

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



## Chapter

# Improving Higher Education Instructional Delivery in the Developing World: The Role of University Teachers as Digital Leaders

*Inusah Salifu and Eugene Owusu-Acheampong*

## Abstract

The last couple of years have seen an increasing demand on university teachers, especially in the developing world, to apply innovations to their instructional delivery to meet students' needs and cater to national aspirations. To succeed in this, a digital leadership initiative that ensures effective use of technology-mediated instruction is indispensable. This study used the context of Ghana to examine the kinds of digital technology tools university teachers in the developing world often used in their teaching as digital leaders and whether the tools were effective in promoting academic work. The study used the embedded mixed method design based on which 252 teachers of the country's universities were accidentally selected to complete questionnaires. Data were analysed using descriptive and inferential statistics. The study mainly found laptops, mobile phones, and projectors as the commonest digital technology tools used in teaching by the participants, and they thought that the tools effectively promoted academic work. The findings have global implications because knowing the effectiveness of digital technology use in higher education teaching in Ghana could serve as a source of information on measures to mitigate the impact of the Covid-19 pandemic on the academic work of HEIs in developing countries.

**Keywords:** digital leadership, developing world, Ghana, higher education, technology-mediated instruction, university teachers

## 1. Introduction

In today's world, rapid technology advancement and globalization seem to significantly influence the creation of a new knowledge-based economy. In other words, technology appears to be the critical factor in this knowledge-based economy for many nations across the globe [1, 2]. Most governments in the world, especially those in developing countries, have recognized that advancement in technology has an immense influence on the socio-economic development of their citizenry. Based on this development, some governments have invested heavily in technology developments to build the human resource base to address and conveniently cope with the demands and pressure of the current information and digital age [3, 4].

The concept “digital technology tools” was used since the post-World War II period in the United States of America to allow the integration of equipment such as audiotapes, television, and slide projectors in teaching [5, 6]. In our contemporary society, digital technology tools include computer-related hardware and software integrated into teaching and learning [7]. In this research, the use of digital technology tools refers to all electronic devices used in instructional delivery.

Digital technology has long been identified as a means to bridging the gap between access to higher education and improvements in learning outcomes, and university teachers have been recognized to play a leading role in the use of digital technology tools [8]. Many arguments posited for digital technology integration indicate that technology makes teaching and learning effective [9]. Trinidad et al. [10] explained teaching and learning effectiveness as “the degree to which a teaching tool contributes to students’ retention of learning or skills...Effectiveness is measured through students’ grades, acquired skills, transfer of knowledge, or retention of ideas” (p. 162).

In Ghana, the initiative to use digital technology devices to improve access, equity, and quality in education delivery was taken only a couple of years ago. In 2003, the country formulated a policy called Ghana ICT in Education Policy. The main aim of the policy was to integrate technology into education to promote teaching and learning, especially in the higher education sector. At the time, the policy framework recognized the essential role of technology in creating an opportunity for teachers to enhance their instructional delivery [11]. Although the policy document was timely because it served as a platform for the promotion of a systematic technology-driven education [12], our engagement with the literature revealed that there was a paucity of information as to whether teachers in the country, especially those teaching at the university level, saw themselves as digital leaders whose critical role was to promote the use of digital technology in teaching. Consequently, there appeared to be a knowledge gap as to the nature of digital technology tools used in instructional delivery at the university level in Ghana, and whether the tools effectively promoted teaching and learning.

The aim of the research was to use the context of Ghana to examine the extent to which university teachers in the developing world effectively used their digital leadership role to promote the use of digital technology in instructional delivery. Specifically, the research was to examine the kinds of digital technology tools university teachers in Ghana often used in their teaching. It was also to find out whether the tools were effective in promoting teaching and learning. Based on the objectives, we posed questions as follows:

1. What kinds of digital technology tools do university teachers in Ghana often apply in their instructional delivery as digital leaders?
2. How effective are digital technology tools in promoting academic work in Ghanaian universities?

