Information and Communication Technology application in pre-service teacher education programs in Vietnamese universities

Ngoc Hai Tran[1], Huong Manh Nguyen[2]*, Hong-Tham Thi Dinh[3], Thuy-An Thi Le[4], Bich-Loan Thi Do[5], Duc Minh Tran[6], Hieu Thi Ngo[7], Hung Van Bui[8]

1. Senior lecturer, Ha Tinh University, No 447, 26March St., Ha Tinh city, Vietnam; haingoc74@gmail.com, and ngoc.tranhai@htu.edu.vn; ORCID ID: https://orcid.org/0000-0003-3326-1365

2. Advanced Lecturer, Faculty of History, Ha Noi National University of Education, No 136, Xuan Thuy St., Ha Noi, Vietnam; E-mail of the corresponding author: Email: nmhuongsphn@gmail.com and nguyenmanhhuongdhpshn@gmail.com

3. Lecturer, Department of Quality Assurance, Thu Dau Mot University, No 06, Tran Van On St, Thu Dau Mot city, Binh Dương province, Vietnam; Email: thamdth@tdmu.edu.vn

4. Lecturer, Department of Education, Tay Nguyen University, No 567, Le Duan St., Buon Ma Thuot City, Vietnam; Email: lttan@ttn.edu.vn

5. Advanced reseacher, Vietnam National Institute of Educational Sciences, No 101, Tran Hung Dao St., Ha Noi, Vietnam; Email: bichloan1095@gmail.com

6. Lecturer, Ha Tinh University, No 447, 26March St., Ha Tinh city, Vietnam; Email: duc.tranminh@htu.edu.vn

7. Lecturer, Department of HR, Tay Nguyen University, No 567, Le Duan St., Buon Ma Thuot City, Vietnam; Email: hieunt@ttn.edu.vn

8. Department of Education, Vinh University, No 82, Le Duan St, Vinh city, Vietnam; Email: buivanhung.dhv.2020@gmail.com;

ABSTRACT

This study investigated how information and communication technologies are being applied in teacher education programs in three universities including Tay Nguyen University, Ha Tinh University and Vinh University in Vietnam. A questionnaire and faculty brochures were used to collect data from final year pre-service teachers in those institutions in Vietnam, which were purposefully selected. The findings revealed that the three higher education institutions are not exposing pre-service teachers to the culture of e-learning; pre-service teachers and educational technology teacher-educators do not engage in reciprocal intergenerational mentoring; document analysis revealed that educational technology courses does not contain adequate ICT-based contents and activities; and that education method courses do not involve the use of ICT-based tools for designing and creating ICT-based activities. Based on these findings, a number of recommendations were made to improve the ICT application in higher education institutions in Vietnam.

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Keywords*:*

ICT Application, Pre-Service Teachers, Inter-generational Mentoring, e-Learning, Vietnamese universities

Introduction

More recently, applying Information and Communication Technologies (ICTs) into the educational process has become a major thrust for most Higher Education Institutions (HEIs) offering teacher education programs. United Nations Educational Scientific and Cultural Organization (UNESCO, 2012) posits that ICT is the key to fundamental wide-range educational reforms in the 21st century. To

this end, teacher education faculties in higher education institutions are evolving from using traditional tools and techniques to the use of ICT-based tools/activities and pedagogies for teaching and learning. The 'Foreword' written for UNESCO (2012, p. 45) document proclaims that "teacher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change". The document provides clues on how to support ICTs integration intoeducation with many theoretical frameworks which include the use of on-site approaches to learning and development (Armstrong, 2019; Resta, 2017). These are challenges teachers have to overcome to enhance the international dimension of educational experiences, since researchers are advocating for the integration of ICTs into education. These advocacies are underpinned by the current re-definition of Educational Technology which emphasizes the use of appropriate technological processes and resources (Januszewski & Molenda, 2018).

