Preparing Preservice Teachers by Building Content and Pedagogical Knowledge of Integrating Technologies

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Abstract

After the declaration of Covid-19 outbreak in March 2020, the system of education changed from traditional field experiences to virtual environment of online learning. As per the need of time, this paper discusses the methods of online learning that learners and educators use to keep up with the flow of education. With the complete incorporation of technology in the educating system, the challenges and training support provided to preservice and in-service teachers is the vital essence to deliver beneficial impacts. However, delivering education with proper expertise in specialized software such as *Google Classrooms*, *Zoom*, *TV school*, online portals, *Microsoft* teams, and different social media platforms such as *Facebook, Twitter*, and *Youtube*, also requires learning materials to excel in terms of quality and accessibility. Hence, preservice teachers are being assisted by online forums, webinars, courses, and even degree programs to learn and develop their careers in a virtual context to prepare for their futures. Current research was conducted with over forty preservice teacher respondents which was consistent with a previous study of over one hundred pre service teacher participants. This article aims to highlight the current pandemic scenario and its impacts on the educational sector in the preservice teacher education programs and to discuss methods and measures currently in use to promote the technological way of learning and how the trainers are affected by it.

Keywords: preservice teachers, educational technology, accessibility during a global pandemic

1. Introduction

As stated by the US education department secretary (2016), Arne Duncan, "If the technology revolution only happens for families that already have money and education, then it's not really a revolution". In the 21ˢᵗ century, human species habitation has reached 83% of planet earth, whereas the challenges for survival persist (Sanderson et.al, 2002). Gathering information and gaining knowledge have been resulting in a continuous series of changes. Discovering new opportunities while going through present challenges defines education in this current era (Duncan and Barnett, 2009). Since the advent of the technological age, the system of education and policy framework has reshaped from the old traditional methods. After developing the No Child Left Behind (NCLB) act (Tardiff, 2001), every child delivered equal rights to attain education without any restriction of barriers such as gender, race, religion, abilities, identity, or socioeconomic status (Mishra et.al, 2019). In 2004 by the US Department of Education, "National Educational Technology Plan (NETP)" was established with a broader vision to provide education with equity and accessibility. Educators to learners, training professionals to educational stakeholders, were provided with a module to revise and upgrade their roles in the process of imparting education. It was emphasized that the perception of e-learning should be incorporated at federal, state, and local levels to enable every teacher to receive training regarding the technical amendments (Thomas, 2016).

The use of technology is indispensable in such times. The production of facts, its interpretation, and the method it conveys have shifted through technological advancement (Yuan, Wang and Eagle, 2019). The Common Core State Standards Initiative (CCSS) in the United States illustrates learners' usage to be premeditated and capable regarding the selection of digital tools in the process of becoming literate in the technological environment (National Governors Association Center for Best Practices, 2010). Education is not only supplemented by these new technologies, technology is now how we educate.

Since previous decades, a series of pandemics have been observed to provide a critical number of challenges all at once, to which the education sector has been one of the primarily affected parties. Therefore, to activate rapid response, closure of schools is considered a non-medical approach (Qiu et.al, 2017). In the United States, the reduced death rate during the 1918 influenza epidemic happened due to the closure of educational institutions, and public gatherings were restricted (Chen et.al, 2011). During the 2009 pandemic of H1N1, the number of schools closed was more than 1300 in about 240 different communities only in the US (Navarro et.al, 2016). As the incidents of pandemics occurred, the establishment of K-12 classes has developed increased opportunities for preservice teachers to develop their careers in such a way that is vast in dimensions (Cattely, 2007). A recent study of over one hundred pre service teachers identified the need for enhanced preparation in educational technologies to better prepare them for classrooms of today. Not only are pre service teachers interested in educational technologies to make learning fun and engaging for their future students, they are realizing the necessity to become well versed in applying technologies into daily lessons.

2. Review of Literature

The idea to incorporate the technology of the prevailing time in educational activities was

initiated in the late 1800s when the University of Chicago offered the enrolment to the K-12 category. Distanced learning got promoted by delivering the learning materials at the doorstep by post (Greenway and Vanourek, 2006). However, the invention of the internet made this system to upgrade to proper virtual schools. In the 1900s, the use of computers helped students to earn their diplomas through online learning. In 1991, the first fundamental Virtual high school, Laurel Springs, was opened in California, which provided 100% online learning content by 1994. The Florida Virtual School (FLVS) and Utah's Electronic High School were opened in the late 1900s, promoting online education at the state level. The Virtual High School (VHS) established in Massachusetts delivered a consortium model. Traditional schools would team up with VHS allotting one course of complete virtual background to a teacher, which in return received rewards as providing access to all VHS courses for students of that teacher (Moore, 2007). As technology got advanced, the number of enrollment to online courses increased to 2 million only in FLVS, reporting the highest amount of students of all the state's virtual schools in 2010 (Watson et.al, 2011).