The research was compelling because earlier studies by Boakye and Banini [13] and Mercader [14] claimed that despite the increasing number of research on digital technology integration in teaching, the concentration had been on the Western world, and little was known about the extent of the use of digital technology in the education system of the developing world.

Thus far, the Section 1 of this chapter has given the background, problem, objectives, and questions guiding the research. Next will be a review of the literature on the theoretical framework and the global use of digital technology tools in higher education. To be followed is the Section 4 detailing the processes involved in conducting the research. The findings and discussion will also be presented

subsequently. The chapter will conclude by highlighting the implications of the research for global higher education, especially in the developing world.

## **2. Higher education teaching in the Ghanaian context**

Ghana has 180 higher education institutions (HEIs) out of which there are 99 public and 81 private universities [15]. Most of the public universities operate the collegiate system. According to NCTE, about 70% of students in the universities enroll to acquire a bachelor's degree, while about 22% pursue diploma programs mostly by the distance education mode. The enrolment in graduate programs (masters' and doctoral degrees) is, however, minimal, according to the NCTE.

Recruitment of teachers in Ghana's HEIs is mainly based on the acquisition of a terminal degree (usually a Ph.D.) and a satisfactory publication record. Recruited teachers serve on a contract basis, usually 6 years with the opportunity for renewal. The promotion criteria for teachers vary from university to university. However, for promotion purposes, the universities commonly emphasize teaching, research, scholarly work (publications), and community service. After recruitment, university teachers in Ghana normally begin as Lecturers and may rise to Senior Lecturer, Associate Professor up to Professor. With regard to reporting lines, teachers and students are directly managed by Heads of Departments (HODs). The HOD's are also supervised by Deans who manage Schools or Faculties. The Deans also report Provosts of Colleges in the collegiate system or directly to Pro Vice-Chancellors who also reports to Vice-Chancellors. The Vice-Chancellors are ultimately answerable to University Councils.

## **3. Review of the literature**

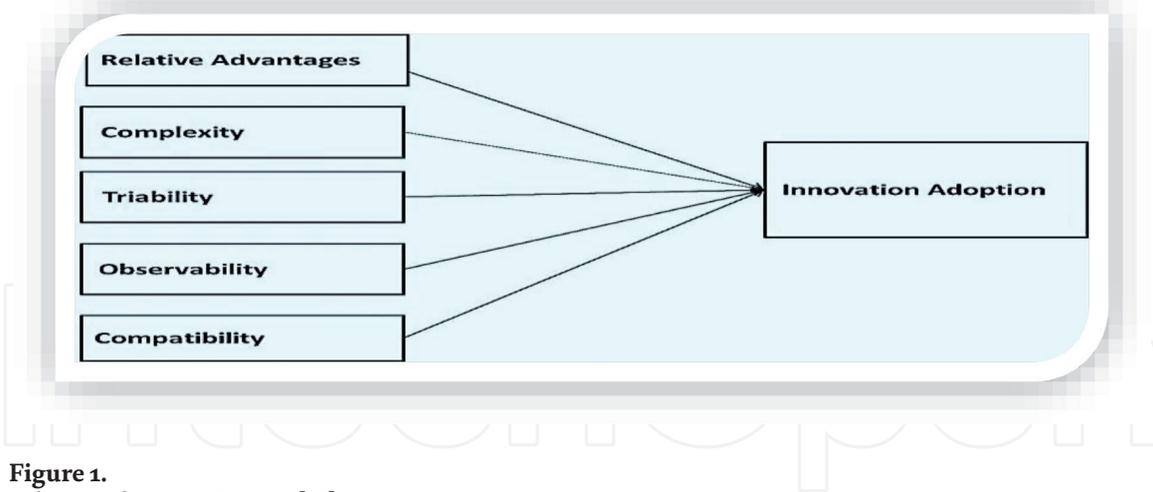
### **3.1 Theoretical framework: Roger's diffusion of innovation (DoN) theory**

Roger's [16] innovation-decision activities vividly define a framework on how people choose to accept or reject a particular technology. The four key ingredients in the framework depicted in **Figure 1** concern innovation, communication, the context of the social system, and time. The four key components interrelate to describe how a person's adoption represents diffusion. Beyond these components, Casmar [17] identified five critical characteristics of adoption decisions. These include the relative merits associated with the adoption of the technology (relative advantage), the complex nature of the technology (complexity), ability to access and try the technology (triability), the availability and visibility of the technology (observability), and compatibility [18].

