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Impact of ICT on Teacher Professional Development: A Mixed-Method Study in the Context of Kathmandu District, Nepal

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Abstract

This study investigates how information and Communication Technology (ICT) is shaping Teacher Professional Development (TPD in Kathmandu District. Based on a mixed-methods research design, the research has targeted school-teachers at the secondary level in the Kathmandu district and has used the UNESCO ICT Competency Framework as the foundation for analysis of teacher responses. The Data were collected from 50 teachers working across different types of schools, combining qualitative interviews with descriptive survey analysis. This approach thus helps to capture how access to ICT influences teachers' opportunities for professional development and learning, pedagogical innovation with best practices, and the type of institutional support they receive. Many teachers have had some form of ICT training; they are still in the process of integrating digital tools into locally relevant teaching practices in the classroom for teaching and learning process. This study also points out that retaining trained teachers remains an issue, reflecting deeper disparities in infrastructure, training opportunities, and participation between public and private schools. The findings points to a need for more decentralized and context-sensitive forms of support. Effective ICT-based TPD requires stronger institutional commitment and a clearer national-level policy framework. The findings shows that, pragmatic recommendations which may help address the existing gaps and inform education planners on the design of more inclusive and ICT-responsive teacher development strategies, with particular reference to the developing educational context in Kathmandu District Nepal.

Keywords: *ICT, Competency Framework, Teacher Professional Development (TPD), Public vs. Private Schools,*

Introduction

In the education field in Nepal, digitalization of the world has opened up new landscapes and redefined challenges for delivery education and teaching learning activities. The approaches for teaching and learning processes have been completely revolutionized by the ICT (UNESCO, 2020). Agreed with UNESCO 2020 that, in the diversified geographical

and social settings of Nepal, ICT Integration in Education is very imperative, while we have some policies like SSDP 2026-2023 and National Educational Policy 2019. The intention of such policies is certainly to enhance ICT-integrated teaching and learning but it's about time we also really consider how ICT does actually contribute TPD in a practical setting. The Professional Development includes systematic and continuous education and training to enhance the instructional capability of teachers, their subject knowledge, and pedagogical effectiveness. According to Desimone, (2009), with the increased usage of ICT, professional development options are increasing from face-to-face workshops to online training, virtual peer collaboration, access to open educational resources, and digital LMS. Indeed, all these tools potentially decentralize TPD, making it more accessible, needs-based, and continuous. According to Davis, Preston & Sahin (2009), various factors influence the success of ICT-based TPD: digital infrastructure, readiness of teachers, institutional support, and attitude towards socio-cultural factors. In Nepal, where many teachers work in resource-limited settings, using ICT for professional development is at the same time a requirement and a challenge.

The Government of Nepal considered using ICT in Education vital since the early 2000s, especially through the ICT in Education Master Plan (2013-2017). Within these strategies, it is expected that the teachers will be digitally competent, have equitable access to learning resources and technology, and infuse ICT into the curriculum and teaching. Despite this policy exertion, the practice at the provincial and district levels is very uneven. It is important to highlight the digital gap between urban and rural regions, but it also exists among teachers themselves. While some teachers in Kathmandu have access to devices, training, and high-speed internet, many struggle with basic digital literacy, more so older or contract teachers. The lack of a universal framework for continuous ICT-based TPD leads to irregular or one-time training that does not produce a long-term impact. Recent studies have pointed out that, post-training support and follow-up mechanism or even peer collaboration to teachers are almost non-existent (Pant, 2021; Bhattarai, 2023). This study is therefore an attempt to contribute to empirical evidence on the impact of ICT on teacher professional development in Nepal, particularly focusing on the Kathmandu district which has higher incidence of digitally connected schools nationwide.

The study are in agreement with international frameworks such as UNESCO's ICT Competency Framework for Teachers which emphasizes three levels of development vital for Education 3.0; Technology Literacy, knowledge deepening and public dragging to become a global digital citizen (UNESCO, 2018). To this end, the research aims to find out where Nepali teachers place themselves between these levels for generating some understanding of its digital pedagogical maturity status in the context.

Literature Review

At the same time, in numerous countries globally, integrating Information and Communication Technology (ICT) into educational implementation, not least in teachers' professional development processes is high on the agenda. One of the most valuable tools that ICT has is being able to help teachers become lifelong learners in a flexible, adaptable, and cost-effective way (UNESCO, 2020). Many international frameworks, including the UNESCO ICT Competency Framework for Teachers (ICT-CFT), recognise and target 3 interconnected hierarchical levels of ICT as: (1) Technology Literacy, (2) Deepening the knowledge, and Creation of Knowledge. This method could provide a firm foundation for investigating and inform professional development initiatives aimed at integrating ICT in various situations (UNESCO, 2018). The South Asian context is characterized by grossly unequal infrastructure and pedagogical preparedness to harness the full potential of ICT towards capacity building

within TPD. Only a few studies from India and Bangladesh particularly underline how different models of blended learning, peer-mentoring by colleagues, and contextualized digital resources may enhance teacher engagement with ICT. Similarly, Davis, Preston, and Sahin (2009) found that the impact of ICT on teacher growth is amplified when professional learning is sustained, collaborative, and closely tied to classroom practice.