Literature Review

Today, students are presumably more knowledgeable in the use of digital technologies than their teachers who are more knowledgeable in subject matter and in traditional pedagogical knowledge. Prensky (2011, p. 1) refers to these set of students as 'digital natives' and their predecessors as 'digital immigrants'; the teachers were not brought up using technology, but want to embrace it now, and hence must adapt. In addition, most conventional teachers are not familiar with technology pedagogy content knowledge model and patterns of adoption of ICT in teaching and learning for e-learning engagement; and as such cannot use ICT-base tools and activities, hence, are unable to engage in e-learning (Hooper & Rieber, 2016). These situations call for on-site and collaborative learning approaches to the use of ICT, using inter-generational mentoring strategies to balance the

inequalities between age groups (Armstrong, 2019; Miller, 2017; Olele & Williams, 2017). With situated learning engagement, pre-service teachers and teacher educators will experience workplace application of ICTs, with the focus on authentic contexts, tasks, and work related activities; but not without institutional support in terms of infrastructural facilities and ICT-based resources.

ICTs are considered basic requirement of the knowledge society for which universities now prepare their students (Burbles & Callister, 2010). The assumed roles of ICT in higher education institutions are evident in the current different directives and policies issued by the Communist Party of Vietnam, the Government and the Ministry of Education and Training (MOET) (Tran et al., 2020a, 2020b). These documents indicate that stakeholders in the field of education are beginning to share a common vision in respect to ICTs in teacher education. This move suggests that the focus now is on teacher education preparation in and through ICT, as strategies for internationalization of teaching and learning. The initiative is consistent with Schrum (2019) view which states that for effective integration of ICT in education, pre-service teachers need to be exposed to the theory and practice of educational technology courses, education method courses, at all levels through hands-on experiences that will eventually lead to the establishment of e-learning culture.

Jenkins and Hanson (2003) define e-learning as learning facilitated and supported through the utilization of ICTs. In another vain, e-learning is defined as "pedagogy empowered by digital technology" (Nichols, 2008, p. 125). Furthermore, Pollard and Hillage (Cited in Armstrong, 2019, p. 670) defines e-learning as "the delivery and administration of learning opportunities and support via computer, networked and web-based

technology to help individual performance and development". According to Rosenberg (2011); Armstrong (2019) and Vai and Sosulski (2011), the basic principle of e-learning are 'connectivity', 'interactivity', and 'collaboration'- connecting hardware to software, people to people as network, exploring content and communicate both locally and globally.

To boast e-learning, Mishra and Koehler (2016) and Koehler and Mishra (2018) came up with a framework on the types of integrated knowledge required for successful ICT integration into teaching and learning. Such knowledge integration occurs at three levels: Content knowledge, pedagogical knowledge, technological knowledge; and then, pedagogical content knowledge, technological pedagogical knowledge, technological content knowledge; and then technological pedagogical content knowledge. These three categories of knowledge portray the components of interactive learning system between domain-related content, content-related pedagogy, and the integration of technology.

Laitha (2015) pointed out that the springboard to e-learning culture is creating ICT-related activities using productivity tools, Internet tools by pre-service teachers and teacher-educators in education method courses to add value to teaching and learning. A good training technique is to take teachers through using a variety of different of media - printed workbook, audiotape or videotape that clearly demonstrate each procedure. Interactive tutorial software packages can teach how to use application programs. For teacher education, a library of tutorials might be useful resources for teachers who wish to update their skills quickly and effectively; learning everything they need from beginning to advance topics. These tutorial packages become handy in education general and specific method courses. The key issue in method courses is usage - using