### **3.2 Digital technology tools used in higher education teaching context around the globe**

Chevers and Whyte [19], Shelton [20], and Tondeur et al. [21] argued that the most frequently applied technology in teaching and learning are projectors and laptops/computers for presentation. According to Farmery [22], most instructors integrate blogs, wikis, and podcasts in teaching and learning. Amory [23], Bagheri et al. [24], Bates and Sangra [25], and Cheung and Slavin [26] also reported that instructional technologies would modify how learners and instructors collect and gather information and collaborate.

Makewa et al.'s [27] study on instructor's competence in integrating digital technologies into teaching and learning found that majority of the study participants



**Figure 1.**  
*Adoption decisions. Source: [16].*

disagreed with being knowledgeable in applying online technology tools such as the podcast, wikis, and blogs. Besides, Montrieux et al.'s [28] qualitative study revealed that mobile tools such as mobile quizzes, blogs, and podcasts were famous for their integration in classroom teaching and learning. However, lecturers tended to be more confident and knowledgeable in using projectors. Other researchers such as Makewa et al. [27], Shelton [20], and Farmery [22] also found projectors and computers as the most frequently used technology tools in teaching. For their part, Alkash and Al-Dersi [29], Rumble and Harry [30], and Rashid and Elahi [31] found that technology-related resources such as the Internet, e-mobile, and computers facilitate distance learning.

In another related research, Alqurashi [32] found that there was a statistically significant relationship between familiarity and proficiency in using digital technologies and integrating them in teaching. Kumar and Daniel's [33] comparative study on the technology integration into instructional delivery at Fijian further established that 36.67% of the studied population indicated they were knowledgeable and skillful in incorporating digital technologies in teaching. In Fleischer's [34] view, integrating digital technology tools in teaching enhances students' creativity and inspires them to explore and learn new things independently. Fleischer's study found that teachers and students used laptops for academic work for long hours.

### 3.3 Institutional challenges in the use of digital technology in teaching

According to Bozkurt [35], the breakdown of technology devices and inadequate wireless services, limited time for integration in lessons, unreliable Internet speed, the lack of computers, and inadequate accessibility to technology tools for effective integration are some institutional factors affecting digital technology integration in teaching and learning.

Chertovskikh's [36] research also identified the following as barriers to technology integration: insufficient digital learning resources, insufficient pedagogical support, the lack of institutional policies for technology integration, insufficient technology equipment, poor connectivity, and insufficient technical support. In similar research, Adedokun-Shittu and Shittu [37] also found technical problems and constraints such as power failure, Internet interruption, and inadequate training for instructors as some of the critical challenges confronting technology integration in teaching and learning. Furthermore, Bagheri et al.'s [24] research rather found the challenges to include inadequate human resource capacity, low bandwidth for Internet connectivity, and poor penetration of technology in higher institutions.

### 3.4 Summarizing the literature and locating the gaps

Thus far, the literature reviewed highlighted the fact that there was scholarly information on various digital technology tools integrated into teaching in higher education institutions. It also revealed the fact that there were challenges confronting digital leaders in using the technologies in teaching. Conspicuously missing, however, was information on which of the digital technology tools were commonly used in the developing world, and whether or not they effectively promoted academic work. This was the gap this research intended to fill.

## 4. Methods

### 4.1 Research design and sample

The study used the embedded/nested mixed-method design to concurrently collect both quantitative and qualitative data. However, the latter played a complementary role in supporting the former [38]. The choice of the design enabled us to give a holistic picture and broader perspective of the extent to which university teachers in the developing world effectively used their digital leadership role to promote the use of digital technology in instructional delivery. The study used the accidental sampling technique to select 252 university teachers across Ghana. The sample size was considered appropriate based on Krejcie and Morgan's [39] standard criteria for determining sample size. **Table 1** presents details of the demographic characteristics of the sample.