Different documents of the related policy, such as the ICT in Education Master Plan (2013-2017) and the School Sector Development Plan (2016-2023), have fixed the agenda for integrating Information and Communication Technology (ICT) in education, including teacher capacity building, through government-led initiatives in Nepal. The studies have highlighted that there is a gap between policy intentions and actual implementation within schools, particularly at public schools (Pant, 2020). The majority of ICT training covers tool familiarity, such as MS Office and Zoom, rather than pedagogical integration (Dahal & Shrestha, 2021). On top of that, the TPD modules in the NCED lack continuous digital learning or contextually relevant digital content creation.

Recent studies by Bhattarai (2023) and Adhikari (2022) further highlight that although Kathmandu district is relatively better in terms of ICT infrastructure, there is still existing inequality between institutional and community schools. Teachers themselves usually lack confidence or contextual support to turn these digital skills into much-needed pedagogical practices. Theoretical viewpoints like ZPD by Vygotsky and the TPACK framework further require scaffolded and situated learning experiences that are usually lacking in the top-down ICT training model of Nepal (Shulman, 1987; Koehler & Mishra, 2009). It aims to add to this increasing literature by providing empirical evidence from Kathmandu district through the lenses of teachers' lived experiences related to ICT-based TPD.

Methodology

In this study, the mixed-method approach was used to explore how Information and Communication Technology (ICT) influences teacher professional development in Nepal specially in the Kathmandu District. In this study, the researcher was used qualitative design, and used minor quantitative component to give additional contextual which is support the reliability of the findings. This mixture helped produce a more smooth-edged understanding of the situation rather than relying on a single method. The research was focused in secondary-level schools in the Kathmandu district of Nepal, including 50 secondary-level teachers was selected as respondent. The participated and their responses offered a realistic picture of how ICT is being used or sometimes not used in their professional growth activities. Both primary and secondary data sources was used. Semi-structured interviews and open-ended questionnaires was made and provided them for data collection for explain their experiences in their own languages, whereas a short, structured questionnaire offered simple descriptive data on ICT access, training participation, and availability of digital tools. Participants were selected by considering a few important variables such as school type, gender, teaching experience, and exposure to ICT. This ensured that the study included teachers with different backgrounds and working conditions. The data collection process was focused on five broad themes: teachers' access to ICT resources, their involvement in ICT-related training, the influence of ICT on teaching practices, institutional support and constraints, and teachers' general perceptions of ICT in their professional development. All interviews were recorded in Nepali language and later translated into English and transcribed. The translations were done carefully so that the original meaning and tone were unspoiled. The thematic analysis followed Braun and Clarke's (2006) framework, which helped the researcher for organize the data into meaningful categories and highlight recurring ideas across participants.

Findings and Discussion

The findings of total 50 secondary-level teachers (respondent) from the study area shows that several important insights regarding the integration and influence of Information and Communication Technology (ICT) on teacher professional development (TPD). The findings were structured into five major thematic areas: (1) *Teachers' Access to ICT tools and digital resources*, (2) *their participation in ICT-focused professional development activities,* (3) *changes observed in teaching practices and pedagogical approaches after use of ICT,* (4) *challenges that affect ICT integration*, and (5) *teachers' perceptions and their recommendations for improving ICT-supported TPD.*

Availability of ICT Tools and Resources

A majority of respondents (76%) say that they regularly use smartphones, and 58% respondent says that, about the availability of a personal computer (either desktop or laptop) in their school or at home. The minority number of the respondents (42%) says that, the internet connectivity is relatively better than in rural areas, and 52% of teachers still reported unstable internet connectivity as a frequent issue. Teachers from private schools were more likely to express their views on access to higher-end digital devices and uninterrupted Wi-Fi, while community school teachers often shared devices and had irregular power supply. Many teachers reported using Google Meet, Zoom, YouTube, and E-Pustakalaya for instructional planning and professional learning. Only 24% had prior experience using Learning Management Systems such as Moodle, Google Classroom, Microsoft Teams, and Zoom. These statistics reflect a moderately enabling digital environment, showing that while access exists, concerns remain in terms of usage.