application programs and communication tools. This implies having students produce documents and publish same in homegrown newsletters and web pages; Have students critique one another's work and have them collaborate on written assignment; have students submit assignment through e-mail attachment; have students make class presentations using PowerPoint slideshows adding pictures, photographs, sounds and animation; have student communicate with audio, video, graphics, as well as through plain text; have students produce reports using spreadsheets for record keeping and graphic calculations; have students look up information on world wide web. Going beyond the basics may imply switching from showing videos to students to having them produce videos, radio/Television programs. The best strategy for teacher-educator and pre- service teacher is probably to learn the rudiments of basic programs and use all the features available. This will gradually lead to expand use of ICTs for teaching. However, learning how to use information hardware and software may be daunting if one has assistance, someone who will show what to do, how to do it, and when to do it, then it is much easier and interesting hence in this case we can fall back to 'digital natives' working collaboratively with 'digital immigrants'. Using intergeneration mentoring techniques to gain competences and then create ICT- activities in education method courses in different subject areas. With these the challenges of e-learning may be minimal (Olele & Williams, 2017).

Anderson (2018) presents two dimension of e-learning - communication and content. The communication dimension of e-learning is presented in a continuum with three points of references - the first point involves least communication with others; teachers and students use the Internet to access information and other resources on the web (information repository). The second point involves enriched communication as in online courses (distance learning). The third

point is the richest form of communication (hybrid courses in form of blended learning, and networked communities). It occurs when teachers combine web andclassroom-based learning activities; and uses the Internet to communicate with peers and other professionals, to share intelligence from both local and international communities. Most students engage in the use of social networking services that connect people who share personal or professional interest. Pre-service teachers and teacher-educators could be encouraged to use these services beyond entertainment.

The content dimension of e-learning also has three points of reference. The first point presents content that are not organized for instruction: pre-service teachers and teacher educators can search the internet for all kinds of information. The second point is what is seen in online courses - Content is pre-structured and organized into lessons, courses or training programs. The third illustrates a situation where teachers and learners as co-learners create instructional materials, designing learning environments, and larger teaching-learning systems (Januszewski & Molenda, 2018).

Resta and Petru (2015) put the two dimensional models of e-learning together to get a single dimension, thus positioned the two categories of e-learning in two axes to get four categories of e-learning as: e-resources, online courses, blended learning and communities of practice. These four categories focus on using the Internet for communication, information retrieval, and information publishing; and for in-depth content coverage within the context of sound pedagogy for knowledge acquisition, deepening and creation to support constructivist process (Newby, Stepich, Lehman & Russell, 2016).

Okiki (2011) presents a study conducted at the University of Lagos on staff and students e-learning experiences using interviews and the university website to gather information. The study revealed that the university is

pursuing their strategic objectives of e-learning with genericobstacles militating against the success of e-learning initiatives. Again if these obstacles are not removed, the possibility of applying ICT in education may be limited.

Truong (2016) in a study on current status in higher education institutions in Vietnam revealed that there is a big gap in ICT skills between students and academic staff when compared with other higher education institutions around the world. According to the researcher, if this situation persist, application of ICT into teaching and learning may be difficult as both academic staff and students need to collaborate for the successful integration of ICT into teaching and learning.

Duong and Hoang (2016) examined the use of electronic learning facilities in learning in a case study in Ha Noi. The study showed that e-learning facilities were inadequate and that students' access where negligible; although, the students were using the new devices asproductivity tools and for information gathering. With inadequate facilities, the possibilities ofapplying ICT in teaching and learning may be hampered.

Pham (2015) examined student's acceptance and understanding of e-learning and m-learning (mobile learning) resources and how these affect motivation in Ho Chi Minh city. The study showed that students' were motivated, but that students' technical skills and infrastructures werenot adequate to meet the demands of e-learning.In a different setting, Le and Brown (2014) examined the use of ICT in teaching and learning practices in Hue higher education institutions using a survey involving students and academic staff. The researchers found that ICTs are being used for teaching and learning events as productivity tools, to access information and for communication.