### 4.2 Research instrument

A self-developed questionnaire was used for the research. The instrument had three sections. The first section ("A") was on the demographic background of respondents. The second section ("B") dealt with kinds of digital technology tools university teachers often applied in their instructional delivery. The third and final section ("C") also elicited responses on the effectiveness of the tools in promoting academic work. Although the instrument was mainly structured, the second and third sections gave respondents an opportunity to express their own qualitative opinions not captured in the structured items. The design of the items in the two sections was informed by the authoritative views expressed in the extant literature gleaned for this research. The items were put on a five-point Likert scale in both sections as follows: Section "B": (1) never used; (2) rarely used; (3) occasionally used; (4) frequently used; and (5) more frequently used. Section "C": (1) strongly disagree; (2) Disagree; (3) Unsure; (4) Agree; and (5) Strongly agree. Prior to using the instrument, a face validity test was conducted on it to ascertain the extent to which the items in the second and third sections met the objective of the research and the findings proved positive. Again, the instrument was piloted among accidentally selected 63 (i.e., a quarter of the sample size) university teachers in Ghana who were not part of the sample. A Cronbach's alpha test yielded a reliability coefficient of 0.81 making the instrument undoubtedly reliable for use in the research.

### 4.3 Data collection and analysis

The data collection exercise was done using the self-constructed questionnaire and took a period of 102 days to complete. As explained already, the accidental technique was used, and it allowed the distribution of the instrument among university

Variable	No.	%
Gender		
Male	97	38.49
Female	155	61.50
Total	252	100.0
Age		
30–39	74	5.95
40–49	113	28.17
50–59	65	25.79
Total	252	100.0
University teaching experience		
1–5 years	121	48.02
6–10 years	88	34.92
11 years+	43	17.06
Total	252	100.0

*Source: Fieldwork (2021).*

**Table 1.**  
*Demographic characteristics of participants.*

teachers on the basis of availability and willingness to participate. Using the SPSS version 21, preliminary analyses were done by organizing the data according to the five-point Likert scale and subjecting them to frequency and percentage analyses. The same data were subsequently converted into means and standard deviations. The qualitative data were grouped into common themes to be analyzed using descriptive statistics. However, because the themes generated did not yield new issues remarkably different from the main items already captured in the questionnaire, the intention was shelved.

#### **4.4 Ethics**

A written consent was obtained from the participants before their involvement in the study. To ensure confidentiality and to check that the rights of the participants are not disregarded and abused, ethical clearance with reference number ECH 101/19-20 was obtained from one of the universities' ethics committees for the humanities. Besides, participation in the research process was voluntary, and participants could withdraw at any point in the research process. Participants' identities were also concealed.

### **5. Findings**

This section presents analyses of the field data obtained from our investigation on the extent to which university teachers in a developing country like Ghana effectively used their digital leadership role to promote the use of digital technology in instructional delivery. The presentation in this section is based on only the quantitative aspect of the embedded/nested mixed-method design because, as indicated in Section 4 (see Subsection 4.3), the qualitative data did not yield new issues remarkably different from the main quantitative data.

The first research question asks: What kinds of digital technology tools do university teachers in Ghana often apply in their instructional delivery as digital leaders?

**Table 2** presents the means (*M*) and standard deviations (*SD*) of the various digital technology tools used for teaching in Ghanaian universities. It further shows the frequency (in mean rank) of their usage for instructional delivery. Looking at the measure of central tendencies on the table, an examination of only the extreme measures of the means (i.e., variable with the highest mean and the variable with the lowest mean) shows that the participants' responses for the variable "laptops" has the highest mean score ( $m = 4.28$ ) indicating a skew toward the agreement scale, responses for the variable "digital speakers" has the lowest mean score ( $m = 1.52$ ) indicating a skew toward the disapproval scale. By implication, whereas laptops were the most frequently used digital technology tool by the participants, digital speakers were the least used by them.

