

# Technological Challenges for Teacher Training

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## Abstract

*Quality of school education depends on the quality of teachers. Although there are individuals, who are born teachers who continue to excel through self-directed learning, majority of individuals going for teaching jobs need training. Quality of training in modern society has to include training in utilizing technology that can facilitate high quality learning skills in students. The paper analyses the need, importance and challenges facing the technological integration in teacher training.*

## 1. Introduction

Technology plays a dominating role in the modern society. It has been permeating the world at very fast rate. Continuous innovations in hardware and software of technology have been a normal phenomenon. It plays crucial role in generating innovations and improving quality of skills of practitioners. This has led to speedy increase in scope of formal learning. Digital skills have become essential for modern individuals. “The term ‘digital skills’ refers to a range of different abilities, many of which are not only ‘skills’ per se, but a combination of behaviours, expertise, know-how, work habits, character traits, dispositions and critical understandings” (UNESCO 2017, p. 4). . Role of technology is more prominent in developed nations. In the United States, in 2008, the average public school of USA had 189 instructional computers and about 98% of them had internet access and number of students per computer with internet access was 3. Most of the students of rich countries also use much technology outside the school (Snyder & Dillow 2011, p. 4). In 2015, percentage of children ages 3 to 18 who use the Internet from home were :3- and 4-year-old 39% ; 5- to 10-year-old 54% ; 11- to 14-year-old 65% and 15- to 18-year-olds 76% (Institute of Education 2018, p. xxiii). Twenty first century has witnessed enduring personalised cognitive assistants – wearable devices which take care of advances in machine learning and artificial intelligence and information over load (de Freitas & Levene 2003, p. 18). Digital third spaces came to rescue the situation in which face to face partnerships could not provide authentic field experiences (Moran 2018, p. 233). All nations are making efforts to improve the quality of their education system by integrating appropriate technology. Technology has facilitated internationalisation of learning through online strategies. American Council on Education (2016, pp.1-2) has referred to Collaborative Online International Learning (COIL) of the State University of New York (SUNY) of the United States. Use of ICT has facilitated rise in level of informal education (mutual learning, learning on demand, learning through the knowledge exchange) and also rise in level of social education through increasing use of on the basis of social networks and their acceptance by formal education system (Gotskaya, 2011, p. 89). Twenty first century has witnessed sharp rise in Open Educational Resources (OER). OER has been defined as “digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research” (OECD, 2007, p.1). The Declaration made at the World Open Educational Resources (OER) Congress held at Paris on June 20-22, 2012 expected that the States, within their capacities and authority will take appropriate action to:

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**a. Foster awareness and use of OER.**

Promote and use OER to widen access to education at all levels, both formal and non-formal, in a perspective of lifelong learning, thus contributing to social inclusion, gender equity and special needs education. Improve both cost - efficiency and quality of teaching and learning outcomes through greater use of OER.

**b. Facilitate enabling environments for use of Information and Communications Technologies (ICT).**

Bridge the digital divide by developing adequate infrastructure, in particular, affordable broadband connectivity, widespread mobile technology and reliable electrical power supply. Improve media and information literacy and encourage the development and use of OER in open standard digital formats.

**c. Reinforce the development of strategies and policies on OER.**

Promote the development of specific policies for the production and use of OER within wider strategies for advancing education.

**d. Promote the understanding and use of open licensing frameworks.**

Facilitate the re-use, revision, remixing and redistribution of educational materials across the world through open licensing, which refers to a range of frameworks that allow different kinds of uses, while respecting the rights of any copyright holder.

**e. Support capacity building for the sustainable development of quality learning materials.**

Support institutions, train and motivate teachers and other personnel to produce and share high - quality, accessible educational resources, taking into account local needs and the full diversity of learners. Promote quality assurance and peer review of OER. Encourage the development of mechanisms for the assessment and certification of learning outcomes achieved through OER.

**54 f. Foster strategic alliances for OER.**

Take advantage of evolving technology to create opportunities for sharing materials which have been released under an open license in diverse media and ensure sustainability through new strategic partnerships within and among the education, industry, library, media and telecommunications sectors.

**g. Encourage the development and adaptation of OER in a variety of languages and cultural contexts.**

Favour the production and use of OER in local languages and diverse cultural contexts to ensure their relevance and accessibility. Intergovernmental organisations should encourage the sharing of OER across languages and cultures, respecting indigenous knowledge and rights.

**h. Encourage research on OER.**

Foster research on the development, use, evaluation and re-contextualisation of OER as well as on the opportunities and challenges they present, and their impact on the quality and cost- efficiency of teaching and learning in order to strengthen the evidence base for public investment in OER.

**i. Facilitate finding, retrieving and sharing of OER.**

Encourage the development of user - friendly tools to locate and retrieve OER that are specific and relevant to particular needs. Adopt appropriate open standards to ensure interoperability and to facilitate the use of OER in diverse media.

**j. Encourage the open licensing of educational materials produced with public funds.**

Governments/competent authorities can create substantial benefits for their citizens by ensuring that educational materials developed with public funds be made available under open licenses (with any restrictions they deem necessary) in order to maximize the impact of the investment.” (UNESCO 2012, p. 2).

