INDONESIAN JOURNAL OF EDUCATIONAL RESEARCH AND REVIEW
Volume 5 Nomor 1 2022, pp 88-99
E-ISSN: 2621-8984; P-ISSN: 2621-4792
DOI: https://doi.org/10.23887/ijerr.v5i1.44887

Professional Development in Technology Integration Among Teacher Educators in Ghana

Mudasiru Olalere Yusuf[1*], Seth Dade Ansah[2], Talatu Fahdilat Ahmed[3]. Hamdallat Taiwo Yusuf[4]
[1,3] *Department of Educational Technology, University of Ilorin, Nigeria, Nigeria*
[2]*Department of Educational Foundations, FES, University of Education, Winneba, Ghana*
[4]*Department of Social Sciences Education, University of Ilorin, Nigeria*
**Corresponding author: moyusuf@unilorin.edu.ng*

Abstrak

Di era digital ini, pendidikan membuat peserta didik memperoleh pengetahuan, sikap dan keterampilan yang tepat dan relevan yang mengarah pada pemahaman dan berfungsi dengan baik di lingkungan mereka yang didominasi digital. Penelitian ini mengeksplorasi bagaimana dosen teladan mengembangkan kompetensi dan keterampilan dalam mengintegrasikan teknologi untuk pengajaran. Desain fenomenologi hermeneutik kualitatif digunakan untuk penelitian ini. Secara keseluruhan, 20 dosen (contoh) dari 327 dosen dari universitas pendidikan guru di Ghana membentuk sampel dan diwawancarai oleh salah satu peneliti selama sepuluh minggu. Data dianalisis dengan menggunakan pengkodean tematik, pengkodean struktural, pengkodean pola dan pengkodean terfokus dalam mencapai pengalaman eksemplar. Temuan menunjukkan bahwa eksemplar TIK terintegrasi seperti Google Application for Educators (GAFE), Microsoft Office and Education tools, dan perangkat lunak open-source lainnya untuk membuat mereka menonjol di antara rekan-rekan mereka, sebagai eksemplar. Para eksemplar memperoleh kompetensi integrasi mereka melalui pembelajaran individu, rekan kerja, dan materi online. Temuan menggarisbawahi perlunya penyediaan fasilitas kelembagaan dan dukungan untuk memperdalam integrasi TIK di universitas. Berdasarkan hasil, rekomendasi, implikasi, dan keterbatasan dibahas.

***Kata kunci*:** *Teladan, Dosen, Pengembangan Profesi, Integrasi Teknologi*

Abstract

In this digital era, education makes learners acquire the appropriate and relevant knowledge, attitude and skills that lead to understanding and functioning well in their digitally dominated environment. This research explored how exemplar lecturers developed competencies and skills in integrating technology for instruction. A qualitative hermeneutic phenomenology design was used for the study. In all, 20 lecturers (exemplars) out of 327 lecturers from a teacher education university in Ghana formed the sample and were interviewed by one of the researchers for ten weeks. Data were analysed using thematic coding, structural coding, pattern coding and focused coding in arriving at exemplars' experiences. The findings show that exemplars integrated ICTs such as Google Application for Educators (GAFE), Microsoft Office and Education tools, and other open-source software to make them stand out among their colleagues, as exemplars. Exemplars acquired their integration competencies through individual learning, colleagues, and online materials. The findings underscored the need for institutional facilities provision and support to deepen ICT integration in universities. Based on the results, recommendations, implications, and limitations are discussed.

Keywords: Exemplars, Lecturers, Professional Development, Technology Integration

History:
Received : January 20, 2022
Revised : January 26, 2022
Accepted : April 04, 2022
Published : April 25, 2022

Publisher: Undiksha Press

1. INTRODUCTION

Information and Communication Technology (ICT) advancement seems to be gathering speed for data processing and more efficiency in all aspects of human life. In education, the advancement in ICT has aided management and administration, assisted instructional delivery, and facilitated learning opportunities (Ali & Maksum, 2020; Lange et al., 2020). In this digital era, education makes learners acquire the appropriate and relevant knowledge, attitude and skills that lead to understanding and functioning well in their digitally dominated environment (Azizah et al., 2020; Putrawangsa & Hasanah, 2018; S. Sari, 2019). When technology is used in achieving 21st-century educational goals (collaboration,

critical thinking, and problem-solving), change is characteristically needed along multiple dimensions of education practice (Grigoropoulos, 2019; Gürsoy, 2021). The change must assimilate the technology and accommodate the new goals, structures, and roles initiated by the integration process (Ertmer et al., 2012). Educational change is complex and requires major change management. Like any other decisive change in education, technologically oriented change, aiming at technology infusion, has become prominent and complex in educational systems worldwide and requires major management strategies (Atkin et al., 2015; Burik, 2021). This technologically oriented change has become more important in this pandemic era because technology integration and infusion in educational institutions could help adhere to COVID-19 protocols.