None of these studies focused on ICT-based contents in courses in teacher education programs. The fact remains that we do not

teach technology for technology sake, and that technology skills should not be taught in isolation in the classroom, rather they should be encountered in all courses. However, ICT is a very powerful tool and can have undesirable consequences if not used in an appropriate manner. In order to prepare young people for the life of work in a rapidly changing world, education and training programs need to be re-oriented to impart a broad range of life skills which include key generic competencies and practical capabilities that cut across the field of ICT. This includes the ability to work and learn independently, work in teams, initiate entrepreneurship activities, cultivate emotional intelligence and be aware of diversity in culture (Obanya 2019; Tran et al., 2020b). Teachers should be exposed to new methodologies for the 21st century; and the emphasis should be on the use of technologies as tools for active teaching and learning. In addition, teacher-educators need to expose pre-service teachers to the art of using web-based facilities to gather information for in-depth content coverage. This is the gap that this study filled.

However, exposing pre-service teachers to the use of technologies may not be possible without on-site teaching and learning conditions. Situated learning emphasizes the use of apprenticeship, coaching, mentoring, collaboration, authentic context, tasks and activities. According to Resta (2017, p. 91) "Learning is the function of activities, context, and culture in which it occurs' This implies using situated learning condition to expose pre-service teachers tothe six components of ICT contents: basic computer literacy; the use of hardware and software for teaching/learning; pedagogy-based ICT use; the integrated use of ICT in subject curricula; classroom management and social networking (Anderson & Glenn, 2013). Hence, there is the need to have computer laboratory with Internet connection in every Faculty of Education for pre-service-teachers and teacher-educators to work collaboratively in the task

of designing activities for teaching and learning in different subject areas.

Statement of the Problem

Teacher preparation courses have come under serious criticism for being shallow in content knowledge or subject matter competences that are needed to be effective teacher (Lubin & Ge, 2018). This situation is more pronounced in Science, Mathematics and Technology related courses in Vietnam; to emphasis this, Santrock (2018), posits that understanding of subject matter is an important aspect of being a competent teacher. This suggests that pre-service teachers and teacher-educators must be encouraged to use the two categories of e-learning to facilitate in-depth content coverage in different subjects. Students can gather information from e-resources, collaborate with others; use images, sounds and text for in-depth content coverage.

Therefore, this study sought to find out the extent to which pre-service teachers and educational technology experts, in three Vietnamese universities including Tay Nguyen University, Ha Tinh University and Vinh University, use e-learning for in-depth content coverage; engage in the use of ICTs through inter-generational reciprocal mentoring in computer laboratory; establish the extent to which educational technology and education method courses contain ICT-based contents in theory and practice in those three universities. The following research questions for this study were as follows:

Research Questions

1. To what extent do educational technology teacher-educators use the two dimensions of e-learning for exposing pre-service teachers to the use of ICT tools/activities for in-depth content coverage in different subjects?

2. In what ways do final year pre-service teachers and educational technology teacher-educators' engage in reciprocal inter-generational mentoring in computer rooms?

3. To what extent do educational technology theoretical courses contain ICT-based contents?

4. To what extent do the contents of education method courses involve the use of ICT-based tools and activities for hands-on-experiences?

Hypotheses

There is no significant difference between the mean scores of final year pre-service teachers and educational technology teacher-educators in three Vietnamese universities in exposure to the use of two dimensions of e-learning through ICT tools/activities for in-depth content coverage in different subjects.

There is no significant difference between the mean scores of final year pre-service teachers and educational technology teacher-educators engaged in reciprocal inter-generational mentoring in computer laboratory.