Having examined the measure of central tendencies on the table, it is equally important to also consider the measure of dispersion. From the table, two extreme measures of standard deviations (i.e., the most dispersed variable from its mean and the least dispersed variable from its mean) show that whereas responses for the variable "Television sets" are the farthest apart and most dispersed ( $SD = 1.63$ ). On the opposite, responses for the variable "Digital cameras" are the closest and least dispersed ( $SD = 1.08$ ).

The second research question also asks: How effective are digital technology tools in promoting academic work in Ghanaian universities?

**Table 3** shows respondents' opinions regarding the effectiveness of digital technology tools in promoting teaching and learning in Ghanaian universities. For the measure of central tendencies, an examination of only the extreme measures of the means gives the impression that while the responses for the variable contending that digital technology tools allowed students to easily retain and recollect learning concepts have the highest mean score ( $m = 4.51$ ) indicating a skew toward the strong agreement scale, responses for the variable claiming that digital technology tools made it easy to attract students' attention has the lowest mean score ( $m = 2.20$ ) manifesting a skew toward the disagreement scale.

In the case of the measure of dispersion, a perusal of the table also reveals two extreme measures of standard deviations showing that responses for the variable on the assertion that digital technology tools enhanced the learning experience of

Digital technology tools	<i>N</i>	<i>M</i>	<i>SD</i>	Mean rank
Laptops	252	4.28	1.32	1
Mobile phones	252	3.94	1.42	2
Projectors	252	3.75	1.27	3
Desktop computers	252	3.03	1.48	4
Television sets	252	2.99	1.63	5
IPads	252	2.10	1.57	6
Smartboard	252	1.81	1.19	8
Digital cameras	252	1.61	1.08	7
Digital speakers	252	1.52	1.11	9

Source: Fieldwork (2021).

**Table 2.**  
*Kinds digital technology tools frequently used by Ghanaian universities.*

Digital technology tools...	M	SD
Allows students to easily retain and recollect learning concepts	4.51	0.88
Allows students to access information at any time and place	4.27	0.89
Motivates and sustains students' interest in teaching	3.68	1.22
Allows easy transfer of knowledge by students	3.67	0.97
Helps students to explore opportunities for further learning	3.51	1.06
Enhance the learning experience of students	3.42	1.51
Leads to better acquisition of skills by students	3.23	1.40
Enable students to obtain desirable findings	3.12	1.39
Helps students to learn independently	2.36	1.07
Makes it easy to attract students' attention	2.20	1.30

Source: Fieldwork (2021).

**Table 3.**  
*Effectiveness of digital technology tools in promoting instructional delivery.*

students are the farthest apart and most dispersed (SD = 1.51). On the contrary, responses for the variable on the view that digital technology tools enabled students to easily retain and recollect learning concepts are the closest and least dispersed (SD = 0.88).

## 6. Discussion

The study found high average usage for laptops, mobile, and phones as the usually used educational technology for teaching by the participants in playing their roles as digital leaders. The study, however, revealed the speaker as the least used educational technology device by the teachers. The findings further show that although most of the participants used digital technology tools, only a few effectively applied the tools in their instructional delivery. This result is interesting, given that a burgeoning body of the literature such as Amory [23], Bagheri et al. [24], Bates and Sangra [25], and Cheung and Slavin [26] found their integration into instructional delivery of most higher education institutions in the world. These digital technology tools are common, easy to operate, accessible, and have numerous advantages [40]. These merits perhaps account for the reason most teachers would want to use them to teach. Alkash and Al-Dersi [29] and Chevers and Whyte [19] believed that these tools make teaching lively, less stressful, and flexible.

Another possible explanation could be that most of the university teachers owned laptops and mobile phones and used them for various social activities. Research has shown that most university teachers believe that the use of these technology tools enhances teaching and fosters collaboration between students and faculty members. For instance, Tondeur et al. [21] pointed out that educational technology integration in the instructional process has become common because technology has assumed a pivotal role in enhancing teaching and learning. It is therefore not surprising that the participants deployed the digital devices to teach. It is also believed that most students have laptops and mobile phones; therefore, the participants would naturally find it ideal to share information and educational resources with the students [5].