Open educational resources are not only available in developed countries, but also in developing countries. There have been reports about examples of successful implementation of open educational resources in various developing countries in the global south (Arinto, Hodgkinson-Williams, King, Cartmill, & Willmers 2017; Arinto, Hodgkinson-Williams, & Trotter 2017; Cox, & Trotter 2017; Czerniewicz, Deacon, Walji, & Glover 2017; de Oliveira Neto, Pete, Daryono & Cartmill 2017; Goodier 2017; Hodgkinson-Williams, Arinto, Cartmill, & King 2017; Karunanayaka, & Naidu 2017; Kasinathan, & Ranganathan 2017; Mishra, & Singh 2017; Oates, Goger, Hashimi, & Farahmand 2017; Sáenz, Hernandez, & Hernández 2017; Toledo 2017; Westermann Juárez, & Venegas Muggli 2017; Wolfenden, Auckloo, Buckler, & Cullen 2017 & Zagdragchaa & Trotter 2017). E-books and E-journals are progressively permeating education systems. A study carried out in Czech Republic on computer course students reported use of Android tablets (76 %) and iPad (iOS 24 %). (Fojtik 2015, p.743). However, a study conducted on the students of pedagogy or teacher education at the University in Split (Croatia) reported that all learners may not like to use E-books in place of printed books. E-books may be additional resources, but may not be able to replace printed books entirely (Frانيا 2018, p. 88). *International Task Force on Teachers for Education 2030- Strategic plan 2018–2021* suggested an online knowledge platform that “...will promote the work of the TTF; give access to a database of quality, curated publications, laws, policies, tools, reports and online courses, with annotations and metadata...” (UNESCO 2018a, p. 9). Each type of ICT-assisted instruction has its own strengths and weaknesses. The nations and institutions choose the tools appropriate to their specific situation (UNESCO Institute for Statistics 2013, p. 32). The trend of technology integration in education system is continuing at a faster rate giving rise to newer technologies and innovative strategies that look at a sustainable world.

Technology use is directly related to the development of schools and the teaching and learning environment.”(Vrasidas & McIsaac 2001, p. 8). Beginning of this century has witnessed acceleration in initiatives for technology integrated school education. In US, in 2001, 17 associations listed various technologies to be utilised in case of teaching of mathematics, science, social studies and languages (Bell 2001). In order to facilitate appropriate and speedy utilisation of innovations in technology, many organisations have been continuously developing suitable technology tools and resources. In United States, a few programs devoted to professional development of educators, mentioned in Asia Society- Centre for Global Education (2018) are: 1. Annenberg Learner; 2. Choices for the 21st Century Education Program at Brown University; 3. Digital Promise Global Microcredentials; 4. Project Zero Visible Thinking Routines; 5. Stanford Program on International and Cross Cultural Education (SPICE); **and 6.** Transatlantic Educators Dialogue. In order to facilitate self-learning, the Government of India has started online platform “Swayam Prabha” which has 32 DTH channels. Various government agencies involved in managing these channels are : CEC (Channels 1-10), NPTEL (Channels 11-18), IIT Delhi (Channels 19-22), IGNOU (Channels 23-24,26, ), NIOS(Channels 25, 27, 28 & 30),IIT Chennai (Channel 29), NCERT (Channel 31) & IGNOU and NIOS (Channel 32). The programs can be accessed also through mobiles. The web site of SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) (Accessed on January16, 2019) indicates the four quadrants in which its courses are offered are : “1. Video lecture, 2.Specially prepared reading material that can be downloaded/printed, 3. Self-assessment tests through tests and quizzes, and 4. An online discussion forum for clearing the doubts.” As part of quality assurance mechanism, online materials require to be subjected to an anonymous double blind peer review and should have provision for feedback from users and mechanism for improvement at intervals. This strategy is generally overlooked as it was found that the module under the title “History of Education Policy on India” covered under “e-PG Pathshala”, had a number of errors. Interestingly, the said platform had many appreciations from the students, who were not aware of the factual errors in it.

Technology may not always include gadgets. It may include innovations that do not require any gadget. Arbitrary use of technology may be counterproductive. In a comparative study in Malaysia, Ratamun & Osman (2018) reported that physical lab was more effective than virtual lab in case of development of science process skills of chemistry. Provision of scaffolding or assistance such as abilities for SDL, use of Web 2.0 tools for learning, online communication, and computers, can facilitate self-directed learning (Sumuer 2018, p.39). A study conducted in Kwara State in Nigeria, reported that level of

online access by lecturers was low (Soetan & Coker 2018, p. 13). In a study, in Canada, Najafi, Rolheiser, Harrison and Heikoop (2018, p. 18) reported that in case of massive open online courses, personal completion goals may be influenced by motivational factors. Wiki technology has been promoted as a collaborative software platform (Prokofieva, 2013 p. 496). In case of Wiki-based writing, revising a shared document is a daunting activity for students (Wichmann, & Rummel 2013, p. 62). Similar situations might exist in case of all developing countries. Technology has also been playing effective role in training of teachers of higher education. A study conducted in Canada found that e-training program was effective in equipping lecturers for imparting student-centred teaching, in particular for online discussion and face-to-face action learning (Tik 2017, p. 1). Carrera and Asensio (2017), in a study conducted in Spain, found augmented reality (AR) technology provided better strategies for map-reading and studying landforms in geography. Beach, Martinussen, Poliszczuk and Willows (2018, p. 578) found that virtual classroom visits could bridge the gap between what teacher trainees learn in their coursework and their field experiences and could provide models of ideal classroom teaching strategies

