voice typing was covered in session including use of these tools for communication, & collaboration. Use of Google Drive & Google apps was main focus of session & purpose of using these resources for pedagogical practices was main concern of session. Practice on Google apps & Google Drive was assigned tasks for participants for practices.
Fourth session	
Participants were able to manage learning management system.	Fourth session was started by experience sharing of participants of previous session. After experience sharing, use of Google Classroom for learning management systems like creating classroom, students' & teacher's enrolment, course management & material sharing, homework, & assignment management for evaluation were covered. Also, terminal evaluation & managing portfolios were covered in session. After completion of day three content, practice of Google Classroom was provided as an assignment to participants.
Fifth session	
Participants were able to take virtual class.	Program of fifth day was started by revision of fourth days activities. Main content of session was scheduling, taking online class, screen sharing, use of digital board (Jam Board & Microsoft Whiteboard), virtual class environment (risk management), virtual attendance, class recording, messaging, & sharing techniques, video recording of PPT, & screen recording through Link2Go application & video development.
Sixth session	
Participants were aware about safe use of digital resources like subject related software, online resources & mobile apps. Participants were able to use personal digital library & manage collaborative group.	Sixth day program was started by reflection of fifth day program. Activities covered were use of digital resources, the Internet surfing strategies, techniques of downloading software, mobile apps, books, journal articles, & content related PPT. Evaluation techniques & access to digital resources in diverse content were practiced & shared. Focus was given to learning portal developed by Center for Education and Human Resource Development. Library management & collaborative learning tool with referencing & citation "Mendeley" was main focus of program. Download, install, account creating, & use of digital library tool Mendeley, manage groups, folders, import documents from device & web sites, highlighting text, & notes were core contents under digital library tool, Mendeley. Before closing program, reflection by participants, organization, & facilitators were shared by representatives of concern groups.

had provided professional development opportunity to the teachers at the working schools on early grade reading and early grade math. Similarly, the poor performing children of grade 1-3 are provided remedial support as well. Likewise, the organization has provided bursary support to the children from most marginalized family for their continuity at schools, child-friendly classroom management and provision of grade appropriate learning materials as also the key interventions. In this way, the project is providing technical support and the on-the-spot coaching support to the early grade teachers through mobilizing trained Pedagogical Resource Person.

Objectives of the Training

The main aim of training was to develop digital skills of school teachers of Karnali Province, which is the remote area of Nepal. The detail objectives of training were to develop skills of teachers for

1. handling digital devices, learning apps, and portals,
2. handling Google apps and drive,
3. managing virtual classrooms,
4. using learning management system tools,
5. using digital library tool/software (Mendeley),
6. use of virtual learning platform, and
7. awareness of safeguarding risks and mitigation strategies while taking online classes

Day-Wise Detail Activities of the Program

Most of the program sessions were practical, where the teachers need to be engaged online and off-line both. The organization had provided internet connection charge to the participant teachers during the program. The training was completed on six sessions in fifteen hours (2.5 hour per session). The content of the training package was determined with the help of digital competency framework of Joshi et al. (2021). The detail activities with learning outcomes of the program are presented in **Table 1**.

Data Analysis

The data were analyzed by using inferential and descriptive statistics. The level of digital pedagogical skills of teachers in pre-test and post-test were analyzed by using mean, standard deviation (SD) whereas item wise mean difference between post-test and pre-test was reported to find the changes in competencies of teachers after intervention. Independent sample t-test and ANOVA were used to find the significant results on digital pedagogical skills of teachers based on sample characteristics whereas the multiple linear regression was

Table 2. Status of level of digital pedagogical skills of teachers in pre- & post-test (n=44)