Methodology

The study is a descriptive survey conducted in three universities in Vietnam, namely Tay Nguyen University, Ha Tinh Universiy and Vinh University. This is necessitated by the current dispensation whereby technology changes what people do. New technologies provide new opportunities to improve teaching and learning, so education should take the lead as a change agent. The population of the study comprised all the final year pre-service teachers and all educational technology teacher-educators in five higher education institutions in Central Vietnam. Three universities were randomly selected. The sample size consisted of one hundred and twenty (120) final year pre-service teachers and forty-eight (48) educational technology teacher-educators that were randomly selected from the three universities. Four research questions and two hypotheses guided the study. A structured questionnaire titled 'Application of ICT in Teacher Education Questionnaire', and Faculty brochures/course outlines were used to generate data. The questionnaire had three sections with two corresponding two research questions and the demographic characteristics of the respondents; the documents addressed two research questions. Experts in Educational Measurement and Evaluation validated the instruments, which yielded a reliability index of 0.70 established using Cronbach's Alpha. Data were analyzed using mean scores, rank order, and percentages and document analysis. A criterion means score of 2.5 was calculated to judge the mean scores of respondents, hence, any mean score above 2.5 is accepted otherwise, rejected. Z-test was used to test the hypotheses at an alpha level of 0.05. The calculated value less than the critical value of 1.96, is accepted and rejected if the calculated value is greater than the critical value.

Results

Research Question 1

To what extent do educational technology teacher-educators' use the two dimensions of e-learning for exposing pre-service teachers to the use of ICT tools/activities for in-depth content coverage in different subjects.

Table 1a: Mean scores of educational technology teacher-educators and pre-service teachers on the use the two dimensions of e-learning for in-depth content coverage in different subjects.

S/N	Item	Teacher-educators			Final year pre-service teachers		
		N	*X*	Rank	N	*X*	Rank
1	Use of digital video for knowledge creation	48	1.29	7th	120	2.14	5th
2	Creating digital video for knowledge transfer	48	1.22	8th	120	1.77	8th
3	Using subject specific CD-ROM for in-depth mastering of subject content	48	2.38	4th	120	2.05	7th
4	Using digital devices in teaching/learning	48	2.37	5th	120	2.06	6th
5	Preparing lesson plans with internet printed material/information	48	3.77	1st	120	3.04	2nd
6	Using the information gathered from different sources on the Internet to enhance content knowledge	48	2.90	3rd	120	2.85	3rd
7	Using interactive white board to enhance new knowledge	48	2.35	6th	120	2.26	4th
8	Using educational focused software for teaching and learning	48	3.12	2nd	120	3.08	1st
	Aggregate mean		2.43			2.41	

Table 1 shows that educational technology teacher educators responded to items 5, 6 and 8 with high mean scores of 3.77, 2.90 and 3.12 respectively following the rank order ranging from 1st to 3rd which are greater than the criterion mean score of 2.5. They responded to items 1, 2, 3, 4 and 7 with low mean scores of 1.29, 1.22, 2.38, 2.37 and 2.35 respectively following the rank order ranging from 4th to 8th which are less than the criterion mean score of 2.5. Final year pre-service teachers responded to items 5, 6 and 8 with high mean scores of 3.04, 2.85 and 3.08 respectively following the rank order ranging from 1st to 3rd which are greater than the criterion mean score of

2.5. They responded to items 1, 2, 3, 4 and 7 with low mean scores of 2.14, 1.77, 2.05, 2.06 and 2.28 respectively following the rank order ranging from 4th to 8th which are less than the criterion mean score of 2.5.

The aggregate mean scores of 2.43 for educational technology teacher-educators and 2.41 for final year pre-service teachers show that the extent educational technology teacher educators use the two dimensions of e-learning for exposing pre-service teachers to the use of ICT tools/activities for in-depth mastery of subject matter content knowledge is very low. They can only prepare lesson plans with internet printed

material/information, use the information gathered from different sources on the internet to enhance content knowledge, and

use educational focused software for teaching and learning.