Training of teachers for online learning:

Considering the growing necessity of distanced online learning, a "Pratica" was included in the teacher's training program to introduce and provide practices to the preservice teachers about the virtual system, and the US education department mandated it as a part of the completion of their certification process (Moore. C, 1979). But later, when upon the realization that most of the preservice teachers were not even aware of online teaching structures and K-12 classrooms. The International Association for K-12 Online Learning (iNACOL) put up its role in understanding and addressing the need to include courses that provide training in the virtual environment by enhancing strategies for online pedagogical structures. It was known as "New vision of the future of Education" (Archambault and Kennedy, 2014). The preservice training was encouraged by the Partnership for 21st Century Skills (2007). Teacher-learning organizations add 21st-century skills proficiencies, particularly in Information and Communication Technology (ICT), to the qualification criteria for teacher education programs. Preservice teachers need to understand how to make use of new technology, how to bring into practice effectively to formulate meaningful knowledge experiences (International Society of Technology in Education, 2002).

A survey was conducted to gather views of preservice teachers about the delivery of education through the gaming environment. They were allowed to play games on the gaming systems to which they were familiar. Almost every training candidate was able to differentiate between recreational and educational games. They found that through gaming, a virtual environment's training becomes informative and entertaining at the same time. Respondents viewed games as beneficial to create a valuable learning framework, generate virtual realms, and associate imitations to realism. However, participants did not rate social characteristics of gaming to be as significant as concerns of motivation. However, concerning educational goals, a substantial fraction of responses specified that preservice teachers appreciated games as a motivational tool rather than an essential part of social life (Schrader, Zheng & Young, 2006).

For evaluation of the process of online training by preservice teachers, three conceptual factors were examined by (Garrison and Anderson, 2004) known as the "Community of Inquiry." Appropriate study about the virtual concept of learning, the interdependent aspects include:

Social Presence:

This concept is virtually essential to support cognitive presence. It is intended to develop a cloud of trust that encourages and supports open communication between learners and the learning individuals. For an effective online learning process, the trainers must establish a face-to-face communication process. As (Garrison and Vaughan, 2008) state, it is vital to view three categories to assist in the growth of the social presence:

➢ Firstly, open communication should provoke a sense of risk-free environment to enable the establishment of eloquent interaction and trust-building.

➢ Secondly, trainers should be able to engage a group of individuals in cohesion to promote collaborative work, recognize each individual's presence, encourage and create a positive learning environment to cultivate purposeful associations among all.

➢ Thirdly, it is essential that every student feels emotionally secure without lagging in the learning environment and should feel free to express his/her views and concerns without hesitation.

Cognitive Presence:

(Garrison and Vaughan, 2008) When raising an intellectual environment to enhance thinking procedure by the learners, the perceptive manifestation becomes divided into four categories:

➢ In the activating stage, the issue is recognized, questioned as to how, why, and when it generated, hence a sense of perplexity is developed.

➢ The investigation by students helped in retrieving facts and finding answers to the raised questions.

➢ The assimilation phase connects the ideas produced by every individual of the group.

➢ Resolution phase, estimated results are discussed upon, and new ideas get placed to implementation.

Teaching Presence:

The online learning system is a very interactive process that demands the proper attention of both the individuals of the learning process. The presence of a teacher is a critical element of the "Community of Inquiry." As illustrated in the previously described two categories of presence, this category is also comprised of major three factors (Garrison and Vaughan, 2008):

➢ Design and Organization: preservice teachers who undergo professional development must be provided with training to develop their cognitive thinking from not just attaining

higher grades, but to make learning a goal to excel in their career. The instructor designated in the course design expressed the views that students who are assessed and enrolled in degree programs are mostly found to have no prior experience regarding the e-learning structures. Hence they expect to be fully enriched by the training programs supporting the information and knowledge of the virtual based system, which is the most crucial necessity of this time.