Again, the use of the digital tools in teaching by the participants as digital leaders appears to give credence to the finding that digital technology tools increase

teachers' ability to speedily search for information [2, 7] and library databases [1]. By implication, the findings mean that if university teachers in the developing world are assisted with technology devices, it would boost their morale and encourage them to integrate educational technology into teaching [41]. It would also enhance the quality of their instructional delivery and impact positively on students' learning outcomes.

Comparing the findings of this research with previous studies reveals some consistencies. For example, the findings appear to confirm a key finding of Bozalek et al. [1] who revealed that educational technology devices are used in teaching in higher institutions in South Africa. Furthermore, Sife et al. [6] found that in Tanzania, higher institutions faculty members use educational technology for many educational purposes. The findings also corroborate Jackson and Chapman's [4] research who reported that most lecturers were proficient in using PowerPoint and Word applications for teaching.

Arguing from the perspective of Roger's [42] diffusion of innovation theory, which anchors this research, one would reason that if digital technology tools are not easy to use, not accessible, and do not offer relative advantages to university teachers in the developing world, they might decline their usage in teaching. It appears obvious that university teachers in Ghana, like all other teachers in the higher education sector in the developing world, may have positive attitudes toward the usage of digital technology tools in teaching but they need support to procure them.

## **7. Conclusion and recommendations**

This study aimed to use the context of Ghana to examine the kinds of digital technology tools university teachers in the developing world often used in their teaching as digital leaders, and whether the tools were effective in promoting academic work. The study mainly found laptops, mobile phones, and projectors as the commonest digital technology tools used in teaching by the participants, and they thought that the tools effectively promoted academic work.

The study has two major limitations. First, the accidental technique used to recruit participants from Ghanaian universities does not allow the findings to generalize beyond the present sample. Second, because the study used the cross-sectional survey design, it cannot offer causal interpretations. Based on the limitations, we recommend that future research should compare the experiences of university teachers playing digital leadership roles in different geographical contexts across several developing countries. Because the research found that digital technology tools were effective in promoting academic work, we wish to also suggest that universities in Ghana should provide allowances to teachers to assist them to procure digital technology tools needed for teaching.

Despite the limitations, substantially, the findings are original because, to the best of our knowledge, there has not been previous research that has focused on the same issue on HEIs in the developing world. The study is also novel because of its use of the Diffusion of Innovation (DoI) theory to discuss pertinent issues about digital technology use in higher education. Most importantly, because developing countries arguably have similar characteristics, the findings may apply favorably with other developing countries.

Again, the findings may have global implications because knowing the effectiveness of the use of digital technology in higher education teaching in Ghana as a developing country could serve as a source of information on measures HEIs in developing countries have put in place to deal with the negative impact of the Covid-19 pandemic on academic work. Finally, research also contributes to existing

knowledge about how HEIs in the developing are using digital leadership to address the issue of large class size teaching bedeviling most universities.

### **Acknowledgements**

The authors acknowledge the immense contributions of colleagues who read through the manuscript and provided the needed feedback to improve the quality of the paper.

### **Funding**

The authors received no financial support for the research, authorship, and/or publication of this article.

### **Conflicts of interest**

There are no potential conflicts of interest/competing interests with respect to the research, authorship, and/or publication of this article.

### **Consent to publish**

The authors consent to the publication of the manuscript titled above in the journal "Australian Education Researcher."

### **Availability of data and material**

All data generated or analyzed during this research are included in this manuscript (and its supplementary file).