Table 1b: Z-test Difference between the Mean Scores of educational technology teacher-educators and pre-service teachers on the extent of the usage of ICT tools/activities for in-depth mastery of subject matter content knowledge

Status		*X*	S.D	Df	z-cal	Critical value	Decision
Educational technology teacher-educators	48	2.43	1.03	166	1.46	1.96	Accepted
Pre-service teachers	120	2.41	1.01				

Table 1b: Z-test Difference between the mean scoret of final year pre-sevirce teachers and educational technology teacher-educators on the use of the two dimensions of e-learning for exposing pre-service teachers to the use of ICT tools/activities for in-depth mastery of subject matter content knowledge. The result shows that the z-calculated value of 1.46 is less than the critical value of 1.96 at 0.05 alpha significant levels. Hence, the null hypothesis is accepted. Therefore, there is no significant difference between the mean scores of final year pre-service teachers and educational

technology teachers on the use of the two dimensions of e-learning for exposing pre-service teachers to the use of ICT tools/activities for in-depth mastery of subject matter content knowledge. This shows that the two groups are co-learners in the use of ICT tools and activities.

Research Question 2
In what ways do final year pre-service teachers and educational technology teacher-educators engage in reciprocal inter-generational mentoring in computer laboratory?

Table 2a: Mean scores on ways in which educational technology teacher educators and pre-service teachers engage in reciprocal inter-generational mentoring in computer laboratory

| S/N | Item | Teacher-educators | | | | |
		N	$\bar{X}$	Rank	$\bar{X}$	Rank
9	Working collaboratively with students/teachers in the laboratory	48	1.97	3rd	120	2.76
10	Teaching one another how to use ICT tools	48	1.05	6th	120	3.07
11	Working with teachers to	48	1.15	5th	120	2.01

	create ICT based activities					
12	Working with students to create educational videos	48	1.56	4th	120	1.62
13	Posting on class activities for students/ lecturers to read	48	2.45	1st	120	2.38
14	Producing subject specific CD-ROMs with colabolative efforts of student/teacher.	48	2.06	2cnd	120	2.26
	Aggregate mean		1.71			2.35

Table 2a shows that educational technology teacher educators responded to items 9-14 with low mean scores of 1.97, 1.05, 1.15, 1.56, 2.45 and 2.06 respectively following the rank order ranging from 1st to 6th which are less than the criterion mean score of 2.5. Final year pre-service teachers responded to items 9 and 10 with high mean scores of 2.76 and 3.07 respectively following the rank order 1st and 2nd which are greater than the criterion mean of 2.5. They responded on items 11-14 with low mean scores of 2.01, 1.62, 2.38 and 2.26 respectively following the rank order ranging from 3rd to 6th which are less than the criterion mean score of 2.5. The aggregate mean scores of 1.71 for educational technology teacher-educators and 2.35 for final year pre-service teachers show that they do not engage in reciprocal inter-generational mentoring in computer laboratory.

Table 2b: Z-test Difference between the mean scores of final year pre-service teachers and educational technology teacher-educators on engagement in reciprocal inter-generational mentoring in computer laboratory

Status	N	X	S.D	Df	z- cal	Critical value	Decision
Educational technology teacher-educators	48	1.71	0.69	166	1.32	1.96	Accepted
Pre-service teachers	120	2.35	0.93				

Table 2b shows the z-test difference between the mean scores of final year pre-service teachers and educational technology teacher-educators on engagement in reciprocal inter-generational mentoring in computer laboratory. The result shows that the z-calculated value of 1.32 is less than the critical value of 1.96 at 0.05 alpha significant levels. Hence, the null hypothesis is accepted. Therefore, there is no significant difference between the mean scores of final year pre-service teachers and

educational technology teacher-educators on engagement in reciprocal inter-generational mentoring in computer laboratory. This shows that both groups do not engage in reciprocal inter-generational mentoring.

Research Question 3
To what extent do theoretical content of educational technology related courses contain ICT-based contents?