Extent of utilisation of technology in school teaching depends on the amount being invested in schools. It also varies from one student to another depending on the economic status of the student. There are large numbers of schools which have students from poor socio-economic background, who do not possess smart phones. Pedagogical applications of smartphone integration in teaching get adversely affected by non-availability of a smart phone with every learner (Seifert 2014, p. 117). Some students may not possess ordinary mobile phones that can facilitate teacher student communication through messages. In Australian situation, disadvantaged students were more likely interested in playing computer games, while advantaged students, belonging to top 25% in the socio-economic status browsed Internet for information, news and e-mails ( OECD 2015a, p. 1). Technology integrated teaching depends on teacher beliefs about technology, which gets formed by the types of personal experiences and vicarious experiences of the teacher and social-cultural influences on the teacher (Ertmer, 2005, p. 32). Inappropriate school facilities and nature of the Internet resources obstruct teacher enthusiasm for integration of ICT (Wiesenmayer & Koul, 1998, p. 271). There are varieties of levels of technology utilisation in schools. High quality schools in even developing countries pose a conceptual challenge for the teachers that force them to go beyond the traditional transmission model of teaching and adopt interactive models. At the other end of the continuum, there are low quality schools, where the teachers do not adopt modern technologies as the schools may not have even electricity. Classroom practices with interactive whiteboard may not be perfected during pre-service teacher training and may need a few years of experience in school teaching to achieve perfection (Lefebvre, Samson, Gareau & Brouillette 2016, p. 11). In a study of Malaysian school situation, Ismail, Azizan and Azman (2013, p. 45) pointed out banning of use of mobile phones in schools. Hence, use of mobile as a pedagogical tool is a daunting task. The situation might have not changed in a period of five years. *There have been efforts to evaluate apps available for use by teachers.* Walker (2011) produced one of the first rubrics created for evaluating apps, and it consisted of six dimensions: Authenticity, Curriculum Connections, Differentiation, Feedback, Motivation, and User Friendliness. Buckler (2012) also developed a rubric to evaluate apps, using the dimensions of benefits, cost, ease of use, adjustability, feedback, and application to assess the quality of apps for students with special needs. In a study of virtual schools in US, Huerta, Shafer, Rice, and Nitkin (2017,p.750 recommended examination of the work and responsibilities of virtual school principals, especially, their knowledge and skills for effective evaluation of teachers and promoting best practices.

Modern teacher, in order to be effective, continuously assesses his / her teaching strategies and go on improving them to suit to the changing learning styles of the students and to cope with large amount of self-learning materials utilised by students. Info Dev (2012, p.1) reported that “Students are more sophisticated in their use of technology than teachers”. Keeping pace with the rapid speed of growth in ICT, learner characteristics are also changing (Zhang 2014, p.336). Technology has provided varieties of options to both learners and teachers. It has brought in transformation in styles of teaching and learning and information access strategies (Watson 2001, p. 251). In advanced education systems, technology has become indispensable for teacher training programs. In the beginning of this century,

a document pointed out that generally, teachers do not have the time for support or preparation of assignments and questions for use within a computer supported collaborative learning (European Commission 2001, p. 2). High quality teaching requires highly skilled teachers. In high quality schools, teachers are required to work more as they have to prepare themselves to cope with knowledge and skills gained by students by self-learning at home or learning in coaching centres. This task is not expected from teachers of low quality schools.

“In OECD countries, there appears to be a great disconnect between student knowledge and usage of ICTs the knowledge and abilities of teacher to use ICTs. This suggests that teacher inexperience and skill deficiencies may often be an important factor inhibiting the effectiveness of ICT use in education by students” (Info Dev 2012, p.1).

Use of technology in teacher training not only prepares technically literate teachers, but also bridges the gap between theory and practice and accelerates skill development in teacher trainees and promotes reflective measures to improve theoretical knowledge and practical skills (Chen, Liao, Chen, & Lee 2011, p. 27). Virtual interaction taking place through asynchronous video mentoring between pre-service and in-service teachers facilitates adoption of technology in lessons of pre-service teachers (Ottenbreit-Leftwich, et al. 2018, p. 12). For some students digital hub is very much useful (Hagerman & Coleman 2017, p. 137). Social networking services such as WhatsApp, Telegram, Edmodo, Google Form, Facebook, Twitter, YouTube, etc., when appropriately utilised, enriches quality of collaborative and interactive learning in teacher training programs (Habibi, et al 2018, p. 47). In a teacher training program in United States, Benko, Guise, Earl, and Gill (2016, p. 1) reported effectiveness of use of twitter for ongoing reflection and increased communication opportunity with larger communities of practice. A study conducted in Ecuador found Facebook very much beneficial for writing practice (David & Ibarra 2018, p. 11). Flipped classroom is one such innovation, in which learning of a content starts from outside the class to be followed by a teacher in the classroom (Bäcklund & Hugo 2018, p. 451). In a study in a Japanese university, Cote and Milliner (2018, pp. 87-88) reported improvement in training of teachers in skills such as “recording and editing sounds, designing websites, managing databases and creating spreadsheets” and increased effort to provide experience in “online video conferencing, online discussions, CD-ROM use, spreadsheet creation, wikis, database management, blog applications, cloud computing, website design and computer games”.