To foster technology integration as innovation in educational systems, the United Nations Educational, Scientific and Cultural Organization suggested a two-dimensional guide for educational institutions. The highest point of integration is transforming, where ICT gets infused into all regular instructional activities. Besides, ICT shapes the rethinking and renewing of institutional organisation in creative ways; they play traditional roles in the day-to-day activities of the institution; they are an integral part of daily personal productivity and professional practice. Ranging from emerging (bottom) to transforming (top), key educational stakeholders such as instructors, learners, institutional administrators, and educational institutions must manage the various changes within the integration phenomenon (Zafar et al., 2022). The integration of ICT in teaching and learning boosts students' motivation. It provides students with quicker access to rich sources of data and information (Hatlevik et al., 2018; Lawrence & Tar, 2018; Lynch et al., 2021). It also relieves teachers of the administrative tasks while focusing on the learners' achievements, enables learners to learn independently, assists learners to interpret and organise their knowledge, easily convey knowledge acquired to their instructors and colleagues through collaboration; and helps in technical reconditioning (Eugenia et al., 2013; Park et al., 2020).

Lecturers have a crucial role in tertiary education delivery in the 21st century (Berlian, 2018; Mardiana, 2020). They play a tactical role in supporting the process and results of the total educational system (Dukhan et al., 2019; Mohd Zain et al., 2018). As seen in their capabilities to champion teaching content and instructional method, their professional competence influences their performances. Lecturers' roles in the 21st century include adaptor, visionary, collaborator, risk-taker, learner, communicator, model, subject matter expert, researcher, technocrats, community developer and leader. A good mix of these roles gives the needed skills to enable the lecturer to function well to meet the changing 21st-century learning needs in this digital age (Gürsoy, 2021; Zulfiani et al., 2020). The digital age dominating this century requires lecturers to be techno-savvy to live up to their expectations as educators in contemporary higher education.

Amid much online content, diversified learners modernized ways of communication, and the COVID-19 pandemic, the university's responsibility of teaching, training, and facilitating learning among students for the job market seems to revolve mainly around the lecturer (Sadikin & Hamidah, 2020; Widagdo et al., 2020). It implies that a lecturer's performance has much impact on educational goals. In this wise, a lecturer as an educator needs to develop continuously to support the dynamics and effectiveness of the educational process. Meanwhile, professional development for lecturers in ICT and its integration received less attention in most teacher education universities in Ghana. Moreover, less attention is given to resource provision against continuing professional development activities for which ICT integration has been minimal. A cursory look by the researchers showed many universities' attempts to respond to the COVID-19 pandemic, rushing professional development programs towards ICT integration. However, the need for lecturers' competence and skills in online teaching and learning, blended-mode, LMS, personalization,

collaboration, presentation, and open education needed in ICT-enabled education had still not received much attention from university authorities (Anamuah-Mensah, 2015; Molly et al., 2017).

ICT tools and resources, if managed well, can assist in improving tertiary education and, by extension, make gains in SDG Goal 4 in Ghana, other African countries, and the developing nations of the world. Such technologies are learning management systems, personal learning environments, cloud computing, game-based learning, open content, learning analytics, informal learning, educational apps, and social networking tools, among others (Anamuah-Mensah, 2015). Lecturers need ICT in their teaching and learning space to promote student-centred strategies to make education accessible to all. ICT introduction for student centred-learning will improve the quality of teaching and learning, thereby preparing students for the 21st-century work environment (Gil-Flores et al., 2017; Hatlevik et al., 2018; Kristinawati et al., 2018).

Studies have shown that the lecturers are supposed to overcome some stages such as knowledge acquisition, skills training, and desire to integrate. Professional Development programmes towards technology integration by lecturers have yielded a broad spectrum of results depending on trainees' perceptions (Nguyen & Doytch, 2021; H. I. Sari, 2016). The ICT in education policy in Ghana vision was to optimise the advantages of ICTs in an educational institution. Among other things, ICT in education policy envisaged the provision of multiple avenues for the professional development of lecturers. Also, ICT increases opportunities for more student-centred pedagogical approaches at the basic and secondary levels of education in Ghana. Despite these laudable goals, not much has been invested in lecturers' professional development to model good instructional and administrative use of technology. Although few foreseeable implementation challenges are mentioned, the policy sought to effectively integrate ICT into the educational planning and delivery process. It also sought to ensure deployment of appropriate platforms, content, and applications, user training and support with specific programmes and proper evaluation of the policy to measure the outcome of professional development programmes and their impact on technology integration.