# IntechOpen

## Author details

Inusah Salifu<sup>1\*</sup> and Eugene Owusu-Acheampong<sup>2</sup>

1 Department of Adult Education and Human Resource Studies, School of Continuing and Distance Education, College of Education, University of Ghana, Legon, Ghana

2 Department of Secretaryship and Management Studies, Cape Coast Technical University, Cape Coast, Ghana

\*Address all correspondence to: [isalifu@ug.edu.gh](mailto:isalifu@ug.edu.gh); [insalifu1@yahoo.co.uk](mailto:insalifu1@yahoo.co.uk)

## IntechOpen

---

© 2021 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

## References

- [1] Bozalek V, Ng'ambi D, Gachago D. Transforming teaching with emerging technologies: Implications for higher education institutions. *South African Journal of Higher Education*. 2013; 27(2):419-436
- [2] Latchem C. *Using ICTs and Blended Learning in Transforming Technical and Vocational Education and Training*. Paris, UNESCO Publishing; 2017
- [3] Boden R, Nedeva M. Employing discourse: Universities and graduate 'employability'. *Journal of Education Policy*. 2010;25(1):37-54
- [4] Jackson D, Chapman E. Non-technical skill gaps in Australian business graduates. *Education and Training*. 2012;54(2/3):95-113
- [5] Delgado, A. J., Wardlow, L., McKnight, K., and O'Malley, K. (2015). Digital technology: A review of the integration, resources, and effectiveness of technology in K-12 classrooms. *Journal of Information Technology Education*, 14:397-416.
- [6] Sife A, Lwoga E, Sanga C. New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. *International Journal of Education and Development using ICT*. 2007;3(2): 57-67
- [7] Kachalov N, Velsh A, Antonova Z, Konyshva A, Proshaeva N. Application of modern digital technologies at the research university. *Procedia-Social and Behavioral Sciences*. 2015;206:225-231
- [8] Dzobelova VB, Yablochnikov SL, Cherkasova OV, Gerasimov SV. Digital educational technology in a higher education institution. In: "New Silk Road: Business Cooperation and Prospective of Economic Development" (NSRBCPED 2019). Amsterdam, Atlantis Press; 2020. pp. 153-156
- [9] Quaye, F., Ametepe, W., and Annan, N. K. (2015). The impact of ICT on teaching and learning in tertiary institutions: A case study of Wisconsin International University College, Ghana. *Journal of Information Engineering and Applications*, 5(5), 8-14.
- [10] Trinidad JS, Ngo GR, Nevada AM, Morales JA. Engaging and/or effective? Students' evaluation of pedagogical practices in higher education. *College Teaching*. 2020;68(4):161-171. DOI: 10.1080/87567555.2020.1769017
- [11] Addy NA, Ofori-Boateng P. ICT and education: An analysis into Ghana's universities. *International Journal of ICT and Management*. 2015;3(2):23-28
- [12] Natia J, Al-hassan S. Promoting teaching and learning in Ghanaian basic schools through ICT. *International Journal of Education and Development using ICT*. 2015;11(2):113-125
- [13] Boakye KB, Banini DA. 11. Teacher ICT Readiness in Ghana. In: *ICT and Changing Mindsets in Education/ Repenser l'éducation à l'aide des TIC*. 2008. p. 147
- [14] Mercader C. Explanatory model of barriers to integration of digital technologies in higher education institutions. *Education and Information Technologies*. 2020;25:5133-5147
- [15] National Council for Tertiary Education. *Statistical report on tertiary education for 2016/2017 academic year*. Accra, Ghana. 2018
- [16] Rogers EM. Diffusion of innovations: Modifications of a model for telecommunications. In: *Die diffusion von innovationen in der*

telekommunikation. Berlin, Heidelberg: Springer; 1995. pp. 25-38

[17] Casmar SP. The adoption of computer technology by faculty in a college of education: An analysis of administrative planning issues [doctoral dissertation]. Washington State University; 2001 [ProQuest Digital Dissertations (UMI No. AAT 3025011)]

[18] Surendra S. Acceptance of Web Technology-Based Education by Professors and Administrators of a College of Applied Arts and Technology in Ontario. Toronto, Canada: University of Toronto; 2001. pp. 1-164

[19] Chevers DA, Whyte CC. Gender difference in the knowledge and adoption of digital technology by faculty: The case of a Business School in Jamaica. In: CONF-IRM 2015 Proceedings. 2015. p. 23