Items	Pre-test		Post-test		MDoPP t-value
	Mean	Standard deviation	Mean	Standard deviation	
Writing tools (MS Word & Google Docs)	1.84	0.71	3.25	1.38	1.41
Result analysis tool (Excel & Google Sheets)	1.57	0.59	2.86	1.39	1.29
Presentation apps (PowerPoint & Google Slide)	1.75	0.65	2.91	1.33	1.16
Digital notebook (Evernote & OneNote)	1.39	0.65	2.59	1.32	1.20
Calendar-timetable (Google Calendar)	1.41	0.66	2.68	1.27	1.27
Evaluation tools (Google Form)	1.39	0.65	2.68	1.27	1.29
Use of email (massaging, file transfer, & receiving massage)	1.93	0.76	3.48	1.32	1.55
File sharing (Google Drive)	1.68	0.74	3.16	1.33	1.48
Internet surfing (search information & download files)	1.66	0.71	3.36	1.35	1.70
Subject related software	1.36	0.57	2.84	1.26	1.48
Subject related mobile applications	1.61	0.58	3.09	1.14	1.48
Subject related online resources	1.61	0.69	3.09	1.25	1.48
Video conferencing tool (Google Meet & Zoom)	1.48	0.63	3.00	1.35	1.52
Virtual board (Jam Board & Microsoft Whiteboard)	1.34	0.53	2.64	1.33	1.30
Learning Management System (Google Classroom)	1.39	0.58	2.64	1.43	1.25
Screen recording (Link2go)	1.39	0.58	2.66	1.33	1.27
Digital library tools (Mendeley)	1.34	0.57	2.61	1.28	1.27
Total mean	1.54	0.46	2.91	1.18	1.37

Table 3. Significant results based on sample characteristics (n=44)

Sample characteristics	Frequency	Post-test			Pre-test		
		Mean	Standard deviation	p-value	Mean	Standard deviation	p-value
Gender				0.04*			0.30
Female	8	3.69	0.73		1.69	0.56	
Male	36	2.74	1.20		1.50	0.43	
Experience				0.91			0.69
<10 years	20	2.89	1.16		1.57	0.43	
≥10 years	24	2.93	1.23		1.51	0.49	
Qualification				0.03*			0.00*
Bachelor	6	3.90	1.44		2.04	0.39	
Master	38	2.76	1.08		1.46	0.42	
Educational background				0.21			0.06
Other streams	6	3.48	1.15		1.86	0.60	
Education stream	38	2.83	1.18		1.49	0.42	
Job type				0.43			0.47
Permanent	21	2.76	1.25		1.48	0.36	
Temporary	23	3.05	1.13		1.59	0.54	
Teaching level				0.05*			0.01*
Basic level	20	2.54	1.17		1.33	0.46	
Secondary level	24	3.22	1.13		1.71	0.39	

Note. *p<0.05

calculated to find the effect of sample characteristics on digital pedagogical skills of teachers.

RESULTS

Table 2 shows that the mean and SD of both test and mean difference between post-test and pre-test. Result shows that the level of digital pedagogical skills of teachers found to be significantly low in all measured items. However, the teachers have poorest competency level in the use of digital notebook and evaluation tools (Mean=1.39, SD=0.65), virtual board (Mean=1.34, SD=0.53), LMS and screen recording tools (Mean=1.39, SD=0.58), and digital library tools (Mean=1.34, SD=0.57).

MDoPP: Mean Difference on Pre- & Post-Test

Table 3 shows that the training was found to be significantly more fruitful for female teachers (Mean=3.69, SD=0.73) as compared to males (Mean=2.74, SD=1.20). Similarly, it is found to significantly more fruitful for those having bachelor's degree (Mean=3.90, SD=1.44) and the teachers of secondary level (Mean=3.22, SD=1.13) as compared to those having master's degree (Mean=2.76, SD=1.08) and teachers of the basic level (Mean=2.54, SD=1.17), respectively. However, the mean score is found to be high in post-test as compared to pre-test in each case. Additionally, the effect size was measured by using Cohen's d technique and the value found to be 1.53.

In **Table 4**, the multiple linear regression was calculated based on sample characteristics on the mean score of pre- and post-test results. The model in pre-test explain 29% variance with significant ANOVA $F(6, 37)=2.52$ whereas the post-test explains 42.7% variance with

Table 4. Effect of sample characteristics on pre- & post-test results (n=44)

Variables	Post-test			Pre-test		
	Beta	Significance	VIF	Beta	Significance	VIF
Gender	-0.33	0.03	1.12	-0.13	0.32	1.12
Experience	-0.02	0.92	1.25	-0.22	0.13	1.25
Qualification	-0.32	0.05	1.24	-0.44	0.00	1.24
Educational background	-0.15	0.31	1.07	-0.23	0.09	1.07
Job type	-0.07	0.65	1.24	-0.09	0.52	1.24
Teaching level	0.21	0.17	1.17	0.34	0.02	1.17

significant ANOVA F(6, 37)=4.59. The results indicate that the teaching level and qualification were significant predictors in the models and results found to be in favor to those having bachelor qualification and teaching at secondary level in pre-test. Whereas gender and qualification found to be significant predictors in post-test and the results found to be in favor to female and having bachelor's degree qualification.