The findings of previous studies also stated that students would be helped in learning when using technology (Fitri & Putro, 2021; Hatlevik et al., 2018). Other research findings also state that technology in learning is now essential because it can facilitate student learning (Li, 2021; Magen-Nagar & Firstater, 2019; Park et al., 2020). It can be concluded that teachers must integrate learning with technology to support the learning process. Research has affirmed that a teacher's quality of teaching is the most crucial factor contributing to a student's academic success in schools. Lecturers' ICT professional development occurring within their work environment can ensure professional learning that meets required standards to ensure successful learning. Educators' technological competency contributes significantly to achieving technology integration in teaching and learning, but lectures often use many modes of acquiring technological competencies. In the contemporary knowledge-age society, creativity, critical thinking, and communicative skills shape learning. Therefore, lecturers need to master technology integration for improved instructional delivery and educational administration. The purpose of this study is to explore how exemplary lecturers develop competencies and skills in integrating technology for teaching.

2. METHODS

This study adopted a qualitative hermeneutic phenomenology design, using a case study approach. A qualitative method was adopted to ensure that the researchers derive helpful information from the lecturers' stories. The hermeneutic phenomenology approach

was considered the best design for this study. The design enabled the researchers to interpret the lived experiences of the research participants. The lecturers' lived experiences got explored in line with the ICT integration phenomenon within a teacher education university in Ghana.

The target population was 327 lecturers in teacher education, with expected pedagogical knowledge, content knowledge, and technological knowledge competence. The need to select participants who could provide information about the studied phenomenon was paramount. Using snowballing/network sampling technique to arrive at the sample was optimum (Creswell, 2009). The first participant recommended another participant or participants known for integrating technology into their instruction. Through this referral process, 20 participants were drawn. The researchers used an interview guide and a semi-structured questionnaire designed for data collection. A one-on-one in-depth interview was mainly employed as one of the researchers interviewed and conversed with participants to record participants' verbal and body language (Yin, 2016). The semi-structured questionnaire was used for eliciting themes for concentration and data triangulation. All seven items on the interview guide had various sub-items depending on how the interview went on the field. On average, each participant spent 50 minutes for the interview session interviewing. Note-taking (paper and pen) and audio recording were used in capturing data. To ensure data trustworthiness, each participant went through their transcribed data to confirm the accuracy of the interview information. With conscious efforts to observe COVID-19 protocols, online versions of the instruments were strictly employed.

A qualitative data analysis programme (NVivo-12), thematic coding, attribute coding, structural coding, pattern coding and focused coding were conducted until saturation was attained. The researcher accordingly identified and extracted vital phrases, terms, themes, ideas, and meanings from participants' experiences concerning the phenomenon under study. Finally, meanings were drawn from single instances and aggregated themes from the data interpretation. As a result, overall meaning emerged from the collection of stories, instances, and themes. Necessary efforts were made to ethical issues such as addressing informed consent, anonymity, and confidentiality. All the participants voluntarily consented and signed a consent form to indicate their willingness to participate in the research and permission to publish findings from the analysis of their responses. For the anonymity of participants, pseudonyms were used, and the transcript of their responses and other research records were kept confidential. Besides, the institution's name is kept confidential.

3. RESULTS AND DISCUSSION

Results

The results and discussion are predicated on the research questions outlined the introductory part of this paper.

Research Question 1: What are the ICT integration skills exhibited by exemplary lecturers among their colleagues in a university in Ghana?

ICT integration skills exhibited by lecturers to make them exemplars among their peers.

Lecturers' core activities were lessons preparation, lessons presentation, and assessment and evaluation. Most participants consider technology integration so critical in their lesson preparation. Besides the recommended textbooks, lecturers used current online materials to support their existing knowledge base. Ama noted, among other things, that "Lessons have not been successful without searching online for new trends." Another participant, Kwame, stated that "I review all my content on slides including infographics to ensure they are in order with the audience." Ajo said, "I retrieved already made PowerPoint slides, modified them and used them for my lessons. Similarly, Abena stated, "my course is a

project-based one, and I do not resort to technology integration during my lesson preparation". Notwithstanding the variations, technology integration in lesson preparation is crucial in their professional life. Lecturers took digital media and embedded them for robust lesson presentations and a multimodal learning environment. Kwame noted that "despite the online challenges associated with MOODLE, I still upload my content unto it for students and also engage students in interaction on Moodle". This ascertain indicates that irrespective of the challenges associated with integrating the institutional LMS, lecturers make do with it.

In their attempt to determine whether teaching and learning have been effective and efficient, lecturers gave assignments to students. They demanded that students answer in digital formats or e-portfolio. Students also made a group presentation and sent electronic files online for lecturers to mark. Yaw asserted that "I always ask my students to send their assignments online, after scoring, I send marked works back to them". Aside from digital assignments, lecturers are required as a matter of policy to key-in (submit) assessment scores in an online institutional platform called Online Student Information System (OSIS). Automatic grading is done by OSIS as soon as continuous assessments and end of semester examination scores are keyed-in. Although there were few stories of failure, participants gave accounts of countless success stories of their ICT integration. Some of the lecturers noted that the adoption and integration of ICTs enhanced their teaching, learning and research.