Since eighties, focus is being given on developing pedagogical content knowledge of teachers, by making them analyse their own lessons either by reviewing notes taken or video recordings of their own lessons (Cochran 1997). In developed systems, faculty members prepare list of online resources relevant to each topic to be dealt by them. These even are supplied to the future teacher trainees, before starting of the courses. In certain systems, the trainees are also expected to have a list of their queries mailed to their teachers, even before attending the classes. Faculty members group such queries and tackle them at the time of face to face interaction in the classroom. The teacher trainees can also transplant this strategy in their own school situation for the students who have developed the skills of handling e-mails, Skype and other modes. Video technology is a low cost technology that can improve quality of teacher training programs as reported in studies conducted by Calandra, Brantley-Dias, Yerby, & Demir (2018); Gaudin, Chaliès, & Amathieu (2018); Hamel, Viau-Guay, Ria, & Dion-Routhier (2018); Leblanc (2018); Lussi Borer, Flandin, & Muller (2018); Santagata, & Taylor (2018); and Seago, Koellner, & Jacobs (2018). Video technology is also helping teacher educators in improving their skills of supervision of practical work. Video review was found as a promising approach for advancing supervisors’ self-awareness of their post-observation facilitation skills (Baecher & Browne Graves 2018, p. 556). PCK-based module could improve designing of lesson plans (Maryani, Martaningsih and Bhakti (2017, p. 91). Lesson study, which had originated in Japan, has now spread to most of the world. Suh and Seshaiyer, P. (2015, p. 226), in their study on teachers’ understanding of the mathematical learning progression through vertical articulation during lesson study, reported that the lesson study programme could facilitate teachers’ revisiting of “the conceptual principles underlying a concept across grade levels and anticipate strategies, representations, multiple models and misconceptions that students would encounter.” In a study conducted in Philippines, the participating teachers found

productive lesson study framework more time consuming and restrictive in use (Espinosa, Datukan, Butron, & Tameta 2018, p. 1). Use of TPACK (technological pedagogical content knowledge) could increase the level of awareness of teacher trainees about the challenges to be faced by them in the course of technology integrated teaching (Kuo 2015, p. 14). Bibi and Khan (2017, p. 83) recommended use of TPACK knowledge domains. TPACK self-efficacy beliefs were positively affected by Web 2.0 applications (Wright & Akgunduz 2018, p. 66). United States has witnessed enthusiasm for use of TPACK (Baran, Chuang, & Thompson 2011, p. 375). However, Shinas et al. (2013, p. 356) pointed out the need for revisiting TPACK framework. The digital electronic portfolio is a recent innovation in teacher education. Modern teacher training programs require teacher trainees to maintain electronic portfolios (Wray, 2007, p. 50). E-portfolios facilitate self-study in pre-service teacher trainees (Maher & Gerbic 2009, p.51). Professional electronic-portfolios develop in teacher trainees the ability of deep thinking about and make teacher trainees more conscious of theories and practice teaching strategies and promote in them collaborative dialogues about their teaching (Sanford, Hopper, & McGregor 2010, p. 350). This process can transform professional learning programs through a complex and continual process of reflecting and integrating learning (Hopper, Fu, Sanford, & Monk 2018, p. 15). Success of e-portfolio programmes depend on the level to which teacher trainees have been trained in maintaining the e- portfolio (Morrison, Masters, & Quentin-Baxter 2018, p. 100). Well-designed synchronous web conferences influenced self-reported perceptions of their understandings of, passion for, and skills to engage in professional conversations of initial teacher education students (Dyment and Downing 2018, p. 87). A study conducted in Turkey found that participants in a pre-service language teacher education had a positive view of podcasts in general (Güler & Özkan 2018, p. 131). A case study of a project based course for learning to teach with ICT in South Korea mentioned about teacher trainees producing instructional digital images and having technology integrated lessons utilising Microsoft Office PowerPoint, games, instructional movie clips, and web-based project materials (Kim 2013, p.29). A case study of the in Computer in Education course at South China Normal University (SCNU) had provision for 12-to 15-week computer assisted education teaching practicum in primary or middle schools that developed appropriate technology integrated teaching skills (Zhao 2013, p.21). A study of Mongolian teacher training programmes suggested production of ICT integrated teaching materials by stimulating teacher cooperation through hands-on exercises (Li, Yamaguchi, & Takada 2018, p. 112). Five dimensions of the ICT for Meaningful Learning course taught in teacher training programme offered in the National Institute of Education (NIE), the sole teacher training institute in Singapore are : (1) Engaging prior knowledge (2) Learning by doing (3) Real world knowledge (4) Collaborative learning and (5) Self-directed learning (Wong & Divaharan 2013, p. 55). In recent times, there has been a progression in online learning. Face to face mode teachers also use online techniques for providing feedback and guidance to their students. The teachers in certain situations also use online teaching for their face to face students. Training in online pedagogy, that has been drawing the attention of initial teacher training programme planners, in order to be effective, has to be constructivist and democratic, cover a variety of learning styles; develop critical thinking skills; and support interaction among peers (Duncan, H. E., & Barnett, J. 2009, p. 373). Integration of ICT in teacher training programmes in India has been reported by (Dahiya 2008; Deshmukh & Maheshwari, 2008; Dhillon. & Sareen 2008; Laxmi & Sarala 2008; Patel & Raval 2008; Rama & Lakshmi 2008; Sharma, Sobti & Manocha 2008; Srinivasacharyulu 2008; and Vishwanath 2008). Technology integration in teacher education requires research-based teaching (Meisalo, Lavonen, Sormunen, Vesisenaho 2009, p.40). In case of pre-service early childhood professionals, video-conferencing technology observation methods were as effective as traditional onsite methods (Pickering & Walsh 2011, p. 106). A study of perceptions of teacher candidates conducted in Canada reported that blended learning gave them better opportunity to express anonymously review on course material, which was not possible through face to face settings, lest review or comments could offend others. (Bowen, Farmer, and Arsenaault 2012, p. 20). In a study on pre-service perspectives on e-teaching, the online e-teaching synchronous platform was more favoured than in-person presentations (Sisco, Woodcock, & Eady 2015, p. 1). Telecollaboration experiment involving language teacher education students in five countries (Canada, Israel, Spain, South Korea and Sweden) was found effective (Sauro, 2016, p. 84). Documenting the regulation process on a blog could enhance pre-service teachers' self- and co-regulation (Cho, Lim, & Lee 2017, p. 166). A study conducted in English language teaching in Ukraine found that the participants were of the