Participation in ICT-Based TPD

Nearly all teachers (92%) had participated in at least one ICT-related training or workshop in the last three years. Training programs were conducted by government agencies, e.g., National Centre for Educational Development NCED; international NGOs, e.g., UNESCO and British Council; and private EdTech organizations. However, the duration and quality of training were very uneven. A minority of respondents (38%) reported receiving follow-up support and refresher training. The majority of the teachers (66%) said that, The MS Office, Zoom, and YouTube but never received in-depth training on how to integrate these tools into teaching learning activities in their lessons appropriately (Dahal & Shrestha, 2021. Teachers also quoted dissatisfaction with one-off training events that lacked continuity and classroom application. One teacher from a public school mentioned: *"We are called for ICT training, but it's often just about basic computer use. Real classroom strategies using ICT are not covered at all, even in every training".*

Changes in Teaching Practices and Pedagogy

In the face of ongoing infrastructural limitations, 61% of the teachers say that they use at least one form of ICT tool in their regular teaching and learning activities. Teachers in private schools tended to integrate digital videos, PowerPoint slides, and online quiz platforms to make lessons more interactive (UNESCO, 2018). Some community school teachers (10%) also made efforts to incorporate digital resources, often relying on materials downloaded from different learning platform like; Google, YouTube, E-Pustakalaya, particularly for subjects such as science, English, and Computer. More than half of the respondents indicated that ICT use had increased their motivation to innovate, experiment, and reflect on their teaching methods. A notable proportion of teachers (39%) continued to rely primarily on the traditional Board Marker/chalk-and-talk approach. Their unwillingness stemmed mainly from a lack of confidence in using digital tools and concerns about potential technical difficulties during

lessons. Majority number (90%) teachers agreed that ICT enhances student engagement, especially within blended learning settings that became more common after the COVID-19 pandemic. As one female English teacher shared*, "After COVID-19, I started recording lessons on my phone and sharing them through WhatsApp. It was not perfect, but it helped me stay connected with my students."*

Institutional and Systemic Barriers

In this study, a series of different barriers to effective ICT-based teacher professional development were identified. (1) Private and public schools are experiencing a wide digital gap, with few devices, untrained ICT personnel and unreliable internet in the latter. (2) Administrative support is less-than-stellar; only 30% of teachers said that they had staff to help with ICT or even a school-level digital strategy. (3) Most schools have no clear guidance or motivation for teachers to follow ICT training Nepal (Shulman, 1987; Koehler & Mishra, 2009). The uncompromising format of the government's teacher training model and insufficient budget for ICT in community schools are also compounding. Some teachers also expressed concern about the additional burden due to a lack of familiarity with digital platforms. *"Occasionally, I avoid online assignments because I do not know how to assess them properly," said a senior teacher from a public school.*

Teacher Perceptions and Recommendations

Teachers perceived ICT as having the potential to support their professional development (UNESCO, 2020). But, they are calling for more practice-oriented, subject-related, and context-sensitive ICT training. The majority of respondents recommend that the training should be conducted in the Nepali language, demonstrations are to be provided and allocation of time for practical work is necessary. Delegated interventions, on-site capacity building and blended learning models were preferred over centralized, very generic programs. Some teachers also asked for a 'reward', such as a certificate, to encourage participation. *"We want to use technology, but we need step-by-step guidance and support from our school management,"* summarized view of one mathematics teacher.

Discussions

Findings from this study suggest that ICT has made a moderate though significant contribution to the TPD of secondary school teachers in Kathmandu. While many teachers indicated that they participate in exposure to different types of ICT training and reported having a positive attitude towards digital technology, their involvement, skill development, and pedagogical shift seem to vary greatly. These results reinforce the earlier assertions by Dahal and Shrestha (2021) that ICT integration in Nepal's teacher development is potentially promising, but problems exist in terms of implementation. Although this more urban district has better access to certain ICTs than its rural counterparts, it still faces infrastructural issues of both access and availability. Private school teachers used resources such as a strong internet connection and computer labs dedicated to their use, while community teachers worked with devices they shared between each other, or with the lack of stable connectivity. This 'digital divide' within schools reflected inequalities at the national level, a point made clear in the Digital Nepal Framework (MoCIT, 2019), where access to hardware and connectivity was identified as a critical challenge for equitable uptake of ICT.

The data show that the pattern of ICT-based TPD is one of compliance rather than impact. Even if 92% of the respondents in Kathmandu have participated in basic ICT training, that is still lacking benefits due to the lack of follow-up support and mentorship on classroom pedagogy. This is in line with the criticism of Pant (2020), who argues that most TPD programmes in Nepal adopt "a one-size-fits-all approach" and do not cater to differentiated

needs surrounding teacher readiness and subject knowledge. A study such as Davis et al. (2009) have highlighted internationally that it is best to teach teachers which occurs over time, in context and as part of the fabric of daily teaching. In the case of Nepal, there is a policy-practice 'gap' in translating this principle into practice. An important finding presented in the article is minimal pedagogical change, even when exposed to ICT use. Although 61% of the teachers indicated using technology in classrooms, it was primarily confined to a superficial level where use of new technologies is limited to showing PowerPoint slides and playing YouTube videos and not delving further into digital pedagogy or learner centred practices. This is consistent with the claim of Unwin et al. (2010) that ICT use in education can often tend to be conservative rather than progressive. The UNESCO ICT-CFT spectrum provides the context for this study, with most teacher faculties engaging at the phase of technology literacy than in re-designing and adding to the curriculum or creating new knowledge (UNESCO, 2018). Only a small proportion of teachers reached more advanced levels of "knowledge deepening" or "knowledge creation," demonstrating the demand for clear, targeted career paths and structured ICT Continue to learn opportunities.