ICT applications that make lecturers outstanding among their fellow lecturers included integrating technology in lessons preparation, lesson delivery, assessment, and research. The analysis of the data established that lecturers exhibited competencies in downloading online materials, designing digital and online instructional materials, using OSIS for the assessment of academic achievement of students. The finding is in line with Cochrane and Narayan (2013) that the impact of mobile web 2.0 technology and others in higher education had a significant change in lecturer conception of pedagogy. However, learning to be techno-savvy to boost their internet browsing as part of efforts towards using an online learning environment (Doering, Veletsianos, Scharber & Miller, 2009) was a key motive in professional development programmes. Furthermore, the findings align with Amhag, Hellström and Stigmar (2018), which established that technologies are adjustable compared to traditional pedagogical technologies. They rapidly change and are dense, and therefore available technology could be put to diverse uses in the teaching profession. However, their integration also needed to be developed professionally in line with educational pedagogy and enhance understanding of the skills, dispositions, and knowledge.

Research Question 2: How did the lecturers acquire skills and competencies for integrating ICT?

Lecturers' acquisition of ICT integration competencies and skills

The lecturers themselves have made efforts towards competency acquisition, not by the corporate institution (university). Lecturers have acquired their integration competencies through self-tuition, learning from colleagues and learning from online materials. Some lecturers limited themselves to only one or two techniques, whilst others combined all three. Self-tuition involves exploring technological solutions and finding innovative ways of integrating technology in performing professional duties. The quest to incorporate available technology led some lecturers to search for and research technology integration, with most of them acquiring the knowledge and skills independently. Komla stated, "I was thinking about an innovative and efficient way of interacting and supervising my distant students' project work, so I read about the Google tools and got to know that sharing files in Google Drive will be very suitable for me". Among the knowledge that lecturers have acquired through self-tuition is knowledge on designing instruction that utilises content-specific technologies, using effective strategies for teaching online or blended learning, and addressing ethical use and legal use of technology in education. However, some lecturers found self-tuition to be

challenging to acquire competencies. Their reason was that they usually lose focus as they learn technology content independently. As adult learners, most of them did not have a well laid out learning plan

Some lecturers acquired technology integration competencies from their colleague lecturers and researchers. On a one-on-one basis, lecturers had acquired skills and knowledge in integration. Skill training that the lecturers had acquired through colleagues included using technology to separate instruction for diverse learning needs. Others are using digital and online tools to boost teaching and learning, applying troubleshooting skills to resolve technical issues related to technology use, and using technology to connect globally with various regions and cultures. Kofi noted that "I usually consult my colleague in the ICT department to guide me through troubleshooting". Another indicated that she had contacted colleagues for digital instructional packaging and online content delivery assistance. Besides, some lecturers acquired competencies through group discussion among like-minded lecturers on trending issues in technology integration.

Also, few of the lecturers acquired knowledge from global experts and authorities through the community of learners. Social media use (e.g., Twitter and WhatsApp) promotes assembling and following people with the same interest. Lifetime continuous professional development associations such as 'Thought Teacher' and AECT use social media platforms to create an avenue for individuals to share and learn technology integration. Some lecturers follow some of these experts on social media (Twitter and Facebook). Abena stated, "I do follow EdTech experts on Twitter, and Instructional Designers on Facebook, I learn a lot from them". Some other lecturers shared the same opinion that they subscribed to the international community of learners on social media, which have been very helpful in their competency acquisition.

Online materials have been a major source of knowledge and skill training for integration. Search engines such as Google search and YouTube have served as a reference point for many lecturers. They have relied mainly on search engines to guide their instructional media production. Some lecturers resorted to adaptive media production, where videos or slides are downloaded and modified to suit the context of their lessons. All participants shared that they resorted to tutorials from YouTube and Google search. The lecturers have been updating their content online regarding pedagogical and technological advancements. Lecturers are eager to stay on top of their profession in the information age, so they deem it necessary to integrate technology. They have deliberately gone through non-formalised ways of acquiring competencies in technology integration to improve their teaching and learning efficiency.

The determination of how the ICT integration lecturers acquired their competencies and skills revealed that lecturers developed their integration competencies mainly through experiential learning. They made massive participation by controlling their learning process and interacting with others who taught them (Rogers & Horrocks, 2010). In the study area, lecturers set out their content for their professional development, which guided their expedition or interaction with colleagues using different modes such as self-tuition or knowledge expedition, learning from colleagues, and learning from online materials. The findings concur with Tuttle (2012), who revealed that integrating lecturers leveraged professional and personal networks to support and guide technology use. The result established that most participants resorted to individual knowledge expedition learning like Kelly (2017) found. Educators saw it as ideal learning from their peers, less preferred working in groups as their personal questions were not addressed, and finally had to understand the importance of what they were learning. Lecturers' professional development is beneficial to their university, and the lecturers essentially decide their content, method, and design in the study area.

