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Impact of Technology on Education in Nepal

Upama Chaudhary*

Abstract

This study examines the impact of technology on education in Nepal. Learning outcomes is the dependent variable. The selected independent variables are access to technology, teacher training, digital resources, government policies and support and parental involvement. The primary source of data is used to assess the opinion of respondents regarding access to technology, teacher training, digital resources, government policies and support, parental involvement and learning outcomes. The study is based on primary data of 132 respondents. To achieve the purpose of the study, structured questionnaire is prepared. The correlation and multiple regression models are estimated to test the significance and importance of technology on education in Nepal.

The study showed a positive impact of access to technology on learning outcomes. It indicates that increased access to technology enhances learning outcomes. Similarly, the study showed a positive impact of teacher training on learning outcomes. It indicates that trained teachers lead to enhance the learning outcomes. Likewise, the study showed a positive impact of digital resources on learning outcomes. It indicates that availability of resources digitally leads to increase in learning outcomes. Further, the study showed a positive impact of government policies and support on learning outcomes. It indicates that support from government body to educational institutions lead to increase in learning outcomes. In addition, the study showed a positive impact of parental involvement on learning outcomes. It indicates that active parental involvement enhances the learning outcomes.

Keywords: access to technology, teacher training, digital resources, government policies and support, parental involvement, learning outcomes

1. Introduction

Technology has transformed the educational landscape by enhancing access to information and enabling interactive learning experiences. For students, digital tools and online platforms have made learning more flexible and personalized. Understanding the impact of technology is crucial, as it shapes not only how students learn but also how educators teach. Tala (2009) argued that techno science played a crucial role in unifying science and technology education by promoting a coherent understanding of the two traditionally distinct subjects. Research indicated that integrating science and technology through techno science could enhance learning processes by providing students with a more authentic and interconnected perspective. According to Ertmer *et al.* (2012), teachers' beliefs about technology had been considered a significant factor in technology integration, and it had been suggested that internal factors, such as a passion for technology and problem-solving skills, influenced their success in adopting technology despite existing barriers. Gros (2007) examined digital games in education and suggested that multimedia design for learning environments should integrate key elements of interactive technology to improve student engagement and digital literacy.

The integration of technology in education has shown both significant potential and

* Ms. Chaudhary is a Freelance Researcher, Kathmandu, Nepal.

notable challenges, particularly in rural areas with limited access to resources. Despite efforts to implement e-learning and digital tools, the effectiveness and equity of these technologies in enhancing learning outcomes remain uncertain. Tamim *et al.* (2011) examined the impact of technology on learning practice in technology adoption. Bouck (2004) examined the impact of school size and setting on education in rural schools. The study revealed that rural schools face educational hardships such as limited course offerings, poverty, and less technological advancement, which affect student outcomes. Similarly, Essary (2011) examined the impact of social media and technology on professionalism in medical education. The study found that social media challenges students' ability to maintain professional boundaries, leading to incidents of unprofessional conduct. Likewise, Bonnardel and Zenasni (2010) investigated the impact of technology on creativity in design. The study found that new computer-aided design (CAD) systems enhance designers' cognitive processes and creativity. Moreover, Beldarrain (2006) explored the trends in distance education, focusing on the use of emerging technologies to foster student interaction and collaboration. The study concluded that technologies like wikis, blogs, and podcasts can promote collaboration, although their implementation faces challenges in distance education.

Dwivedi *et al.* (2020) examined the impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. The study revealed that the pandemic forced organizations to rethink their processes and adopt new technologies, offering insights on various topics including online learning and digital strategies. Similarly, McNicholl *et al.* (2021) assessed the impact of assistive technology use for students with disabilities in higher education: a systematic review. The study found that assistive technology promotes educational engagement and psychosocial benefits but highlighted barriers like inadequate training and device issues. Likewise, Papastergiou (2009) investigated digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. The study concluded that game-based learning enhanced both student knowledge and motivation compared to non-gaming methods, with no significant gender differences in learning outcomes. Moreover, Ertmer and Ottenbreit-Leftwich (2010) explored teacher technology change: How knowledge, confidence, beliefs, and culture intersect. The study concluded that teachers must adopt new mindsets and effectively integrate ICT to enhance student learning, emphasizing the role of professional development.

