

Tech-Ready Student Teachers: Demographic Insights into Digital Empowerment in Arunachal Pradesh, India

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ABSTRACT Technology has been an intricate part of human lives in this contemporary digital era, making proficiency in its use crucial. The study explored the Digital Empowerment (DE) levels of student teachers in Arunachal Pradesh, with a focus on demographic variables such as sex, locale, and residential status. The descriptive survey research method was used. Data was collected from 611 fourth-semester student teachers pursuing a Bachelor of Education using the Student Teachers' Digital Empowerment Scale (STDES) constructed and standardised by the researcher. Findings revealed that the majority (71.03%) of the student teachers were 'Moderately Empowered', while only a small proportion fell into the high or low extremes of DE. Moreover, independent sample t-tests showed no significant differences in DE between male and female, rural and urban, and between native and non-native student teachers. Based on the findings of the study, recommendations were made to elevate digital empowerment from moderate to higher levels.

INTRODUCTION

In today's knowledge driven era, technology permeates nearly every aspect of life, making proficiency in its use essential for both teachers and students. Therefore, having digital competency is now a fundamental need in all professions (Jakaria et al. 2025). People who do not possess such skills are perceived as less qualified and ineffective in their jobs. Therefore, communities are working on improving their digital professional competency (Prensky 2009). In the teaching and learning process, critics argue that with the emergence of technological shift, teachers' role is diminishing. However, technology alone does not work in itself, nor does it imply that human intelligence is not needed any longer. Notably, it is the interaction between these two which leads to digitally wiser human beings (Prensky 2009). Further, teaching, which is also a profession, is susceptible to job losses. As such, Stephane Kasriel, Upwork CEO, from CNBC (an American business news channel) on 31st October 2018 states, "*The future of work won't be about college degrees, it will be about job skills*".

Thus, technological skills are vital for the teacher's professional development. As Ray Clifford (1987) rightly quoted, "*Technology won't replace teachers, but teachers who do not use technology will be replaced*" (as cited by Campbell and Sarac 2018). Therefore, integrating digital skills is essential for the professional development of prospective teachers, especially as they prepare to educate students in a digitally driven 21st century (Leh 1998). Moreover, pre-service teachers (PSTs) also have a similar opinion that the qualities of an ideal 21st century teacher should include adaptability, digital fluency, digital literacy (DL), creativity, reflective practice, and being well versed with the latest professional skills, as outlined by the findings of Mello and Gravett (2025). This evolving role of teachers demands that they cultivate learning environments that merge technological tools with human skills to maximise educational outcomes (Fisher 2000). Consequently, today's teachers need substantial training in developing, integrating, and collaborating with technological resources to support future learners effectively (Birch and Irvine 2009). Kohnke et al. (2025) also uphold this idea that the initial teacher education program is central to preparing and developing pre-service teachers, who will lead the future generation, to respond to the dynamic demands of contemporary education. This argument finds additional backing in the work of Hou and Xiong (2025), who, through an ex-

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perimental study, justified that with proper training, resources, and assistance, pre-service teachers can be digitally empowered. They further argue that digital literacy is no longer a pedagogical need but also a social responsibility.

Recognising this need, several policies and frameworks, including the National Curriculum Framework for Teacher Education (NCFTE 2009), UNESCO's Teacher Policy Development Guide (2019), and the National Education Policy (2020) of India, emphasised the importance of embedding technology within education. In line with this, one of the primary goals and functions of the National Council of Educational Research and Training (NCERT) is to create and distribute innovative teaching materials and to explore ICT applications in education, necessitating tailored teacher training. This makes it critical to cultivate a digitally empowered teaching workforce, equipped not only to use digital tools but also to model digital fluency for students. Moreover, the process of digitalisation in schools cannot be accomplished without the involvement of teachers (Musfira et al. 2022), and the effectiveness of these technologies depends significantly on how well-versed teachers are in their utilisation of technology in the teaching-learning process (Singh and Chan 2014).

Shifting to another aspect, that is, empowerment, according to Perkins (2010), the genesis and popularisation of 'empowerment' started owing to social, political, as well as civil rights movements throughout the 1950s-1960s, later inspired by other global liberation and independence movements. However, the usage of the word 'empowerment' is related with Barbara Solomon's (1976) book entitled, "*Black Empowerment: Social Work in Oppressed Communities*" (as cited by Solomon 1987), in which the author linked empowerment to being a method, whereby social personnel made an attempt to help those marginalised communities for them to overcome their barriers that disturbs their capacity to function in the societies effectively, which was termed as 'power blocks' by the author. It affirms that the term 'empowerment' was initially used to emphasise the power imbalances between the communities (Solomon 1987).