opinion that online lessons on certain topics utilizing strategies such as using phones for translation, learning words, reading articles and listening to news could be useful in improving communication between teacher and taught (Mospan 2018, pp. 119-120). A case study conducted at Edith Cowan University, Australia found that training in ICT made only a handful of teacher trainees shift from traditional to technology integrated teaching and pointed out necessity of providing adequate ICT experiences to teacher trainees (Lim 2013, p.9). In a developed country like US, the teacher trainees are expected to go for high level technology integration in their lesson plans. But, Byker, Putman, Handler, Polly (2017, p.) did not find such instances and suggested efforts to develop such skills in teacher trainees. Certain features of face to face mode instruction for online students could be possible by blended synchronous learning environment (BSLE) (Wang, Huang, & Quek 2018, p.1). The extent of generating structured schematic representations correctly is dependent on level of spatial skills of pre-service teachers (Özsoy, 2018, p. 49). According to Goodnough, Bullock, and Power (2015, p. 190), digital technology in teacher education becomes amorphous due to rapid changing nature and ubiquity of digital devices. Augmented reality was found effective for learning of teacher trainees (Sural 2018, p. 565). Sharing of experiences, technology mediation, and recursive and contextualised dialogues between Maltese teachers using Tablet PC could accelerate sense-making adaptation processes, consolidating newly formed technological interpretations (Camilleri 2018, p.467). King, Luan and Lopes (2018, p. 286) in their study on experiences of Timorese language teachers reported that the blended Massive Open Online Course (MOOC) could support Continuing Professional Development (CPD) of teachers. Above studies reflect the effectiveness of technology integrated teacher training in improving the quality of school teaching, having a positive role to play in creating a sustainable teaching and learning scenario. However, there are certain technological challenges that obstruct high quality teacher preparation.

### **A. Technological Challenges in Teacher Training**

Technology integrated teaching raises the issue of teachers “to learn about a very different approach to teaching and learning, and develop new digital materials and online activities ahead of the start of the course”. (Laurillard, 2011 p. 63). The technological challenges in teacher training are daunting in developing countries. According to SEAMEO (2010, p. 23), the challenges for teacher training programme in South east Asian countries could be making teacher trainees “open to new ideas, new practices and ICT, learn how to learn, unlearn and relearn, and understand and accept the need for change”. The technological challenges that create a wedge between expectations and reality, according to OECD (2015b, p. 190) are: (a) gaps in the digital skills of both teachers and students, (b) difficulties in locating high-quality digital learning resources from among a plethora of poor-quality ones, (c) a lack of clarity on the learning goals, and (d) insufficient pedagogical preparation for blending technology meaningfully into lessons and curricula. Review of literature indicates many technological challenges in initial teacher training. Increased use of internet by children using their mobile phones, poses formidable challenge for the teachers. Internet is a double edged weapon for children. Not only it helps them to improve their academic excellence, but also it exposes them to the hazardous online materials such as “inappropriate content, harmful interactions with other children or with adults, and exposure to aggressive marketing practices” (OECD 2012, p. 5). Many studies have reported about risks in internet use that enables unsafe situation engulfing emotional and social behaviour of children (Ballantine-Jones & Oates 2018; Kosenko, Luurs, & Binder 2017; Kowalski, Giunetti, Schroeder, & Lattanner 2014; and Livingstone, Haddon, Görzig, & Ólafsson 2010). Four major concerns in case of technology integrated teaching of pre-service teachers were: resources, technology skills, subject area and students (Ottenbreit-Leftwich et al. 2018, p. 11). Academically, technology cannot provide a substitute for direct experience. For instance, direct experience a student gets by preparing Oxygen gas in school laboratory should not be substituted by screening video recording of such gas preparation. Use of audio-visual aids cannot provide better experiences than provided by practical work. However, these aids can be utilised for providing experiences in cases of topics such as solar system. Therefore, in certain cases, technology use is considered as an inferior strategy and an unwanted expenditure.