Table 3: ICT-based theoretical content in educational technology courses

1.	Rationale for ICT in teacher education.	A	N/A	A
2.	Framework for ICT in teacher education	A	N/A	A
3.	Theories supporting the use of ICT in teaching and learning.	A	N/A	A
4.	Developing strategic technology plan for schools.	N/A	N/A	N/A
5.	Technology- enhanced learning tools.	N/A	N/A	N/A
6.	Successful technology- enhance learning experience.	A	N/A	A
7.	Integration of computer to support learning.	A	A	A
8.	Integration of the Internet to support learning.	A	A	N/A
9.	Conceptual models for integrating ICT into teaching and learning.	N/A	N/A	A
10.	Trends and issues inintegrating technology into teaching and learning.	A	N/A	A

Indicator: Not Included - 'N/I'

Order	Types	Institution1 Inclusive	Institution2 Inclusive	Institution 3 Inclusive
1.	Word processing software	N/I	N/I	N/I

2.	Use of spreadsheet software	N/I	N/I	N/I
3.	The use of database software	N/I	N/I	N/I
4.	Microsoft Windows 7	N/I	N/I	N/I
5.	Computer graphics programs	N/I	N/I	N/I
6.	The use of tutorial software	N/I	N/I	N/I
7.	Use of software packages to create animations	N/I	N/I	N/I
8.	Use of illustration/design/ presentation software	N/I	N/I	N/I
9.	Use of utility software like Antivirus	N/I	N/I	N/I
10.	Use of a Text editor	N/I	N/I	N/I
11.	Use of Question Bank software	N/I	N/I	N/I
12.	Use of Interactive tutorial software	N/I	N/I	N/I

Table 4a shows that none of the institutions of higher education exposes the pre-service teachers to various activities that emanates from software based tools and activities through method courses. This negates the recommendation of Schrum (2009) and UNESCO (2012) that pre-service teachers should be exposed to the use of ICT tools and activities through hands-on experiences.

Table 4b: The use of Internet tools and activities among the institutions of higher education

Items	Institution 1	Institution 2	Institution 3
	Inclusive	Inclusive	Inclusive
Exposure to the use of search engines.		N/I	N/I
Communication through the Internet		N/I	N/I
Exposure to the use of WebQuests	N/I	N/I	N/I
Exposure to the various ways of retrieving information from the		N/I	N/I

Internet.			
Exposure to the ways of publishing on the Internet.	N/I	N/I	N/I

Indicator: Included 'I', Not Included 'N/I'

Table 4b shows that the use of internet tools does features in institution 1 as indicated in items 1, 2, and 4. Pre-service teachers are not exposed to the use of WebQuests and on how to publish on the internet (items 3 and 5). For institutions 2 and 3, the use of internet tools does not feature in method courses at all.

Table 4c: The use of hardware devices among the institutions of higher education

Items	Institution 1 Inclusive	Institution2 Inclusive	Institution3 Inclusive
Use of smart phones	Not in-use	Not in-use	Not in-use
Use of multimedia projector for academic purposes	Not in-use	Notin-use	Not in-use
Use of digital cameras	Not in-use	Notin-use	Not in-use
Use of digital video cameras	Not in-use	Notin-use	Not in-use
Interactive Videodisc	Not in-use	Notin-use	Not in-use
Use of iPad for academic purposes	Not in-use	Notin-use	Not in-use
Use of interactive whiteboard in teaching/learning	Not in-use	Not in-use	Not in- use

Table 4c shows that the documents from the three institutions do not show the presence of the use of hardware tools/activities in both general method courses and specific method courses.

Discussion

The findings revealed that the use of two dimensions of e-learning for exposing pre-service teachers to ICT tools/activities for deep understanding of subject matter was very low with aggregate mean scores of 2.43 for educational technology teacher-educators and 2.41 for final year pre-service teachers. Z-calculated value of 1.46 which is less than the critical value of 1.96 indicates a hypothesis of no difference which suggests that both categories of teachers are co-learners and are not versatile in the use of ICT tools/activities for in-depth content coverage. These findings negates the recommendations of Schrum (2019); UNESCO (2012), and Januszewski and Molenda (2018) on ICT integration into teacher education programs.