However, when it comes to digital empowerment (DE), the meaning and definition of this term remain a fluid and disputed concept, as it

differs according to disciplines, technological context, and the level of its application. Mäkinen (2006) outlined DE as an enabling process with prerequisite variables such as "*awareness, technical access, learning motivation, and the development of skills and abilities*" that, when met, can further improve the knowledge and skills required to prosper in a digital society, which leads to an empowered community, and the process refine itself. According to him, motivation and awareness are vital determinants, as they serve as desires, which drive the urge for individuals to use various technologies accessible to them, that is further influenced by the level of their awareness towards the use and benefits of such technologies, thus accelerating the process of empowerment.

Building on this idea, Kirti et al. (2017) further substantiated the cyclic nature of DE, which helps individuals to adapt to the digital world. However, they included different dimensions, such as legal, psychological, economical and technical competency, as it was developed for students pursuing vocational courses like agriculture. Again, Kong et al. (2019) proposed different dimensions for DE, namely, meaningfulness, impact, creativity belief and competence belief, which were developed on school students. Another study by Ezzeldin and Alsharidah (2021), whose focus group was school teachers, presented dimensions such as digital technologies in teaching, digital communication, digital evaluation, and supportive digital environment. Additionally, Jakaria et al. (2025) propose that factors such as technological awareness, technical skills and abilities, digital collaboration and adaptability interact to enhance the digital competence of educators. They further argue that, alongside formal learning, informal learning ensures support and flexibility and also helps them overcome barriers. This standing was further supported by Irwansyah and Hardiah (2020), who stated that reflexivity and responsive learning can lead to collaboration among the teachers and students to overcome certain barriers during the DE process. Thus, verifying that collaboration serves as a convincing factor that influences DE.

Furthermore, as stated by Fayda-Kinik (2025), with the rapid emergence of new technologies, the traditional understanding and parameters of

DL and DE alike call for a revamp in the conceptualisation of these terms. In this context, Baskara (2025), through a review study, emphasised the urgency of redefining DL to address evolving challenges in the era where artificial intelligence (AI) dominates education, and proposed four components framework comprising of technical understanding of AI systems, implementation skills, critical evaluation, and ethical considerations.

Overall, the variability of the components in DE that differ contextually confirms its multifaceted nature, and thus, a consensus can be seen across the literature on its multidimensional nature. Henceforth, in line with the aforementioned evolving discussions on the components influencing DE, the researchers of the present study argue that it is crucial to incorporate factors such as the ethical aspects of using digital technologies and digital security to assess the DE of individuals from all walks of life. Hence, in the present study, DE has been considered as a multidimensional concept comprising four components, which focus on its practicality, accessibility, digital security and ethical aspects, that is, Technological Competence, Technical Access, Digital Collaboration and Communication, and Digital Security and Ethical Usage of Technological Resources. Therefore, the operational definition of DE has been outlined as, *“Digital Empowerment refers to the degree to which student teachers possess the necessary skills, access, and responsible practices needed to effectively engage with digital technologies in their personal, academic and professional pursuits, which reflects their proficiency with technological tools, access to digital infrastructure, participation in collaborative digital environments, and adherence to security and ethical standards while using digital resources.”*

Even though DE plays a significant role in all aspects of human development, its literature has been mostly limited, also reported by Akturk and Emlek (2016), Iyengar et al. (2017), and Kong et al. (2019). Furthermore, Irwansyah and Hardiah (2020) opine that before implementing any measures towards digitalising teaching and learning process, it is crucial to understand and analyse the context within which such measures can be incorporated.

Thus, attempts have been made to understand demographic insights of DE where the role of sex (male and female) has shown mostly no conclusive results, suggesting no relationship

between the male and female student teachers (Incelenmesi et al. 2017; Varghese and Arya 2024), and no substantial difference between male and female university students' DE (Eynur 2016; Shridhar and Thippesh 2023), thus, emphasising the limited impact of gender or sex on this aspect of DE. Furthermore, when analysed based on locale, the findings from an empirical study carried out by Aslan (2021) validated that when pre-service teachers, irrespective of their place of origin or locale, are exposed to technologies during the teacher education program, there is a significant difference in their overall DE and literacy. This standing was further reinforced by the findings of Liu (2024), who, through an ethnographic study, substantiated that students, irrespective of their origin, can be digitally empowered if universities provide digital facilities and infrastructure. Notably, highlighting the vital role tertiary educational institutions can play in leveraging digital standards and fostering DE among pre-service teachers.