Research Question 3: What factors motivated the lecturers to integrate ICT?

Motivating factors that encouraged the lecturers to resort to ICT integration

The themes that emerged from the motivating factors were working smart, personal interest, making a difference, helping colleagues and students and lifelong learning. Whilst some of the lecturers were motivated by single factors for integrating ICTs, others were motivated by multiple factors for integrating ICTs.

Regarding working smart, the lecturing profession is tedious as lecturers must engage in many intellectual/academic activities. The routine activities include preparing lessons, interacting with students, assessing students' achievement, conducting research, and rendering academic counselling. Most Lecturers believe that harnessing the advantages of ICTs will make their professional life easy for them. Kobla gave an account of easy storage, and retrieving digital files makes life easy for him. "As Arts Education lecturer, my graphics works and works of others that I use as teaching and learning materials (TLMs) and relevant previous knowledge (RPKs) are stored on my computer and easily retrieved and displayed in class". Lecturers found it easy working with digital materials. They easily edit, save, download, retrieve and share digital content. Contrarily, some other participants were not particular about working smart. However, another participant mentioned that her need to integrate was not influenced by working smart but due to a great deal of versatility in working with modern digital tools.

Personal interest is adduced as a great deal of self-fulfillment in integrating modern devices and technologies in their profession. Some are just in love with ICT and, therefore, will like to resort to the ICT aspect of everything in their lives; they are interested in changing for the latest technologies. Such lecturers see ICT integration as a means of personal satisfaction. A participant noted that "I enjoy the easy ways of doing things, therefore if I have the means to acquire a device or software that will make things easy for me, why not?". Mamle observed that ICT had become the order of the day; it influences every aspect of life, so to be relevant in this time, I must learn to integrate ICT into my profession. In addition, lecturers are interested in using modern technology in teaching students in modern times. This inner motivation has led to lecturers resorting to ICT integration.

Making a difference shows that most young lecturers considered it essential to resort to new and different ways of doing things. Young lecturers pursue new ways of searching for information, more efficient lesson delivery and assessment methods, and unlimited interaction with students. Ama believed that times had changed; students had changed, and homes had changed. So, teacher trainers could not keep on doing things the old-fashioned way. "I must do things differently". Apart from two participants, all participants shared that they need to move away from the old ways of doing things. On the other hand, the two participants with a contrary view to making a difference explained that specialisation in their area of study and articles' publication was more vital to them. They believed that it would boost their chances for professional promotion.

The desire to help colleagues and students and the need to help students with special needs emerged as a major motivating factor for integration. Some lecturers enjoy the accolade of being called "tech-icon". Other lecturers called upon them to coach and instruct on troubleshooting and instructional media preparation. Adwoa stated, "I am always enthused to integrate technology. My constant practice helps me coach other lecturers to integrate". They feel relevant and fulfilled as other lecturers depend on them for technological solutions. Another participant who received formalised training on using MOODLE expressed the joy of being put in charge of training other lecturers. Besides, some other lecturers sounded student-oriented as they were much concerned about students living with disabilities. Such lecturers make deliberate efforts to meet the needs of all students through technology

integration. Kofi stated, "I teach a general course, my class sizes are huge, so apart from my radio lecture, I post videos on YouTube for those who are following me to download". They feel fulfilled to reach out to the hearing impaired, visually impaired students as they integrate technology such as availing audio-visual instructional material to students.

Discussion

Lifelong learning is also a focus as **l**ecturers need not stop learning (Daggol, 2017; Devi et al., 2016; Garzón-Artacho et al., 2021; Sert & Boynueğri, 2017). Lecturers with terminal degrees are still researching and learning new things, whilst lecturers without terminal degrees are pursuing terminal degrees. In all these cases, lecturers retrieve data and information for processing. They also need to disseminate knowledge. For efficiency purposes, lecturers must integrate technology into their lifelong learning activities. Akosua mentioned, "As part of my PhD, I need to make a series of presentations; life would have been tough if I had no basic knowledge in MS Word and MS PowerPoint. I do not struggle because I have these tools at my fingertips". Lecturers are interested in getting promotions in their professional life. It takes research**,** publication, and conferences. They are motivated in integrating technology in teaching, learning, research, and dissemination of research findings. Lecturers integrating technology have inner satisfaction in performing their professional duties (Gil-Flores et al., 2017; Huang et al., 2021; Tondeur et al., 2019). The motivation derived from integration could improve their work output (Bal-Taştan et al., 2018; Bdiwi et al., 2019; Lukman et al., 2020).