Teachers are change agents and besides 'no education system may rise above the quality of its teachers'; hence, it is imperative for all categories of teachers to form the habit of using ICT-based tools and activities for knowledge acquisition, deepening and creation. Constant and rapid changes of ICT tools demands that teacher-educators need to continually use ICT in order to keep up with the pace of technological changes. The low mean scores may be attributed to the fact that ICT facilities are not situated in Faculties of Education as indicated by respondents. Situating ICT facilities in Faculties of Education will encourage active, engaging, and participatory learning; as the focus would be on the use of physical, social and contextual learning environment with emphasis on authentic tasks/activities, authentic cognitive tools for interactive and collaborative learning to develop deeper levels of understanding.

Furthermore, the findings revealed that pre-service teacher who are younger (digital natives) and their teacher educators (digital immigrants) do not engage on reciprocal inter-generational mentoring in computer laboratory. The result shows the aggregate mean scores of 1.71 and 2.35 for both categories of teachers respectively. The final year pre-service teachers are younger and are said to have grown up in technological mediated environment; so in situated learning environment, one expects the pre-service teachers to mentor their teachers on the use of various digital devices, while the teacher-educators in turn mentors them on the use of digital devices for academic purposes. However, the low mean scores undermine the implications of Prensky (2011), references of students as 'digital natives' and their teachers as 'digital immigrants', and Miller (2017) calls

for inter-generational mentoring as a path way to sharing knowledge and skills between two groups at the opposite ends of age spectrum: the young and the old. This association can only flourish in an on-site and collaborative learning environment to bridge the gaps.

Continuing with the findings, the study revealed that both categories of teachers in the three higher education institutions are not being exposed to the use of innovative modern digital devices through educational technology courses as indicated in their course descriptions/outlines. Teachers need to know how to create educational films/videos, design and produce radio/television programs, design and produce audiovisual (AV) material, be able to participate in social network platforms. Besides, educational technology courses are also meant to address ICT skills and competency and how to install software packages in the computers and use such to build computing skills, to enable them learn everything they need from beginning to advanced topics. Most interactive tutorials are organized for fast and easy learning with practical exercises to build skills quickly and effectively. This finding is consistence with the findings of Lubin and Ge (2012) which posits that teacher preparation courses have failed to adequately enhance students' conceptual knowledge in educational technology that could lead to the use of ICTs for in-depth content coverage through e-learning. Today's teaching and learning requires 'creating, using and managing appropriate technological processes and resources', plus an understanding of how, why, and when, they should be used appropriately. This is what modern educational technology is all about.

Finally, the study revealed that pre-service teachers in the three higher education institutions are not being exposed to the activities associated with the use of application programs, Internet tools and digital hardware devices as indicated in general method and specific method course descriptions/outlines. UNESCO (2012) strongly recommended the use of various digital devices for teaching and learning in context.

Conclusion

The study was an attempt to find out how ICTs are being applied in teacher education programs in three universities in Central Vietnam in terms of inclusion and usage. Critical analysis of the findings point to the fact that teacher education programs in Higher Education institutions in those universities in Central Vietnam are not complying with the holistic programs associated with modern and innovative approaches to teaching and learning through diversification of contents and methods and promoting

experimentation using ICT-based tools and activities in educational technology courses, method courses and practical experiences. The likely implications are that if teachers are not sufficiently exposed to the knowledge and use of ICTs in Educational Technology related courses, the use of such tools and activities in the classroom may not be possible.

Recommendations

Based on the findings of the study, the following recommendations are proffered: Adopt UNESCO (2012) planning guide on ICTs in teacher education:

- Infuse ICT into teaching and learning to enhance e-learning culture;

- Situate ICT facilities and resources in all Faculties of Education;

- Use ICT tools/activities for teaching and learning, for assignments, for examinations, seminars;

- Use social network technologies as a platform for dialogue and collaboration to build communities of practice.

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