➢ Assessment: preservice teachers found this step as a critical source of motivation for the formulation of their study materials. Students taking part in reviewing the online testing systems discussed their opinions that by an assessment performed online, they could easily find gaps to upgrade their learning procedures. Whereas being educators, it is one of their roles to provide enhanced learning outcomes. Preservice teachers found that during an online assessment, interaction with new technological gears was also a noticeable and yet a beneficial tool in their training. The capability to use animations and interactive items; the opportunity for instant feedback on quizzes; the availability of question banks not only for test preparation but also to vary test items to reduce the chance of cheating, provided a great fraction of assistance in learning the online learning structure.

➢ Course Structure: as technology is in a continuous process of change, it is necessary for the instructors in the training programs to review the comments of the preservice teachers to enhance the outcomes of the e-learning part. In this way, students are encouraged; hence, they gain confidence as part of the structural development of their professional development process.

➢ Facilitating Dialogues: discussions with the preservice learners have described that whenever a student faces difficulty and raises questions, face-to-face interaction is more likely to be effective than just vocal. In case of an email, a lively and gentle tone should be used in answering questions to encourage students that issues are being solved with concern and given proper attention, which is one of the main essences to maintain the quality of online distanced-learning.

➢ Direct Instruction: in this step, the instructor provided the opportunity to the preservice teachers to discuss and gain ownership and lead the course as per their strategies and intellect.

However, the instructor only interfered when learners got deviated or lose their focus. Most of the contributors felt that the course could be amended by giving a better steadiness between the debate of content and hands-on individual and group assignments in which undergraduates implemented the knowledge they had learned. Highlighted as an example, recommendations comprised of projects to generate online assessments and to develop instructions about criminal activities from the computer and Internet security rather than just conferring these topics. As the course designed was a mixed learning opportunity that involved a preliminary meeting, learners specified that the chance to study to use the course development technology in a face-to-face, the hands-on setting would have significantly minimized the steepness of the learning curve. In contrast, the student's frustration about

mastering skills on a new technological system was also eradicated.

Importance of online learning and training of teachers in times of covid-19 pandemic

By the end of 2019, the Wuhan Health Committee in China reported masses of increasing pneumonia cases. As the biological background did not match with any of the prevalent other diseases in the world, the actual cause disease remained unknown. In an environment of uncertainty and risks related to human lives, it was necessary to launch immediate responses and measures to conquer the spreading disease, which was later identified as the "Novel Coronavirus (2019-nCoV)" (European Centre for Disease Prevention and Control, 2020). In 2020, by March, more than 6 million active cases were declared and about 35 thousand deaths around the world, making this disease a global pandemic to which currently the whole world is being greatly obstructed. Active growing cases were reported in ten majorly affected countries of the world, including China, Italy, the United States of America, Spain, Germany, Iran, France, South Korea, Switzerland, and the United Kingdom (World Health Organization, 2020). Prevention from the virus primarily includes: maintaining social distance, reduced or no traveling, frequent washing of hands, in case of any symptoms self-isolation is highly recommended. This atmosphere of creating spaces to cope up with the pandemic situation resulted in huge impacts upon economies of the developed and developing world equally. Therefore, closure of interactive systems and restriction of activities also resulted in absolute change in the structure of education just like others.

Generation Z and the upcoming generations (as described by the world economic forum):

A generation that has entirely grown in the technological era is categorized as Generation Z. In today's world, this generation majorly comprises the learning candidates in the educational institutes. This generation, from whom the oldest age is 25 years old, is probably seen as reflecting on their education as a consequence of a truly worldwide pandemic. A major fraction of this generation is facing canceled exams, sporting occasions, and even graduation. A generation which is defined by technology, the terms FOBA (Fear of Being Alone) and FOMO (Fear of Missing Out) express their anticipations of prompt communication and feedback. Stimulated over apps like Instant Messenger, Snapchat and WhatsApp, which includes from parents and educators, somewhat becomes intensified with the current remote learning.

Children of the millennial, described as Generation Alpha, are the most culturally diverse generation across the world, and technology is merely an extension of their consciousness and personality, with social media defining the way of living. These young pre-schoolers are also the generation with the most non-traditional family structures, often with "bulldozer parents" who move obstacles out of the way to create a clear path for their kids. Even though Generation Alpha is probably oblivious to the impact of the global pandemic on their education, the effect will surely be felt even for our youngest learners for years to come.