Among the findings that emerged from the motivating factors were working smart, positive attitude, perception, making a difference, helping colleagues and students and lifelong learning. Results of this study indicate that all participants had a high positive attitude towards technology and its integration. Furthermore, data show that participants had a positive perception of technology integration. Previous studies have proven such perceptions that educators with good perceptions about technology integration did not hesitate to integrate technology (Hennessy et al., 2010; Konstantinidou & Scherer, 2022; Sharma & Srivastava, 2020). However, were quick to add that attitude will thrive for integration in cases where significant ICT infrastructure is in place (Hennessy et al., 2010; Sharma & Srivastava, 2020). This phenomenon is supported by previous studies where educators did not embrace technology integration because of their poor attitudes towards technology (Batubara, 2017; Rahmayanti, 2015; Razak et al., 2018). Therefore, positive perceptions and beliefs about ICT motivated ICT integration by lecturers. In line with helping colleagues and students as a motivator. Peer support and perceived impact on student learning was all-important in motivating lecturers in integrating technology in their teaching.

The findings imply that the lecturers attached so much inherent importance to technology integration and deemed it critical to their profession as lecturers. Exemplars were eager to assist colleagues in integrating; this is essential as it will bridge the information gap with non-integrating lecturers. Lecturers who are personally motivated to undergo ICT professional development program have improved classroom practices. Through such professional development, educators learn new knowledge and skills, use what they learn to improve instruction and administration, and ultimately enhance student learning and achievement.

4. CONCLUSION

Exemplars integrated ICTs with their instructional material preparation, interaction with students and assessing students. The exemplars were highly interested in their professional development to boost their competency in ICT integration in instruction.

Lecturers considered working smart, personal interest, making a difference, helping colleagues and students and lifelong learning as the motivating factors that made them integrate ICTs. All these motivational factors are intrinsic. This study concluded that technology integration in teacher education is a better way of training all levels of teachers for the 21st-century classrooms; therefore, it should be purposefully planned and executed as a central part of all professional development program.

5. REFERENCES

Ali, M. K., & Maksum, H. (2020). Utilization of E-Learning-Based ICT Learning Using the Google Classroom Application During the COVID-19 Pandemic. *Journal of Education Research and Evaluation*, *4*(4), 373. https://doi.org/10.23887/jere.v4i4.29181.

Anamuah-Mensah. (2015). Teachers' ICT usage in second-cycle institutions in Ghana: A qualitative study. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, *11*(2).

Atkin, D. J., Hunt, D. S., & Lin, C. A. (2015). Diffusion Theory in the New Media Environment: Toward an Integrated Technology Adoption Model. *Mass Communication and Society*, *18*(5), 623–650. https://doi.org/10.1080/15205436.2015.1066014.

Azizah, U., Djono, D., & Musadad, A. A. (2020). Developing Digital Book Based on Lafran Pane' Thought for Increasing State Defend Attitude of Students. *Yupa: Historical Studies Journal*, *4*(1), 29–39. https://doi.org/10.30872/yupa.v4i1.235.

Bal-Taştan, S., Davoudi, S. M. M., Masalimova, A. R., Bersanov, A. S., Kurbanov, R. A., Boiarchuk, A. V, & Pavlushin, A. A. (2018). The Impacts of Teacher's Efficacy and Motivation on Student's Academic Achievement in Science Education among Secondary and High School Students. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(6), 2353–2366. https://doi.org/10.29333/ejmste/89579.

Batubara, D. S. (2017). Kompetensi Teknologi Informasi dan Komunikasi Guru SD/MI (Potret, Faktor-faktor, dan Upaya Meningkatkannya). *Muallimuna Jurnal Madrasah Ibtidaiyah*, *3*(1), 48–65. https://doi.org/10.31602/muallimuna.v3i1.954.

Bdiwi, R., de Runz, C., Faiz, S., & Cherif, A. A. (2019). Smart learning environment: Teacher's role in assessing classroom attention. *Research in Learning Technology*, *27*, 1–14. https://doi.org/10.25304/rlt.v27.2072.

Berlian, Z. (2018). Competency Analysis of Job Satisfaction and Organizational Commitment to Lecturers Who Teach at Private Universities in the Area of Southern Sumatra. *American Research Journal of Business and Management*, *4*(1), 1–6. https://doi.org/10.21694/2379-1047.18023.

Burik, A. (2021). Using Technology to Help Students Set, Achieve, and Publicize Goals. *Adult Literacy Education: The International Journal of Literacy, Language, and Numeracy*, *3*(1), 83–89. https://doi.org/10.35847/aburik.3.1.83.

Daggol, G. D. (2017). Lifelong learning: Not a 21st century, but an omnitemporal skill. *International Journal of Social Humanities Sciences Research (JSHSR)*, *4*(12), 1254–1267. https://doi.org/10.26450/jshsr.207.