Thus, in an era where digital competence and skills are vital for both teaching and learning, future teachers must be technologically proficient. Although literature has highlighted the potential of DE to enhance educational outcomes, there remains a significant gap in understanding how demographic variables intersect with DE among the student teachers in regions with comparably more rural settings, such as in India's northeastern states. Thus, this study seeks to bridge this gap by exploring the DE levels across certain demographic variables such as sex (male and female), locale (rural and urban) and residential status (native and non-native) of student teachers in Arunachal Pradesh, which presents unique administrative set up as the state follows the Inner Line Permit (ILP) System introduced under the Bengal Eastern Frontier Regulation (BEFR) 1873, which restricts the entry of non-native individuals into the state and ensures that natives of the state receives constitutional protections including land rights, thus, making it crucial to examine the present status of student teachers in this region.

Objectives

The objectives of the study are:

- a. To study the levels of Digital Empowerment of the Student Teachers.

- b. To study the differences in Digital Empowerment of the Student Teachers based on sex, locale and residential status.

Hypotheses

In the present study, null hypotheses have been framed that suggest no significant difference in the student teachers' digital empowerment based on demographic groups such as sex (male and female), locale (rural and urban), and residential status (native and non-native).

METHODOLOGY

Research Design

Given that the objectives of the present study are to examine the current state, including their interactions with specific demographic variables, through a survey approach, the researcher has employed the descriptive survey research method. According to the American Psychological Association (APA) Dictionary of Psychology, the descriptive research method is "*an empirical investigation designed to test prespecified hypotheses or to provide an overview of existing conditions, and sometimes relationships, without manipulating variables or seeking to establish cause and effect*". The findings of descriptive research are critical for generating foundational knowledge and forming the basis for further, more in-depth experimental and exploratory studies.

Study Group

The study group comprised all the fourth-semester Bachelor of Education (B.Ed.) student teachers under the two-year B.Ed. program in all the Colleges of Teacher Education (CTEs) affiliated under Rajiv Gandhi University, Arunachal Pradesh, which were ten in number at the time of data collection. It consisted of 931 student teachers of which only 611 (corresponding to 65.62% of the population) voluntarily completed the survey that included 211 (34.53%) males and 400 (65.47%) females, 394 (64.48%) rural and 217 (35.52%) urban residents, and 513 (83.96%) native and 98 (16.04%) non-native student teachers. The ten CTEs are located across seven districts, namely, Mahabodhi Lord Buddha College in Namsai (Dist. Namsai), Denning College of

Teacher's Education in Tezu (Dist. Lohit), Kasturba Gandhi Institute of Higher Education in Roing (Dist. Dibang Valley), Siang Royal Academy and Daying Ering CTE, both located in Pasighat (Dist. East Siang), Teacher Training College, Aalo (Dist. West Siang), Mudo Tamo Memorial College in Ziro (Dist. Lower Subansiri), and three CTEs located within Papum Pare District, namely Vivekananda Kendra CTE in Nirjuli, Hills College of Teacher Education in Naharlagun and Donyi Polo B.Ed. College in Itanagar.

Tools and Techniques Used

The Student Teachers' Digital Empowerment Scale (STDES), constructed and standardised by the researcher, was used in this study. The scale is a 5-point Likert scale with options for 'Always', 'Very Often', 'Sometimes', 'Rarely' and 'Never', based on the frequency of its use. The final form of the scale consisted of 51 items under four dimensions, namely, Technological Competence (TC), Technical Access (TA), Digital Collaboration and Communication (DC), and Digital Security and Ethical Usage of Technological Resources (DE). Try-out was carried out for item analysis based on their Critical Ratio 't' values, for which data was collected from 150 student teachers in Arunachal Pradesh, other than the actual samples. Cronbach's Alpha value of 0.867 was obtained, indicating a good internal consistency. The content validity of the scale was established based on the agreement of eight experts' opinions, and the construct validity was established using the dimension-wise item-total correlation and inter-dimension correlation method.