Failure of technology can be a reality not only in developing, but also in developed world. For instance, on 27<sup>th</sup> November, 2018 the train from Brussels to Paris could not make its travellers avail internet facility. In the post lunch session on Education, due to squeezing of the presentation time, certain panellists in a session in Global Sustainable Conference held at Brussels, Belgium were requested to speak sans power point presentation. To take care of such an emergency one needs a print out of his/ her power point presentation. A teacher in a school may also fail to appropriately utilise his/ her developed technology integrated teaching strategies. While technology has the power to improve teaching and learning, the teachers need to be prepared for the situation arising due to failure of technology.

Extent of ICT usage in schools varies from one country to another. As per PISA 2015 study (OECD 2017, p. 83), in case of OECD countries, highest use of ICT at school level was found in Australia followed by Denmark, Sweden, and Thailand and lowest use of ICT was found in the East Asian countries of B-S-J-G (China), Japan and Korea. However in PISA (2012), in case of digital reading, top performers were Singapore, followed by Korea, Hong Kong-China, Japan, Canada and Shanghai-China (OECD 2015c, p. 1). A study reported that technology self-efficacy of pre-service elementary teachers included: (a) first hand experiences with iPads, (b) enhanced science content understandings, (c) high interactivity and engagement, and (c) instructor modelling the use of technology (Menon, Chandrasekhar, Kosztin & Steinhoff 2017, p. 336). When appropriately used, social media plays effective role in improving teaching and learning, it was reported that face book provided three categories of pedagogical affordances: 1. Mixing information and learning resources, 2. Hybridizing different expertise, and 3. Widening the context of learning (Manca and Ranieri 2013). Blended approach to teacher training programmes can be more effective than face to face mode programmes (Eaton, Dressler, & Gereluk 2015, p. 6). Quality of training of school teachers that adopts technology integrated teaching faces many challenges, especially in developing countries. A few of these challenges are given below.

### ***B. Poor or Unstable Internet Connection***

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Many teacher training institutions, especially in developing countries, do not possess stable internet connection. For instance, in Vietnam, referring to a project-based course for pre-service teachers of biology at Hanoi National University of Education, Nguyen (2013, p. 94) reported the challenges for ICT integration included poor or unstable Internet connectivity in many remote areas. Chirwa (2018, p. 4) reported that in two teacher training colleges in Tanzania, only 12.5% of the participants reported use of internet and there was also limited Internet access in these colleges.

### ***C. Lack of Motivation in Teacher Trainers to Use ICT***

In many cases, the teacher trainers are faculty members who have come to teacher training as the last option and are not interested to assert themselves as expert in teacher training. For instance, in India, most of the faculty members imparting teacher training are double post graduates and these types of teacher educators, go for second Masters' Degree in (Master of Education), only when they fail to get a teaching job after their first non-Education post graduate degree. Several such teacher educators, while cursing their fate may not be innovative to try out varieties of strategies. A study of a project-based course for pre-service teachers of biology at Hanoi National University of Education (Vietnam) found that the biggest challenge was negative perceptions among lecturers regarding the role of ICT in education and also their low level of ICT competency (Nguyen 2013, p. 94). Use of technology takes a back seat in the teacher training systems that do not have even adequate teacher trainers not to speak of technological tools and devices. According to 2017 national survey of online learning in Canadian post-secondary education, online learning gave rise to innovative teaching strategies and a few pedagogical benefits and major challenges were inadequate resources and lack of specialist teaching technology support staff, lack of training and resistance from instructors (Bates 2018, p. 13). In Thailand, although, the students of the Faculty of Education, Rajabhat Mahasarakham University were found comfortable in looking for internet resources and in constructing, designing,



and developing instructional materials that improved their self-learning skills, the challenge of lack of computer skill and availability of Internet for students continues to threaten ICT integration in teaching (Simmatun 2013, p.79).

Lack of accuracy check in placing a material in internet has given rise to availability of large resources that are wrong on the date accessed. This creates the task of teacher trainers more daunting as they not only have to list various resources for self-learning / browsing by teacher trainees but also to have a list that they should not browse. In order to be more acceptable, the online resources need to be accessible, trustworthy, and well-designed (Beach & Willows 2014, p. 13). Teacher training that covers these two types of situation is in a fix.