Devi, S., Bhat, Ks., Ramya, S., Ravichandran, K., & Kanungo, R. (2016). Self-directed learning to enhance active learning among the 2nd -year undergraduate medical students in Microbiology: An experimental study. *Journal of Current Research in Scientific Medicine*, *2*(2), 80–83. https://doi.org/10.4103/2455-3069.198379.

Dukhan, S., Brenner, E., & Cameron, A. (2019). The Influence of lecturers' Expectations of students' role in meaning making on the nature of their PowerPoint slides and the

quality of students' note-making: A first-year Biology class context. *African Journal of Research in Mathematics, Science and Technology Education*, *23*(1). https://doi.org/10.1080/18117295.2019.1598625.

Ertmer, P. A., Ottenbreit-Leftwich, A., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers and Education*, *59*. https://doi.org/10.1016/j.compedu.2012.02.001.

Eugenia, Raymond, & Leung, W. N. (2013). Ready for 21st-century Education – Pre-service Music Teachers Embracing ICT to Foster Student-centered Learning. *Procedia - Social and Behavioral Sciences*, *73*. https://doi.org/10.1016/j.sbspro.2013.02.047.

Fitri, Y., & Putro, N. H. P. S. (2021). EFL Teachers' Perception of the Effectiveness of ICT-ELT Integration During the COVID-19 Pandemic. *Proceedings of the International Conference on Educational Sciences and Teacher Profession (ICETeP 2020)*, *532*(532), 502–508. https://doi.org/10.2991/assehr.k.210227.086.

Garzón-Artacho, E., Sola-Martínez, T., Romero-Rodríguez, J.-M., & Gómez-García, G. (2021). Teachers' perceptions of digital competence at the lifelong learning stage. *Heliyon*, *7*(7), e07513. https://doi.org/10.1016/j.heliyon.2021.e07513.

Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J. J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behavior*, *68*, 441–449. https://doi.org/10.1016/j.chb.2016.11.057.

Grigoropoulos, J. E. (2019). The Role of Ethics in 21st Century Organization. *International Journal of Progressive Education*, *15*(2), 167–175. https://doi.org/10.29329/ijpe.2019.189.12.

Gürsoy, G. (2021). Digital storytelling: Developing 21st century skills in science education. *European Journal of Educational Research*, *10*(1), 97–113. https://doi.org/10.12973/EU-JER.10.1.97.

Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers and Education*, *118*(November 2017), 107–119. https://doi.org/10.1016/j.compedu.2017.11.011.

Hennessy, S., Harrison, D., & Wamakote, L. (2010). Teacher factors influencing classroom use of ICT in Sub-Saharan Africa. *Itupale Online Journal of African Studies*, *2*.

Huang, F., Sánchez-Prieto, J. C., Teo, T., García-Peñalvo, F. J., Olmos-Migueláñez, S., & Zhao, C. (2021). A cross-cultural study on the influence of cultural values and teacher beliefs on university teachers' information and communications technology acceptance. *Educational Technology Research and Development*, *69*(2), 1271–1297. https://doi.org/10.1007/s11423-021-09941-2.

Konstantinidou, E., & Scherer, R. (2022). Teaching with technology: A large-scale, international, and multilevel study of the roles of teacher and school characteristics. *Computers & Education*, *179*, 104424. https://doi.org/10.1016/j.compedu.2021.104424.

Kristinawati, E., Susilo, H., & Gofur, A. (2018). ICT Based-Problem Based Learning on Students' Cognitive Learning Outcomes. *Jurnal Pendidikan Sains*, *6*(2), 38–42. https://doi.org/10.17977/jps.v6i2.11683.

Lange, S., Pohl, J., & Santarius, T. (2020). Digitalization and energy consumption. Does ICT reduce energy demand? *Ecological Economics*, *176*. https://doi.org/10.1016/j.ecolecon.2020.106760.

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, *55*(1), 79–105. https://doi.org/10.1080/09523987.2018.1439712.

Li, B. (2021). Ready for Online? Exploring EFL Teachers' ICT Acceptance and ICT Literacy During COVID-19 in Mainland China. *Journal of Educational Computing Research*, 073563312110289. https://doi.org/10.1177/07356331211028934.

Lukman, L., Lian, B., & Sari, A. P. (2020). The Influence of Principal's Leadership and Work Motivation toward Teacher's Performance. *International Journal of Progressive Sciences …*, *22*, 378. https://doi.org/10.52155/ijpsat.v22.1.2087.

Lynch, M., Sage, T., Hitchcock, L. I., & Sage, M. (2021). A heutagogical approach for the assessment of Internet Communication Technology (ICT) assignments in higher education. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00290-x.

Magen-Nagar, & Firstater, E. (2019). The obstacles to ICT implementation in the kindergarten environment: Kindergarten teachers' beliefs. *Journal of Research in Childhood Education*, *33*(2), 165–179. https://doi.org/10.1080/02568543.2019.1577769.