Awless and Pellegrino (2007) examined professional development in integrating technology into teaching and learning: Known's, unknowns, and ways to pursue better questions and answers. The study revealed that a more systematic evaluation of technology integration is necessary to understand its long-term impacts on teachers and students. Similarly, Kirkwood and Price (2014) assessed technology-enhanced learning and teaching in higher education: what is 'enhanced' and how do we know? The study revealed that there is no shared understanding of what constitutes enhancement in TEL and emphasized the need for clear evidence to support claims. Likewise, Teo (2009) investigated modelling technology acceptance in education: A study of pre-service teachers. The study concluded that perceived usefulness, attitude towards computer use, and computer self-efficacy directly influenced technology acceptance, accounting for a significant variance in behavioral intention. Moreover, Di Serio *et al.* (2013) explored the impact of an augmented reality system on students' motivation for a visual art course. The study concluded that augmented reality increased students' attention and satisfaction compared to traditional slide-based learning.

Jewitt (2012) examined the technology, literacy, and learning: A multimodal approach. The study concluded that new technologies have significantly reshaped curriculum knowledge, pedagogy, and students' literacy practices, altering teacher and student roles in the classroom. Similarly, Tondeur *et al.* (2012) assessed the strategies to prepare pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. The study found that using teacher educators as role models, providing authentic technology experiences, and ensuring institutional support are key strategies for effective technology integration. Likewise, Hsu and Kuan (2013) examined the impact of multilevel factors on technology integration: The case of Taiwanese grade 1–9 teachers and schools. The study found that both teacher-level factors, such as beliefs and training, and school-level factors, including school support and access to technology, play vital roles in successful ICT integration. Moreover, Sahu (2020) investigated the closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. The study found that the sudden transition to online platforms during COVID-19 disrupted education and negatively impacted the mental well-being of students and academic staff. Abidah *et al.* (2020) examined the impact of covid-19 to Indonesian education and its relation to the philosophy of “merdeka belajar”. The study found that the Indonesian Ministry of Education and Culture responded by promoting digital learning and implementing policies such as physical distancing and self-quarantine during the pandemic. Similarly, Tondeur *et al.* (2017) assessed the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. The study found that pedagogical beliefs significantly influenced technology use, emphasizing the need for professional development and institutional support. Likewise, Fu (2013) analyzed the complexity of ICT in education: A critical literature review and its implications. The study found that although ICT integration offers numerous benefits, barriers such as teacher attitudes, confidence, and school culture play an important role in successful implementation.

In the context of Nepal, Shakya *et al.* (2017) examined the state education system with e-learning in Nepal, focusing on its impact and challenges. The study found that e-learning provides flexibility in learning but faces barriers in rural areas and challenges in implementation. Similarly, Adhikari *et al.* (2020) explored the enhancement of Education 4.0 in Nepal in the context of school-level technology change. The study revealed that Education 4.0 is crucial for reforming the education system and improving digital competencies, though its implementation is hindered by a lack of local research and resources. Likewise, Dawadi *et al.* (2020) investigated the impact of COVID-19 on the education sector in Nepal, focusing on the challenges faced by the school education system. The study revealed that the pandemic worsened educational disparities, particularly for disadvantaged students, due to gaps in technological access. Moreover, Manihar (2024) analyzed the impact of computer applications in teaching and learning at the higher education level in Nepal. The study concluded that computer applications significantly enhance the efficiency and effectiveness of education, though challenges remain in their widespread adoption.

The above discussion shows that empirical evidences vary greatly across the studies on the impact of technology on education. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The major objective of the study is to examine the impact of technology on education in Nepal. Specifically, it examines the relationship of access to technology, teacher training, digital resources, government policies and support and parental involvement with learning outcomes.

The remainder of this study is organized as follows: section two describes the sample, data, and methodology. Section three presents the empirical results and final section draws the conclusion.

2 Methodological aspects

The study is based on the primary data which were collected from 132 respondents through questionnaire. The study employed convenience sampling method. The respondents' views were collected on relationship of access to technology, teacher training, digital resources, government policies and support, parental involvement and learning outcomes. This study is based on descriptive as well as causal comparative research designs.