DISCUSSION

The aim of the research was to identify the effect of five-days digital pedagogical training on the digital pedagogical skills of teachers in the remote area of Nepal. The results showed that the digital pedagogical skills of teacher of Karnali Province found to be significantly poor, which may cause that the teachers of the study area have not access of digital devices and internet for learning continuity during COVID-19 pandemic. This is the common problem in the context of Nepal (Adhikari et al., 2022; Joshi & Rawal, 2021; Khanal et al., 2022a, 2022b). Additionally, because of not having such facilities, instructional activities during lockdown were entirely disturbed. Among all measured items the digital competencies of teachers in using digital notebook, evaluation tools, virtual board, learning management system tools, screen recording tools, and digital library tools found to be poorer as compared to remaining items. The digital pedagogical skills of teachers found to be high in post-test hence the interventions as training found effective however, the training was virtual, and the teachers have some resources related issues hence only five-days training is not sufficient. Thus, regular training is needed to teachers for their professional development (Kabakci, 2009), which includes follow up support

The training was found to be significantly more effective for female teachers, which may cause that the female teachers in remote area did not get opportunities to promote digital pedagogical skills in comparison to the male teachers before this training and became highly motivated during the training. In Nepalese context, females are more energetic, enthusiastic and dedicated to learning new things in comparison to male, so they engaged more in the discussion during the training. The results also suggesting that the females can do better by getting such opportunity, hence concern stakeholders should give more opportunity for professional development support like participation on training, workshop and seminars (Ruggiero & Mong, 2015). Similarly, the training found to be significantly more effective to those teachers having bachelor level qualification indicating that teachers of having higher qualification needs more digital pedagogical skills (Instefjord & Munthe, 2017). The digital pedagogical skills of teachers of secondary level found to be higher than the basic level, which may cause that the above bachelor's degree qualification is mandatory for secondary level school teachers in Nepal and ICT related information is partially integrated in the curriculum of Bachelor of Education and Master of Education, hence, they were somehow familiar with digital pedagogical skills. However, the necessary skills to use digital tools in pedagogy is not achieved at desired level hence further training and support are needed to the teachers of all levels.

The training found to be more effective in the use of writing tools (MS Word and Google Docs), email (messaging, file transfer, and receiving messages), file sharing (Google Drive), internet surfing (search the information and download files), subject related mobile applications and online resources, and video conferencing tool (Google Meet and Zoom), which are basic and necessary skills for online instruction and use of digital resources in instructional practices. However, the digital pedagogical skills of teachers have less improvement in digital notebook (Evernote and OneNote), calendar-timetable (Google Calendar), evaluation tools (Google Form), virtual board (Jam Board, Microsoft Whiteboard), LMS tool (Google Classroom), screen recording (Ink2Go), and digital library tools (Mendeley). The reason behind that may be almost teachers were participating through smartphone and some of these applications are comparatively difficult to use in mobile. This scenario indicates that issue of availability of digital device still existing in the remote part of Nepal. All the teachers did not have personal computer to practice together with the facilitators. We can easily imagine that the accessibility of the digital devices for the students is further challenging.

CONCLUSIONS

The training program in digital pedagogical skills is highly effective to the teachers of remote areas. Gender, qualifications, and teaching level are contributing factors to determine the digital pedagogical skills of teachers. The research result from the data of five-day teacher training reveals that teachers eagerly participated and improved their digital skills, but long-term support and continuous training is required to be a digitally competent teacher. The result of this study is even more important to policy makers, training content designers, different organizations working in the area of teacher trainings for designing new content of teacher training especially related to digital pedagogy. The results also helpful to the teachers and school administrators to know the digital pedagogical skills for instructional practices. However, the research was limited to remote area teachers not having laptop with all and digitally poor competency level with virtual mode hence further study can be conducted on other geographical area, among those who are familiar with digital resources, and teachers having access of good internet and digital devices like laptop/computer. The effect was measured based on five days training hence further such study can be conducted based on the long-term training conducted by governmental and non-governmental bodies of the government. Furthermore, the training covers large and general content in limited time, hence, further

training can be conducted in content specific domains in face-to-face mode and can be measured its effect.

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