Mardiana, H. (2020). Lecturers' Adaptability To Technological Change And Its Impact On The Teaching Process. *JPI*, *9*(2). https://doi.org/10.23887/jpi-undiksha.v9i2.24595.

Mohd Zain, N., Mohd Fadil, N. F., & Abdul Hadi, A. (2018). Learning Management System: An Experience and Perception Study from Medical Imaging Lecturers and Scholars in a Private University. *International Journal of Interactive Mobile Technologies (IJIM)*, *12*(7), 174. https://doi.org/10.3991/ijim.v12i7.9638.

Molly, B., Tanaamah, A. R., & Sitokdana, M. N. N. (2017). Analisis Kinerja Sistem Informasi dan Teknologi Informasi untuk Menunjang Kinerja Karyawan Menggunakan Framework IT Balanced Scorecard (Studi Kasus pada Wi-Fi Universitas Kristen Satya Wacana). *Jurnal Teknologi Informasi Dan Ilmu Komputer*, *4*(4). https://doi.org/10.25126/jtiik.201744499.

Nguyen, C. P., & Doytch, N. (2021). The impact of ICT patents on economic growth: An international evidence. *Telecommunications Policy*. https://doi.org/10.1016/j.telpol.2021.102291.

Park, H., Kim, H. S., & Park, H. W. (2020). A Scientometric Study of Digital Literacy, ICT Literacy, Information Literacy, and Media Literacy. *Journal of Data and Information Science*. https://doi.org/10.2478/jdis-2021-0001.

Putrawangsa, S., & Hasanah, U. (2018). Integrasi Teknologi Digital Dalam Pembelajaran Di Era Industri 4.0. *Jurnal Tatsqif*, *16*(1), 42–54. https://doi.org/10.20414/jtq.v16i1.203.

Rahmayanti, R. (2015). Penggunaan Media IT Dalam Pembelajaran. *CIRCUIT: Jurnal Ilmiah Pendidikan Teknik Elektro*, *1*(1), 85–97. https://doi.org/10.22373/crc.v1i1.313.

Razak, N. A., Alakrash, H., & Sahboun, Y. (2018). English language teachers' readiness for the application of technology towards fourth industrial revolution demands. *Asia-Pacific Journal of Information Technology and Multimedia*, *7*(2). https://doi.org/10.17576/apjitm-2018-0702(02)-08.

Sadikin, A., & Hamidah, A. (2020). Pembelajaran Daring di Tengah Wabah Covid-19. *Jurnal Ilmiah Pendidikan Biologi*, *6*(02), 214–224. https://doi.org/10.22437/bio.v6i2.9759.

Sari, H. I. (2016). Errors In Using English As Classroom Language Committed By The ICT Teacher of SMP Negeri 2 Semarang. *EduLite: Journal of English Education, Literature and Culture*, *I*(1), 41–56. https://doi.org/10.30659/e.1.1.41-56.

Sari, S. (2019). Literasi Media Pada Generasi Milenial Di Era Digital. *Jurnal Komunikasi Dan Administrasi Publik*, *6*(2). https://doi.org/10.37676/professional.v6i2.943.

Sert, N., & Boynueğri, E. (2017). Digital technology use by the students and english teachers and self-directed language learning. *World Journal on Educational Technology: Current Issues*, *9*(1), 24. https://doi.org/10.18844/wjet.v9i1.993.

Sharma, L., & Srivastava, M. (2020). Teachers' motivation to adopt technology in higher education. *Journal of Applied Research in Higher Education, 12*(4), 673–692. https://doi.org/10.1108/JARHE-07-2018-0156.

Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. *British Journal of Educational Technology*, *50*(3), 1189–1209. https://doi.org/10.1111/bjet.12748.

Widagdo, B. W., Handayani, M., & Suharto, D. A. (2020). Dampak Pandemi Covid-19 terhadsap Perilaku Peserta Didik pada Proses Pembelajaran Daring Menggunakan Metode Pengukuran Skala Likert (Studi Kasus di Kabupaten Tangerang Selatan). *Jurnal Teknologi Informasi ESIT*, *63*(2), 63–70. https://doi.org/10.31599/jki.v1i1.265.

Yin, R. K. (2016). *Qualitative research from start to finish (2nd ed.)*. The Guilford Press.

Zafar, M. W., Zaidi, S. A. H., Mansoor, S., Sinha, A., & Qin, Q. (2022). ICT and education as determinants of environmental quality: The role of financial development in selected Asian countries. *Technological Forecasting and Social Change, 177*. https://doi.org/10.1016/j.techfore.2022.121547.

Zulfiani, Suwarna, I. P., & Sumantri, M. F. (2020). Science adaptive assessment tool: Kolb's learning style profile and student's higher order thinking skill level. *Jurnal Pendidikan IPA Indonesia*, *9*(2), 194–207. https://doi.org/10.15294/jpii.v9i2.23840.