The model

The model used in this study assumes that learning outcomes depend upon technology. The dependent variable selected for the study is learning outcomes. Similarly, the selected independent variables are access to technology, teacher training, digital resources, government policies and support and parental involvement. Therefore, the model takes the following form:

Learning outcome = f (access of technology, teacher training, digital resources, government policies and support, parental involvement)

More specifically,

$$LO = \beta_0 + \beta_1 AT + \beta_2 TT + \beta_3 DR + \beta_4 GPS + \beta_5 PI + e$$

Where,

LO = learning outcome

AT = Access of technology

TT = Teacher training

DR = Digital resource

GPS = Government policies and support

PI = Parental involvement

Learning outcome was measured using a 5-point Likert scale where the students were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include "Students using digital tools achieve better academic results than those who do not" "Technology reduces the gap in learning opportunities in remote areas" and so on. The reliability of the items was measured by computing the Cronbach's alpha (α).

Access of technology was measured using a 5-point Likert scale where the students were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree.

There are 5 items and sample items include “Lack of internet connectivity limits the use of technology in education in Nepal”, “Availability of digital devices enhances students’ access to educational content” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.741$).

Teacher training were measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Teachers trained in digital tools improve classroom learning”, “Lack of training hinders effective use of technology in classrooms” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.815$).

Digital resources were measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Localized educational content is necessary for better adoption of digital tools in Nepal”, “Access to online learning platforms improves academic performance” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.907$).

Government policies and support were measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Government investment in digital infrastructure improves educational outcomes”, “Policies promoting digital literacy enhance student readiness for technology-driven learning” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.835$).

Parental involvement was measured using a 5-point Likert scale where the respondents were asked to indicate the responses using 1 for strongly disagree and 5 for strongly agree. There are 5 items and sample items include “Financial constraints limit parents’ ability to provide digital tools for education”, “Parents’ support enhances students’ use of technology for learning” and so on. The reliability of the items was measured by computing the Cronbach’s alpha ($\alpha = 0.921$).

The following section describes the independent variables used in this study along with the hypothesis formulation.

Access to technology

Access to technology refers to the availability and ability of individuals or groups to use digital tools, devices, and internet services necessary for communication, education, work, and social participation. Naik *et al.* (2020) found that even with high student-to-computer ratios and minimal teacher training, technology-aided teaching positively impacted student learning outcomes, providing a low-cost and scalable solution in line with SDG-4. Similarly, Warschauer and Matuchniak (2010) concluded that the rapid spread of information technology plays a crucial role in enabling social and economic participation in the modern information-driven economy. Likewise, Panigrahi *et al.* (2018) revealed that integrating online learning with virtual communities can enhance student engagement and improve learning outcomes. Further, Wang *et al.* (2013) concluded that students with higher motivation and technology self-efficacy achieved better final grades in online courses. Based on it, this study develops the following hypothesis:

H₁: There is a positive relationship between access to technology and learning outcomes.

Teacher training

Teacher Training refers to the process of preparing individuals to become effective educators by equipping them with the necessary knowledge, skills, methods, and attitudes required for teaching. Harris and Sass (2011) concluded that informal on-the-job training led to increased teacher productivity, with the largest gains occurring in the initial years of experience, whereas formal professional development showed inconsistent results. Similarly, Nortvig *et al.* (2018) showed that key factors influencing e-learning outcomes include educator presence, student interactions, and integration of online and offline activities. Likewise, Araujo *et al.* (2016) found that parents recognize better teachers but do not significantly change their behaviors based on teacher quality differences. Further, Yu *et al.* (2011) concluded that peer-teaching in selected contexts achieved learner outcomes comparable to faculty-based teaching and also provided academic and professional benefits to student-teachers. Based on it, this study develops the following hypothesis:

H₂: There is positive relationship between teacher training and learning outcomes.