#### ***D. Poor ICT Skills of Teacher Trainers***

Initial model of ICT integration is presented to teacher trainees using ICT in theoretical classes held in the teacher training institutions and Departments of Education in universities and colleges. Nguyen (2013, p. 94) referred to low level of ICT competency among teacher trainers as a challenge for technology integration in teacher training curricula in Vietnam. Greener and Wakefield (2015, p. 266) reported that faculties were not clear about the pedagogical reasoning and methodology for the use of mobile technology. Improving quality of teacher training programme applying suitable requires more time from teacher educators. In case of use of iPads in teacher training programmes, teacher educators need more time for exploration, experimentation, and practice, as well as professional support and development (Vasinda, Ryter, Hathcock, and Wang 2017, p. 411). This is perhaps the main reason for which overburdened faculty delivering teacher training programmes in institutions not having adequate numbers of faculty, do not use most suitable technology integrated strategies, even if the institution provides appropriate tools. Tutors for visually impaired student teachers in primary teacher training colleges in Kenya needed training on the use of adaptive technological devices (Ng'etichi 2017, p.431). In order to tackle such situation in US, the Dept. of Education, US (2016, p. 8) suggested “Job-embedded professional development for all teacher preparation faculty focused on the use of current educational technologies to support pre-service teacher learning in the same ways pre-service teachers will be expected to support their students’ learning.”

#### ***E. Poor Quality of ICT Skills of School Teachers***

Although education authorities are aware of the important role played by teachers in promoting quality in student learning, “many education systems pay little attention to what teachers know or what they do in the classroom” (World Bank 2018, p. 131). Technology integrated teaching is generally resisted by teachers in the countries having aged, underpaid and inadequately trained teaching force (UNESCO Institute for Statistics 2014, p. 34). Teachers of schools in which teacher trainees have their school teaching practical are also teacher trainers. Some of these teachers act as mentors. They deliver model lessons and give feedback to teacher trainees. In order to do their work effectively, they need to be model of adoption of technology integrated teaching. There are high quality schools in developed countries like UK and US, which deliver their own teacher training programmes. However, most of the nations do not give such power to selected schools and depend on university / college/ non-school institutions for delivery of teacher training programmes, which must involve schools for practical in school teaching. In most of the education systems in the developing world, there is no policy for selecting a school. Whatever is available are utilised. Non-technology integrated lessons, even model lessons, being delivered by teachers in such schools acts as an obstacle in appropriate training.

In recent times, shadow education opportunities available on payment basis have reduced formal school system to a mechanism involved with registration of students to appear at public examinations. Shadow education is no longer restricted to face to face interaction. A teacher in India was found using Skype for coaching her student who has recently shifted to Australia. Shadow education might be

having negative impact on the motivation level of the formal classroom teacher that might be adversely affecting their interest to adopt technology integrated teaching

### ***F. Poor Quality of ICT Infrastructure in Schools Engaged for Student Teaching***

Schools where teacher trainees deliver their lessons need to have adequate facilities for appropriate technology integrated lessons. If the schools do not have internet facilities, teacher trainees cannot use online resources. In case of utilisation of portable internet modem in laptops, the teacher trainees also need projection facilities. UNESCO (2018b, p. 62) stated that:

“Sometimes teachers in developing and middle-income countries do not own phones at all and those who do often have very basic handsets that cannot access project-recommended applications and services. Even teachers with powerful phones often have devices with operating systems that are incompatible with project content.”

In a study in Indonesian situation, Prasojo et al. (2018) reported that due to poor condition of the schools, the teacher trainees could not have adequate technology integration in their lessons.

### ***G. Inappropriate Climate in Teacher Training Institutions***

Teacher training is taken lightly by many governments in developing countries. As a result, faculty shortage for teaching in teacher training courses is a normal phenomenon in case of many government run teacher training institutions and university departments of education, not to speak of private ones.. In such cases, the teacher trainers instead of utilising technology take recourse to dictation of notes, even not using the available power point projection facility. In many systems, faculty members of teacher training courses teach methods of teaching various school subjects and teach school students as part of the model lesson for the teacher trainees. The trainees observe the lesson and after the lesson is over, take part in the discussion session in which the faculty member clears his / her strategy and the teacher trainees clear their doubts, if any. In ideal situations, the lesson plan is distributed, before the class is taught. The technology integrated in such model lessons has much impact on teacher trainees. Digital transformation is adversely affected by the limited time and energy of academic staff (Greener, S. & Wakefield 2015, p. 260). This is the reality in case of many teacher education programmes in developing countries. The quality of such lessons delivered by faculty members also depends on the school teaching experience of the concerned faculty member. Ignorance about necessity of school teaching experience and ill-equipped teacher training strategies of the concerned organisations / government education departments, not only in the past but also in the present, results in poor quality of demonstration lessons, not to speak of appropriate technology integration. The trainees also access video recording of lessons, available in internet or in the ICT laboratory of the institution. Lack of enthusiasm to improve the quality of teacher training makes many teacher education institutions not to have a collection of such video lessons. In certain other systems, no model lesson is provided by the faculty of teacher training institution and the pre-school teaching starts in the schools, with observation of lessons delivered by mentor school teachers. The ICT usage in these lessons also provides a model for emulation by teacher trainees. Observation of peer usage of technology, in his/her lessons, also act as mode. Hence, faculty members of teacher education institutions and mentor teachers in the schools require being strong models of the simultaneous integration of 21st-century skills (Urbani, Roshandel, Michaels, & Truesdell 2017, p. 44).