Data Collection

Data was collected using the self-developed and standardised STDE Scale from February to April 2023 from all 931 fourth-semester pre-service teachers, of whom 611 voluntarily completed the survey.

Data Analysis

Data analysis involved descriptive statistics, such as mean, frequency, percentage, standard deviation and independent t-tests as inferential statistics. The statistical packages used were Microsoft Excel and SPSS version 26. Norms

were framed by converting raw scores into z-scores for the interpretation of the levels within five divisions, where the scores with a range of 2.01σ and above were considered as '*Extremely Empowered*' category, scores from 1.01σ to 2.00σ as '*Highly Empowered*', between -1.00σ to 1.00σ as '*Moderately Empowered*', between -1.01σ to -2.00σ as '*Slightly Empowered*', and scores of -2.01σ and below as '*Very Low Empowered*'.

Ethical Consideration

The present study's ethical consideration involved prior ethical acceptance from the heads of the ten CTEs for conducting the research, voluntary participation and the consent of the research respondents, confidentiality of data ascertained by keeping data anonymous, respondents were informed that the data will be used strictly for research purpose only, the contact number and email of the researcher was provided to the research participants for any queries, and there is no conflict of interest involved prior, during and after this study.

RESULTS

Overall Levels of Student Teachers' Digital Empowerment

The levels of DE of student teachers as detailed in Table 1 indicate that a significant majority of student teachers, corresponding to 71.03

percent (n=434), were '*Moderately Empowered*'. This is followed by 11.78 percent (n=72) who were '*Slightly Empowered*', 10.80 percent (n=66) who were '*Highly Empowered*', 3.27 percent (n=20) who were '*Extremely Empowered*' category, and 3.11 percent (n=19) who were '*Very Low Empowered*'. These findings suggested that most student teachers experienced a moderate or average level of empowerment, with fewer individuals at either high or low extremes. Moreover, through the survey, it was found that all ten existing CTEs have a computer laboratory and their B.Ed. syllabus has integrated technology related 4-credit compulsory theory paper under paper code, *BED-42: Technology of Teaching and Learning*, along with a practical paper under code, *BED-430 3(b): Computer Literacy and hands-on experience*, which provides both theoretical and hands-on experience in computers.

Student Teachers' Digital Empowerment Based on Sex

The DE of student teachers based on sex, as represented in Table 2, indicates that the mean of male student teachers is 162.59 and that of females is 160.08, suggesting that male student teachers had a slightly higher mean than the females. However, with df (609) at the .05 level of significance, the calculated t-value of 1.94 is less than the table-t value of 1.96 and $p(.05) > .05$, indicating no significant mean difference between the two groups in terms of sex. Thus, the

Table 1: Overall levels of student teachers' digital empowerment

S. No.	z scores	Levels	F	Percent (%)
1.	2.01σ and above	Extremely empowered	20	3.27
2.	1.01 to 2.00σ	Highly empowered	66	10.80
3.	-1.00 to 1.00σ	Moderately empowered	434	71.03
4.	-2.0 to -1.01σ	Slightly empowered	72	11.78
5.	-2.01σ and below	Very low empowered	19	3.11
		Total	611	100

Source: Authors

Table 2: Independent sample t-test for mean difference in the male and female student teachers' digital empowerment

Sex	N	Mean	Std. Dev.	df	Cal. 't' value	p (2-tailed)	Level of Sig.	Remark
Male	211	162.59	13.99	609	1.94	.05	.05	Not Sig.
Female	400	160.08	15.82					

Source: Authors

Table 3: Independent sample t-test for mean difference in the rural and urban student teachers' digital empowerment

<i>Locale</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>df</i>	<i>Cal. 't' value</i>	<i>p (2-tailed)</i>	<i>Level of Sig.</i>	<i>Remark</i>
Rural	394	160.15	15.19	609	1.74	.08	.05	Not Sig.
Urban	217	162.39	15.28					

Source: Authors

null hypothesis is retained. This outcome indicates a positive trend towards gender equality, suggesting that both male and female student teachers have access to comparable opportunities for DE. Such results point towards a progressive environment where digital resources and training are equitably accessible, fostering balanced development across genders.