Digital resources

Digital resources refer to any content or tools that are available in digital format, typically accessible through electronic devices such as computers, tablets, and smart phones. Habler *et al.* (2016) found that while 16 out of 23 high-quality studies reported positive learning outcomes, the findings were inconsistent, and the fragmented nature of the evidence base limited generalizability. Similarly, Falloon (2020) examined from digital literacy to digital competence: the teacher digital competency (TDC) framework. The study revealed that focusing solely on technical skills was inadequate, and suggested that all disciplines must collaborate to ensure comprehensive digital competence in students. Likewise, Säljö (2010) revealed that digital technologies were not only supportive of learning but transformative, affecting how knowledge is acquired and understood. Furthermore, Livingstone (2012) concluded that the debate on whether ICT should support traditional teaching methods or foster new pedagogies centered on digital literacy's. Based on it, this study develops the following hypothesis:

H₃: There is positive relationship between digital resources and learning outcomes.

Government policies and support

Government policies and support refer to the regulations, initiatives, and financial or infrastructural assistance provided by government bodies to address various issues or to promote specific sectors, including education, healthcare, economy, and technology. Hanushek and Woessmann (2011) found that variations in skills measured by international tests are strongly related to individual labor-market outcomes and cross-country variations in economic growth. Similarly, Martin *et al.* (2013) assessed the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. The study concluded that entrepreneurship education and training (EET) has a significant relationship with entrepreneurship-related human capital and outcomes. Likewise, Zhang *et al.* (2020) showed that difficulties such as infrastructure weaknesses and teacher inexperience impeded the effectiveness of online learning during the pandemic. Further, Connor (2013) revealed that entrepreneurship education's economic benefits are difficult to substantiate due to the

multi-definitional perspectives of entrepreneurship. Based on it, this study develops the following hypothesis:

H₄: There is positive relationship between government policies and support and learning outcomes.

Parental involvement

Parental involvement refers to the active participation and engagement of parents or guardians in the educational processes and development of their children. Ma *et al.* (2016) analyzed a meta-analysis of the relationship between learning outcomes and parental involvement during early childhood education and early elementary education. The study found a strong and positive correlation between learning outcomes and parental involvement, emphasizing the role of behavioral involvement, home supervision, and home-school connection. Similarly, Boonk *et al.* (2018) concluded that reading at home, high academic expectations, communication regarding school, and parental support were key variables linked to academic success. Likewise, Gonida and Cortina (2014) found that parental autonomy support was the most beneficial type of involvement, while control and interference were associated with different student outcomes. Further, Castro *et al.* (2015) analyzed parental involvement on student academic achievement: a meta-analysis. The study revealed that high academic expectations, communication about school, and fostering reading habits were the most effective parental models in enhancing academic achievement. Based on it the study develops the following hypothesis:

H₅: There is positive relationship between parental involvement and learning outcomes.

3. Results and discussion

Correlation analysis

On analysis of data, correlation analysis has been undertaken first and for this purpose, Kendall's Tau correlation coefficients along with mean and standard deviation has been computed and the results are presented in Table 1.

Table 1

Kendall's Tau correlation coefficients matrix

This table presents Kendall's Tau coefficients between dependent variable and independent variables. The correlation coefficients are based on 132 observations. The dependent variable is LO (Learning outcomes). The independent variables are AT (Access to technology), TT (Teacher training), DR (Digital resources), GPS (Government policies and support) and PI (Parental involvement).

Variables	Mean	S.D.	LO	AT	TI	DR	GPS	PI
LO	3.798	0.973	1					
AT	3.968	0.868	0.491**	1				
TI	3.089	0.685	0.091	0.193**	1			
DR	4.056	0.733	0.036	0.148*	0.013	1		
GPS	3.550	0.625	0.074	0.184**	0.451**	0.289**	1	
PI	4.179	0.855	0.001	0.021	0.204**	0.413**	0.095	1

Notes: The asterisk signs (**) and (*) indicate that the result are significant at one percent and five percent levels respectively.

Table 1 shows Kendall's Tau correlation coefficients between the dependent variable and the independent variables. The study shows that access to technology is positively correlated to learning outcomes. It indicates that increased access to technology enhances learning outcomes. Similarly, teacher training is positively correlated to learning outcomes. It indicates that trained teachers lead to enhance the learning outcomes. Likewise, digital resources is positively correlated to learning outcomes. It indicates that availability of resources digitally leads to increase in learning outcomes. Further, government policies and support is positively correlated to learning outcomes. It indicates that support from government body to educational institutions lead to increase in learning outcomes. In addition, parental involvement is positively correlated to learning outcomes. It indicates that active parental involvement enhances the learning outcomes.