During this Covid-19 Crisis, recently trained educators must be concerned about what their duties should be to prepare them for the future. As the report of the Dell Technologies state, 85% of the occupations in 2030 that Generation Z and Alpha will enter into have not even been discovered yet. While the World Economic Forum report states that 65% of

primary-school children at present times will be found underemployment in work types that do not exist yet.

The current Covid-19 calamity may have changed the ways previous generations have been living in. Still, it also teaches to adapt and convey. Education is the most effective way that coming generations would be able to prepare themselves for their future. Described below are some crucial measures required to maintain the education process today and virtually in future (World Economic Forum, 2020):

Imparting Education beyond Boundaries:

The word "Pandemic" defines an issue of life risk at the global level. Hence it would be a vital and most probably an essential measure to provide education, which is not limited by boundaries. In this way, nations of the world would interconnect with acceptance of the differences between them and perform collaborative tasks globally.

Redefining the Role of Educator:

The conception of educator, performs as the knowledge-holder who imparts insights to their pupils, is no longer considered as the purpose of 21st-century education. With students being able to gain access to knowledge and even learn a technical skill, through a few clicks on their phones, tablets, and computers, there is a dire need to redefine the role of the educator in the classroom and lecture theatre. It would mean that the part of educators will need to move towards facilitating young people's development as contributing members of society.

Interpreting Life Skills needed for the Future:

The leaders of tomorrow are required to develop some key skills which will be of fundamental importance in this changing environment of the planet. The young generation should have resilience and adaptability in their personalities, which will allow them to navigate in a crisis such as pandemics and economic issues. Employers would expect collaborative work environment and creative thinking skills, which would be easily developed if diverse online learning culture continues.

Unlocking the perfect usage of technology to deliver education

This most critical aspect of a teacher training and learning program is the central core of this paper. As this pandemic has left the education systems of the world to move online completely, therefore discussed below are some of the software and applications being used by teachers and learners in curriculum and professional development:

Professional development online content*:*

➢ *VROOM*: this application is available at Apple iOS as well as for Android users. It focuses on providing early childhood learning by integrating it into household activities such as bath time, cooking, or other household chores to maintain an environment of child nurseries and playgrounds at home (vroom.org).

➢ *Google Teach From Home*: this website provides teachers with training, essential tools, and resources available on google to facilitate distanced learning. It helps teachers decide whether to deliver a video lesson from home or not on video, how to keep students engaged in the remote learning environment, interact with other teachers, and work in collaboration. This website also offers a toolkit to promote a community of practice via twitter.

➢ *Center for Learning in Practice*: this Carey institute website provides both teachers and learners a platform to discuss their problems and discover opportunities. It provides recorded webinars from professional instructors and opens virtual forums to teach preservice teachers how to develop their learning materials, which are purposeful and meet the demands of students. Registration is required but is free of cost.

➢ *Carey Institute for Global Good*: this institute provides online courses for professional development, such as crisis schooling, how to move ways online, and how to promote a social-emotional learning (SEL) perspective. Registration for most courses is free. However, courses for migrants and refugees come at the cost of 10USD. Courses provided are self-guided.

Technological tools presently available to educators*:*

➢ *Microsoft Teams*: Microsoft Teams deals with chat, meet, call, and collaboration features incorporated with Microsoft Office software and are thus suitable for classwork, teamwork, and management.

➢ *Ed Dojo (Class Dojo)*: this is a free communication platform in which the teacher communicates with students and teachers to create classroom communities. Teachers can encourage students for any skill or value — whether it's working hard, being kind, helping others, or something else. Students can showcase and share their learning by adding photos and videos to their portfolios. The platform allows teachers to get parents engaged by sharing photos and videos of wonderful classroom moments. Using the ClassDojo app teachers can access a teacher toolkit which allows them to make various types of virtual activities such as: generate random groups of students, use the classroom noise monitor, set a classroom timer, facilitate discussion with think pair share prompts, display activity directions, turn on background music, and do other things which engage students both in the classroom and virtually.

➢ *Zoom*: *Zoom* is a video communications tool with a cloud platform for video and audio conferencing, collaboration, chat, and webinars. It can be utilized across mobile devices, desktops, laptops, and telephones. Its features like chat, screen share, annotate, whiteboard, polling, breakout rooms, raising the hand, and managing participants lend themselves to generating engaging computer-generated and hybrid lecture halls and cooperating on projects. Users have the option to record sessions. Teachers and students develop cognitive and SEL skills as they navigate the virtual environment. The site supports nine languages.