Student Teachers' Digital Empowerment Based on Locale

The DE of student teachers based on locale, as depicted in Table 3, indicates that the mean of rural student teachers is 160.15 and that of urban is 162.39, suggesting that urban student teachers had a slightly higher mean than the rural student teachers. However, with *df* (609) at the .05 level of significance, the calculated *t*-value of 1.74 is less than the table-*t* value of 1.96 and $p(.08) > .05$, indicating no significant mean difference between the two groups in terms of locale. Thus, the null hypothesis is retained.

One probable reason for such indifference can be attributed to the fact that all ten CTEs are located in urban areas. Thus, rural student teachers also complete their studies alongside their urban counterparts in the CTEs located at urban centres. This shared environment can allow equitable access to digital resources and opportunities, ensuring that both rural and urban students benefit equally in terms of DE. This uniform access reflects that, with a balanced edu-

cational infrastructure, DE can be imparted across diverse backgrounds.

Student Teachers' Digital Empowerment Based on Residential Status

The DE of student teachers based on residential status, as detailed in Table 4, indicates that the mean of native student teachers is 160.74 and that of non-native is 162.02, suggesting that non-native student teachers had a slightly higher mean than native student teachers. However, with *df* (609) at the .05 level of significance, the calculated *t*-value of .76 is less than the table-*t* value of 1.96 and $p(.44) > .05$, indicating no significant mean difference between the two groups in terms of their residential status. Thus, the null hypothesis is retained. This suggests that natives of Arunachal Pradesh are achieving levels of DE comparable to those of non-native student teachers. Such results highlight progress in creating equitable DE opportunities across diverse backgrounds, reflecting positive development for native student teachers in particular.

DISCUSSION

Due to the limited literature on DE, also reported by Akturk and Emlek (2016), Iyengar et al. (2017), and Kong et al. (2019), the present study incorporated discussions from interrelated areas, such as digital literacy and digital competence, to compare the research findings.

Table 4: Independent sample t-test for mean difference in the native and non-native student teachers' digital empowerment

<i>Community</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>df</i>	<i>Cal. 't' value</i>	<i>p (2-tailed)</i>	<i>Level of Sig.</i>	<i>Remark</i>
Native	513	160.74	15.19	609	.76	.44	.05	Not Sig.
Non-native	98	162.02	15.59					

Source: Authors

The findings of the current study on the levels of DE are corroborated by the findings of Kazu and Erten (2014), Incelenmesi et al. (2017), and Varghese and Arya (2024), which suggested that the majority of student teachers are 'moderately empowered' or have an average level of DE. Contrary to this, Akkoyunlu and Yilmaz (2011) found a high level of overall DE among pre-service teachers.

Further, in the DE of student teachers, the present findings suggest that sex plays an inconsequential role, which was also echoed by Incelenmesi et al. (2017) and Varghese and Arya (2024). These findings are additionally reinforced by Eynur (2016) and Shridhar and Thippesh (2023), who also reported no substantial difference between male and female university students, highlighting the limited impact of gender on this aspect of DE. Contrary to this, some studies on pre-service teachers' digital competency and DL suggest significant differences between the groups, as Aslan (2021) and Cabezas-González et al. (2021) reported in favour of females, while Akkaya (2023) suggested in favour of males, whereas, there were also findings which showed no difference between males and females as reported by Atar and Bagci (2023), Yang (2023), and Nurzhanova et al. (2024). However, the aforementioned assertions do not rule out the possibility of sex and gender based differences as several factors such as the accessibility of technological resources, the duration of exposure to technology, the nature and type of content engagement, as well as the kind of scale and its dimensions being examined have the potential to influence sex or gender-based studies.

Similarly, the findings of the current research showed no significant difference in the DE of rural and urban student teachers, which aligns with the recent findings of Varghese and Arya (2024), who reported no significant difference in rural and urban prospective teachers' DL. However, Kumar and Sharma (2024) presented findings that contradict this standing, as they found a substantial difference in digital competence in favour of urban teachers.

In the present study, the indifference among the groups can be attributed to the curricular interventions of introducing a mandatory technology oriented theory paper, along with the

availability of ICT infrastructure. This view is further supported by Aslan (2021), who, through an experimental study, verified that introduction and exposure to technologies can significantly increase the overall DL and DE of pre-service teachers, irrespective of their place of origin. Further validation of this view was offered by Liu (2024), who, through an ethnographic study, defended this standing and stated that university students can be digitally empowered if universities provide digital facilities and infrastructure, thus defying the widely held belief of rural versus urban exclusion. This argument was further reinforced by Jakaria et al. (2025), who also opine that institutional support and accessibility to technology strengthen and advocate the digital competence of both teachers and students. Notably, highlighting the vital role tertiary educational institutions can play in leveraging digital standards and fostering DE among pre-service teachers.