Regression analysis

Having indicated the Kendall's Tau correlation coefficients, the regression analysis has been carried out and the results are presented in Table 2. More specifically, it shows the regression results of access to technology, teacher training, digital resources, government policies and support and parent involvement on learning outcomes.

Table 2

Estimated regression results of access to technology, teacher training, digital resources, government policies and support, parental involvement and learning outcomes

The results are based on 132 observations using linear regression model. The model is $LO = \beta_0 + \beta_1 AT + \beta_2 TT + \beta_3 DR + \beta_4 GPS + \beta_5 PE + e$ where the dependent variable is LO (Learning outcomes). The independent variables AT (Access to technology), TT (Teacher training), DR (Digital resources), GPS (Government policies and support) and PI (Parental involvement).

Models	Intercepts	Regression coefficients of					Adj. R_bar ²	SEE	F- Value
		AT	TT	DR	GPS	PI			
1	0.260 (1.077)	0.892 (14.983)**					0.630	0.591	224.487
2	4.306 (10.994)**		0.164 (1.328)				0.006	0.970	1.763
3	4.074 (8.502)**			0.068 (0.585)			0.005	0.975	0.342
4	4.538 (9.314)**				0.208 (1.541)		0.010	0.968	2.375
5	3.817 (9.202)**					0.001 (0.060)	0.008	0.949	0.000
6	0.026 (0.070)	0.902 (14.827)**	0.063 (0.818)				0.630	0.592	112.292
7	0.153 (0.335)	0.905 (14.806)**	0.051 (0.645)	0.050 (0.687)			0.628	0.593	74.712
8	0.178 (0.382)	0.907 (14.651)**	0.036 (0.378)	0.029 (0.278)	0.042 (0.293)		0.625	0.595	55.656
9	0.312 (0.542)	0.906 (14.077)**	0.018 (0.176)	0.086 (0.758)	0.011 (0.076)	0.105 (1.423)	0.603	0.595	40.546

Notes:

- Figures in parenthesis are t-values.
- The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
- Learning outcomes is the dependent variable.

Table 2 shows that the beta coefficients for access to technology are positive with

learning outcomes. It indicates that access to technology has a positive impact on learning outcomes. This finding is consistent with the findings of Naik *et al.* (2020). Similarly, the beta coefficients for teacher training are positive with learning outcomes. It indicates that teacher training has a positive impact on learning outcomes. This finding is consistent with the findings of Harris and Sass (2011). Likewise, the beta coefficients for digital resources are positive with learning outcomes. It indicates that digital resources have positive impact on learning outcomes. This finding is consistent with the findings of Livingstone (2012). Further, the beta coefficients for government policies and support are positive with learning outcomes. It indicates that government policies and support have positive impact on learning outcomes. This finding is consistent with the findings of Hanushek and Woessmann (2011). In addition, the beta coefficients for parental involvement are positive with learning outcomes. It indicates that parental involvement has a positive impact on learning outcomes. This finding is consistent with the findings of Boonk *et al.* (2018).

4. Summary and conclusion

Technology has transformed the educational landscape by enhancing access to information and enabling interactive learning experiences. For students, digital tools and online platforms have made learning more flexible and personalized. Understanding the impact of technology is crucial, as it shapes not only how students learn but also how educators teach. Technology played a crucial role in unifying science and technology education by promoting a coherent understanding of the two traditionally distinct subjects. Research Integrating science and technology through technology could enhance learning processes by providing students with a more authentic and interconnected perspective.

This study attempts to examine the impact of technology on education in Nepal. The study is based on primary data of 132 respondents.

The major conclusion of the study is that access to technology, teacher training, digital resources, government policies and support and parental involvement have positive impact on learning outcomes. The study also concludes that access to technology is the most significant factor followed by government policies and support that influence the learning outcomes in Nepal.

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