➢ *Google-Suite*: *G Suite for Education* is a cloud-based suite of readily available tools and features tailored for schools and home schools to manage educational material from anywhere on any device. It includes *Google Classroom* and *Google's* core services, including Gmail, Calendar, Docs, Sheets, Forms, Slides, Hangouts, and more. Additional services include products like Chrome and YouTube. The following are the features of each tool. Classroom - designed for teachers to create classes, distribute assignments, give quizzes, and communicate with students. Docs, Sheets, and Slides - team up, share opinions, and work together in real-time on documents, spreadsheets, and presentations. Forms - create forms, quizzes, and surveys to collect and analyze responses with the help of machine learning. Jamboard - a cloud-based smartboard where you are allowed to outline and collaborate on an interactive canvas. Gmail - create school- or university-wide email system, or to exchange secure emails with classes. Drive - store and organize assignments, documents, or class curriculum securely and access them on any device. Calendar - share calendars or create joint schedules with your institution or class members. Sites - an easy-to-use web builder to create websites, host course curriculum, and build development skills. Hangouts Meet - connect with students virtually through secure video calls and messaging. Groups - class forums for communication and conversation. Vault - add students, manage devices, and configure security and settings, so your data stays safe. G-Suite for Education can support cognitive and SEL skills, as it is a learning platform. Its admin consoles can support 28 languages, and other apps can support more than 120 languages.

➢ *Google Classroom: Google Classroom* is a free web service designed for teachers to formulate curriculums, allocate projects, examine, and communicate with students. It combines *Google* Drive for assignment design and circulation. *Google* Docs, Sheets and Slides for writing, Gmail for communication, and *Google* Calendar for scheduling. It differs from *Google's G Suite for Education* in that homeschooling, tutoring programs, lifelong learners, and others without the G Suite can access the *Google Classroom* from their personal Gmail accounts or from outside of the G Suite domains. *Google Classroom* can support cognitive and SEL skills as it is a learning platform. The admin consoles support 28 languages, and Google docs and slides support 62 languages.

Online education scenario

When the first case of COVID-19 was detected, modifications in the general education system all over United States began in the spring semester of 2020 (J.H,University, 2020). To support remote learning, public schools are allowed to free online products. *Microsoft* is providing its premium services free for six months. *Google* is offering its video conferencing feature for larger meetings and G Suite functionality free for educational customers till July 2020 (Rani Molla, VOX. 2020).In about 173 countries, alternative system for digital school management is used known as aSc Edupage. This system supports cloud-based unity of web portal and mobile application. Services provided, includes, computerization of timetable, curriculum, attendance control, assignments for homework, grading and messaging features. Parents are facilitated by getting information about grades and results and can also interact with teachers regarding their concerns and child performance reports (EduPage, 2020). As

analyzed by (Basilaia & Kvavadze, 2020), about 920 students were taught online in the first week of a private school. 86 teachers received online training through *Google* Meet tools about creating the virtual curriculum. Through EduPage system, links were sent to parents, students and teachers to make their timely presence as stated by the timetable. Larger percent of teachers preferred desktop sharing of learning materials, which resulted in about 78 hours of screen usage in one week. To avoid technical issues and continuous screen interaction, 10-15 minutes break was given and lessons were reduced to 30 minutes. It was recommended in the study to provide access to educational statistics openly. As the amount of lessons is reduced, therefore, Saturdays should also be considered in schooling hours.

3. Conclusion

Online and distanced learning is a rapidly developing educational structure that requires extensive research to unlock various other methods and techniques for enhancing its quality. As this out of the blue pandemic situation took the whole world at a rapid pace, it is imperative to work on emergency measures actively. Currently, online education is a challenging task for educators to adapt, as related issues also prevail, such as fair and cheat-proof assessment systems, anti-plagiarism, cyber-crimes etc. Whereas the issue of accessibility for every learner still prevails and with an ongoing uncertainty of when schools will return to a sense of normalcy, there is a need for unending evaluation of access to prevent future inequities. Over the long term, increased research about how pre service teacher learning and development occurs through innovative technologies will be critical to using the above-mentioned resources most effectively. Specifically, a recommendation for enhanced research to identify key gaps could be analyzed, and preservice teachers would be assisted in terms of awareness and proficient career development to build up the generations of tomorrow.

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