Although the findings of the present study indicated a moderate level of DE, which shows encouraging signs, it also highlights gaps that must be addressed for all student teachers to reach a highly empowered status. Given the increasing demand for tech-savvy educators, a teacher with a moderate level of DE might only be able to provide the bare minimum while striving for improvement. This view can be related to Kara et al. (2025), whose cross-country (involving seven developed and developing countries) phenomenological research findings suggested that teacher educators echoed a similar stance that the existing programs for PST are inadequate for preparing them to navigate future 21st century skills.

Thus, as technological abilities can be developed through practice, student teachers should have more access to these resources throughout their teacher education curriculum (Marais 2023) and beyond. For this reason, the CTEs need to expose student teachers to workshops and seminars (Eynur 2016) designed to incorporate technology not only for consuming information but also for the creation and dissemination of knowledge (Atar and Bagci 2023). However, these skill-oriented activities and programs need to be incorporated as an integral part of the teacher education program rather than a separate course (Kara et al. 2025).

CONCLUSION

The findings of this research provided significant insights into the current state of DE of student teachers in Arunachal Pradesh. The study highlights that, on average, student teachers demonstrated a moderate level of DE, with relatively fewer individuals at the high and low extremes. This indicates a balanced yet developing state of digital readiness among student teachers in the state. The comparative analyses based on sex, locale, and residential status further indicate no statistically significant differences in DE across these demographic variables. Although minor variations in mean scores were observed with males, urban residents, and non-native student teachers showing slightly higher means, the differences were not significant at the 0.05 level. The absence of significant disparities across demographic lines reflects the success of a shared learning environment provided by the CTEs that bridge gaps and promote equal opportunity, regardless of gender, geographical background, or residential status, to their learners. Additionally, the uniform access to DE among rural and urban student teachers may be also attributed to the fact that all CTEs are situated in urban areas and possess a computer laboratory, additionally curriculum incorporation of technology based components also allow rural students to study the same theoretical curricular component and share similar digital infrastructure in the CTEs as their urban peers.

Educational implications of the study emphasise the need for CTEs to continue their efforts towards strengthening the existing digital infrastructure and engage student teachers in practical hands-on sessions through workshops, seminars, and digital pedagogical activities, to further elevate the DE from moderate to higher levels, which will also aid them to prepare for their future teaching profession.

Lastly, the theoretical implications of the study include information on the concept and dimensions of digital empowerment and its intersection with certain demographic variables, which supplements the discussion on the evolving multidimensional nature of DE.

RECOMMENDATIONS

The findings of the present study indeed demonstrated a positive sign as the student

teachers possessed a moderate level of DE. However, a sizable number of student teachers possessed 'very low' and 'slightly empowered' DE levels. Thus, providing hands-on sessions by conducting regular workshops, seminars, and digital pedagogical sessions can help student teachers become more adept at using digital tools, fostering a move from average levels to high levels of DE. Additionally, research-based findings can be incorporated into practice by designing teacher education curricula that prioritise both technological and pedagogical proficiency, focusing on both consumption and creation of digital content. By addressing these aspects, the teacher education system in Arunachal Pradesh can create a robust, inclusive, and technology driven teacher education ecosystem that supports the growth of student teachers, increases their adaptability, and empowers them to excel personally, academically and professionally to be leaders in the digital age.

DELIMITATIONS OF THE STUDY

The study has included only the Student Teachers enrolled in the two-years full time Bachelor of Education (B.Ed.) Programs in CTEs under the affiliation and jurisdiction of Rajiv Gandhi University (RGU), Arunachal Pradesh. The study focuses on the practicality, accessibility, digital security and ethical aspects of DE, and therefore, did not incorporate dimensions like attitude, motivation, and self-efficacy belief from the affective domain of DE.

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AUTHOR CONTRIBUTIONS

Rubi Tamang: Conceptualisation, methodology, investigation, data curation and formal analysis, original draft preparation, validation, and editing.

Naraginti Amareswaran Reddy: Supervision, conceptualisation, methodology, review and editing, and validation.

Both authors have read and agreed to the revised manuscript.

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