[20] Shelton C. Giving up technology and social media: Why university lecturers stop using technology in teaching. *Technology, Pedagogy and Education*. 2017;**26**(3):303-321

[21] Tondeur, J., van Braak, J., Siddiq, F., and Scherer, R. (2016). Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. *Computers and Education*, 94 134-150

[22] Farmery R. The integration and use of ICT across the secondary school [doctoral dissertation]. Cardiff University; 2014

[23] Amory A. Tool-mediated authentic learning in a digital technology course: A designed-based innovation. *Interactive Learning Environments*. 2014;**22**(4):497-513

[24] Bagheri M, Ali WZW, Abdullah MCB, Daud SM. Effects of project-based learning strategy on self-directed learning skills of digital

technology students. *Contemporary Educational Technology*. 2013;**4**(1):15-29

[25] Bates AT, Sangra A. *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning*. New Jersey, John Wiley and Sons; 2011

[26] Cheung AC, Slavin RE. How features of digital technology applications affect student reading outcomes: A meta-analysis. *Educational Research Review*. 2012;**7**(3):198-215.

[27] Makewa LN, Kuboja JM, Yango M, Ngussa BM. ICT-integration in higher education and student behavioral change: Observations at University of Arusha, Tanzania. *American Journal of Educational Research*. 2014;**11**: 30-38

[28] Montrieux H, Vanderlinde R, Schellens T, De Marez L. Teaching and learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PLoS One*. 2015;**10**(12):e0144008

[29] Alkash KAM, Al-Dersi ZEM. Advantages of using PowerPoint presentation in EFL classroom & the status of its use in Sebha University. *International Journal of English Language and Translation Studies*. 2017;**1**:3-16

[30] Rumble G, Harry K. *The Distance Teaching Universities*. Oxford, Routledge; 2018

[31] Rashid M, Elahi U. Use of digital technology in promoting distance education. *Turkish Online Journal of Distance Education*. 2012;**13**(1):79-86

[32] Alqurashi E. Technology tools for teaching and learning in real time. In: *Educational Technology and Resources for Synchronous Learning in Higher*

Education. Pennsylvania, IGI Global; 2019. pp. 255-278

[33] Kumar S, Daniel BK. Integration of learning technologies into teaching within Fijian Polytechnic Institutions. *International Journal of Educational Technology in Higher Education*. 2016;**13**(1):36

[34] Fleischer H. What is our current understanding of one-to-one computer projects: A systematic narrative research review? *Educational Research Review*. 2012;**7**(2):107-122

[35] Bozkurt A. Educational technology research patterns in the realm of the digital knowledge age. *Journal of Interactive Media in Education*. 2020;**1**(18):1-17. DOI: <https://doi.org/10.5334/jime.570>

[36] Chertovskikh O. Prospects for integrating artificial intelligence and new digital technologies into tertiary education. 2020. Available from: SSRN 3746561

[37] Adedokun-Shittu NA, Shittu AJK. Evaluating the impact of technology integration in teaching and learning. *Malaysian Online Journal of Educational Technology*. 2014;**2**(1):23-29

[38] Creswell JW. *Research Design: Qualitative, Quantitative, and Evaluating Quantitative and Qualitative Research*. 3rd ed. Newcastle, Sage; 2009

[39] Krejcie RV, Morgan DW. Determining sample size for research activities. *Educational and Psychological Measurement*. 1970;**30**:607-610. DOI: 10.1177/001316447003000308

[40] Jordan LA, Papp R. Powerpoint: It's not "yes" or "no"—it's "when" and "how". *Research in Higher Education Journal*. 2014;**22**:1-11

[41] Allahawiah S, Tarawneh S. Factors affecting information and communication technology (ICT) use by southern college's teachers in Balqa Applied University. In: *Proceedings of the West East Institute International Academic Conference on Education, Humanities and Social Sciences*. 2015. pp. 138-145

[42] Rogers, E. M. (2003). *The Diffusion of Innovation*. 5th ed. New York: Free Press.