The second concern is an institution and ecosystem which surrounding the ICT based TPD. Community school teachers repeatedly reported no school–level digital plans, no access to technical assistance and limited program leader support. The results indicate that ICT usage in teacher professional development (TPD) in Nepal is restricted by systemic problems, such as lack of infrastructure, poor governance practices and misalignment between teacher training and the school resources (Adhikari, 2022). Teachers stressed the necessity of peer-mediated, socially interactive opportunities for learning, which echo Vygotsky's (1978) belief that professional development takes place through interaction with more skilled peers. There is a specific need for tools facilitating peer sharing, co-creation and provision of locally appropriate digital resources. Teachers were willing to use ICT but need continued motivation, support, and avenues for encouragement through provision of structured incentives like digital literacy allowances, certification-motivated career progression and local content in service delivery (Yodi, 2005). These recommendations are consistent with South Asian evidence, which suggests that a hybrid TPD model (combining face-to-face mentorship and online facilities) is recommended to address low ICT confidence (Sinha & Kaur, 2020). On the policy side, for example, Nepal's SSDP (2016–2023) as well as the ICT Master Plan (2013–2017) articulate grand visions of how to transform education digitally. There's still a fractional approach to dissemination and implementing training into classroom practice. This echoes calls for a second-generation ICT in Education Master Plan that privileged digital inclusion, teacher agency and structured pedagogical support (Bhattarai, 2023).

Conclusion

This study investigates the use of Information and Communication Technology (ICT) remains an increasingly crucial aspect of TPD, especially in the Kathmandu district of Nepal. Its potential for change and development remains mostly confined to pedagogical, human, and institutional constraints. Grounded in the UNESCO Framework for ICT Competencies for Teachers, results clearly unveil that the majority of the teachers mostly work at the Technology Literacy stage, where the use of ICT remains mostly confined to basic use and function, rather than transformative pedagogical change. Development at the level of Knowledge Deepening and Knowledge Creation remains irregular and mostly dependent upon the supportive context and the human agency of the teachers. Though the use and accessibility of ICT infrastructural resources and training programs remain far better, this development proves that technology alone remains inconclusive and insufficient to support professional development. The experiences and perceptions of the teachers explain that teachers' confidence, continuous mentoring, peer collaboration, and institutional support largely help to harness their potential

to integrate ICT into their reflective and learner-focused practices. In this case, the use of ICT-enabled TPD in the context of the Kathmandu district remains mostly focused upon compliance rather than results and impacts, mostly characterized by lackluster workshops with mostly sporadic and insignificant follow-through and connectivity to the class. This remains mostly hampered and limits the growing potential of the teachers to witness and experience their development and professionalization through the use and adoption of ICT, mostly deeply rooted and entrenched along the levels and stages of the UNESCO framework. The huge gaps that mostly separate both the government and community schools further confirm the institutional systemically embedded and constructed inequities that shape and mould the professional development and trajectories along the path of the teachers. Teachers belonging to the community schools mostly face structural barriers and constraints that mostly confine their development along the stages and levels defined and constructed along the UNESCO framework, though their motivations to harness and tap into the use and adoption and potential applications of the use and adoption of ICT-enabled TPD practices, activities, and processes mostly remain strong and motivated.

Recommendation

Training should be in form of blended on-line/ contact-programmes formatted on mobile-friendly platforms to engage teachers across different demographic groups. The TPD materials should be developed with the subject specific and classroom context in mind so that they can he accessible in Nepali or other local languages for better usability and understanding. Develop teacher school-based or virtual communities of practice with teachers as facilitators that will collaborate, exchange best practices and links to mentorship, co-create ICT resources etc. Structured Follow-Up and Mentorship and offer regular coaching, helpline support and on-demand micro-courses to keep upgrading the skills of your workforce. Motivate teachers to use the ICT platforms more frequently by providing a digital skill certification, professional recognition and small monetary rewards. Develop digital strategies & hire ICT co-ordinator in schools for TPD Plan the institution of TPD as part of SIP. There is a need for re-examining national education policies to accommodate dynamism in the demands of ICT-supported teacher development and linking TPD objectives to pan-digital transformation strategies.

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