### ***H. Unwillingness of Teacher Trainees to Utilise Technology in Their Lessons***

Sincerity of teacher trainees to learn and implement ICT skills is related to their love for the teaching profession and the extent they have willingly accepted the profession. According to PISA 2015 study

(OECD 2018, pp.134-138) conducted in OECD Countries and a few other regions, the teaching profession could be a sought-after profession in Algeria, Beijing-Shanghai-Jiangsu-Guangdong (China) (hereafter “B-S-J-G [China]”) Ireland, Korea, Kosovo, Luxembourg, Thailand, Tunisia and Viet Nam. It was not a sought-after profession in Albania, Canada, Colombia, Denmark, the Dominican Republic, Estonia, Indonesia, Jordan, Latvia, Peru, Portugal, Qatar and the United Arab Emirates. However, topmost performer country Singapore and a few others such as South Korea and Finland could ensure high content degree of teachers. Basic content knowledge of teacher trainees plays important role in ICT utilisation. In a study of ICT in primary teacher training in Finland, Kotun (2017, p. 162) stated that Finish teachers having master’s degree, could be more effective in using research-oriented ICT utilisation strategies. All countries, such as India, do not require minimum master’s degree for primary school teaching. Many countries have school completion as the content knowledge of primary school teachers. In such cases, ICT integration may be a daunting task. Technology integration in teacher education requires research-based teaching (Meisalo, Lavonen, Sormunen, Vesisenaho 2009, p.40). This requires more time from the teacher trainees. Pre-service teachers’ beliefs had high correlation with their potential integration of technology in their future classroom (Anderson, Grolux, & Maninger 2011, p. 321). Olaniran, Duma and Nzima (2017, p. 385), in a study on pre-service teachers in three institutions offering teacher training programmes by distance in South Africa, found that the teacher trainees’ level of utilisation of e-resources to learn was high, but level of utilisation of e-resources to teach was low.

### ***I. Rigidity in Teacher Training Curricula***

Teacher training curricula in most of the countries do not have inbuilt flexibility in them to cater to the variations in the capabilities and past experiences of teacher trainees. Nguyen (2013, p. 94) referred to fixed training curriculum as a challenge for technology integration in teacher training curricula in Vietnam. It is a fact that in most of the nations, teacher training course of studies prescribed by examining bodies or affiliating universities are rigid in nature and do not take into account the quality and types of human and material resources available for transacting curricula. There has been continuous growth in online learning at home and also in school. Teacher training programmes are yet to be equipped with strategies to design, deliver, and support self-directed learning of students engaged in virtual schooling (Barbour 2012, p. 499). Although shadow education programmes are being delivered overcoming national barriers, most of the teacher training programmes are yet to cover this aspect.

### ***J. Lack of Personal Influence and Individualised Feedback in Distance Mode of Teacher Training***

Effectiveness of initial teacher training through distance mode has been questioned. However, in many nations, this has been accepted as it is cheaper than face to face mode. In Indian situation, although Reddy (1992) and Yash Pal (1993) did not favour initial teacher training through distance mode by national level as well as state level organisations and universities have been going ahead with distance mode teacher education courses. A study of teacher training MOOC reported lack of appropriate design skills and knowledge (Garreta-Domingo, Hernández-Leo & Sloep 2018, p. 56). In order to provide certain amount of individualised Feedback, distance education courses provide face to face interaction. This strategy is ineffective in case of hilly areas, deserts, tiny islands and in other inaccessible areas. In order to cater to needs of learners in above mentioned types of difficult locations, the distance education programmes print materials, which is generally not updated every year to take care of printing costs.

## 2. Conclusion

Teacher training programmes have failed to take appropriate care of professional foundation of pre-service teachers (Kim 2018, p. 148). Such a realisation has made two nations –UK and US allow selected schools to have their own teacher training. All nations accept the vital role played by teachers in improving learning quality of school students. Lack of funds makes many nations not to provide appropriate quality of teacher training and in these nations equity in education is thrown to the dustbin, as the children of poor have poor quality schooling, while the children of political leaders and administrators the rulers have high quality schooling. National level organisations responsible for teacher training may need to ensure that

- a) adequate number of teacher trainers are available for each teacher training programme;
- b) faculty of teacher training institutions deliver a few lessons in schools during every academic session to keep their teaching skill updated at intervals to fit with changing school scenarios;
- c) examining bodies of various teacher training courses make their courses flexible and adaptable and if required, individualised in terms of content, training in school teaching and duration of training;
- d) theory classes are taken by teacher trainers using appropriate ICT;
- e) demonstration lessons on school teaching by faculty of teacher training institutions use appropriate ICT;
- f) schools in which teacher trainees get their school teaching experience have mentor teachers who practice ICT integrated teaching;
- g) list of online resources which are easily accessible, trustworthy, and well-designed are available and updated every month;
- h) increased provision is made for local platforms or portals where teacher trainees as well as teacher trainers can host and share content and practices;
- i) adequate numbers of workshops are organised for teacher trainers to have mastery is digital literacy, participatory pedagogy and instructional design;
- j) subject teacher learning networks are established and made functional at various levels
- k) teacher trainers co-create OER with their teacher trainees;
- l) open educational resources available in various platforms are evaluated;
- m) publication quality indicators are developed as early as possible and made available for use;
- n) learning platforms make anonymous peer review of materials uploaded and indicate not only names of authors/ designers, but also of reviewers; and
- o) there are provision for continuous teacher learning by making discussion boards open to teacher trainees so that they can continue to learn and interact in their new work situations.

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