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The Investigation of Eastern Pre-Service Teachers' Teaching Behavior Using Internet-Based Learning to Teach Digital Native Students

Kusalawat Kongpradit*, Arunwaratchaya Bayolsineesayom & Pongthep Jiraro

Faculty of Education, St Theresa International College, Nakhon Nayok, 26120 Thailand

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Abstract

Digital native students who have high technological competences particularly Internet-based technologies and pre-service teacher who is soon to be a teacher must be progress on advancement and sophistication to new technologies for teaching and mentoring to the next generation. The research data was collected from 836 respondents in six education faculties of the Eastern HEIs (Higher Education Institutions), Thailand via Google form of 5 rating scales questionnaire consisted of respondent data, technological competency, level of technological knowledge and the perception of teaching behavior using ICT. The data was analyzed by t-test, One-way ANOVA and Pearson's Correlation Coefficient method. The research results found that: 1) preservice teachers have highest digital competency and have digital knowledge at very good level; 2) their teaching behavior by using ICT at much more level; 3) the Eastern pre-service teachers of the diploma program on the teaching profession had teaching behaviors using digital technology level higher than the freshmen level; 4) the Eastern pre-service teachers at University A had teaching behavior using digital technology level higher than the pre-service teachers at the other Eastern universities; and 5) the pre-service teachers' knowledge and competence on digital technology positively related to the teaching behavior using digital technology.

Introduction

Technological development have made the development of innovation for quality of life, life styles, productivity enhancement, particularly in education sector. Students were able to achieve the important skills quickly from this development. The digital natives are surrounded by digital media to such an extent that their very brain structures may be different from those of previous generations. They are used to receiving information really fast. They like parallel process and multitasking (VanSlyke, 2003). Those skilled and creative graduates where they can address challenged complex issues from the dynamics of economic and social change by collaboration with the whole relevant sectors (Nguyen, Mai, & Anh Do, 2020; Fowler, Ting, Meng, Li, & Tirrell, 2019) even through individual generation's technological competences which are specified by age, the other factors such as the kind of education institutions, prior training on ICT, educational degree, teaching experience and professional category affect the development of digital

* Corresponding Author
e-mail: kusalawat@stic.ac.th

competence (Hinojo-Lucena, Aznar-Diaz, Cáceres-Reche, Trujillo-Torres, & Romero-Rodriguez, 2019; Romero-Tena, Barragán-Sánchez, Llorente-Cejudo, & Palacios-Rodríguez, 2020). In addition, generations' computer self-efficacy and the duration of computer and internet usage caused the generational differences particularly in digital competences (Çoklar & Tatli, 2021). Whereas, the Office of the Basic Education Commission (OBEC) (2022a; 2022b) found that the mean of reading abilities of Grade 1 students all over the country that was at 77.28 (SD=20.11) while compared to mean of the Thai language abilities of Grade 3 students that was at 55.86 (SD=19.75). These definitely indicate that new born children perceive new technologies quicker and better than the previous born children (Prensky, 2001b; 2009; Buckingham, 2008). Pre-service teachers, therefore, must have advancement in new technologies for teaching and mentoring to the next generation. They must be the teacher who uses digital technologies in classroom and outside of schools to integrate ICT resources and services to improve the use of ICT in student learning. (Bati & Workneh, 2021; Power, Musgrove, & Nichols, 2020). The efficient use of ICT will increase educational quality in the school level and create optimal context of learning. Teachers' provisions of the digital environment with their ICT teaching can greatly affect the assimilation of information technologies in the classroom (Engeness, 2021). However, any pre-service teachers still have never been prepared to integrate ICT into every teaching context (Park & Son, 2020). And also, the learning and teaching processes must have been important more than technologies where educators should consider how to teach pre-service teachers, how they learn, and how they can apply knowledge and skills to professional practices. Therefore, educators and HEIs (Higher Education Institutions) will prepare pre-service teachers to be skillful, able to agile, and to start up. Theoretical and conceptual knowledge also are ready to be integrated into the learning and teaching processes (Smith, Kahlke, & Judd, 2020). In order for their students to develop the 21st century skills. It means that they must developed these skills and didactics as well (Häkkinen et al., 2020).

To teach digital native students who have high technological competences particularly Internet-based technologies, their teachers must be able to integrate new technologies into lessons in each classroom. Teachers must continuously progress in technological skills to teach their digital native students to achieve learning outcomes included self-direction, collaboration, creativity, and innovation (Rotherham & Willingham, 2009). Although there are still obstacles for students who are new to technologies usage such as the limitations of internet system access. The obstacles will be gotten to critical remedial. That are transformation of teachers' pedagogy and didactics in accordance with learners-oriented principle (Su, 2020) to fulfill the technological gap and resource access of teachers and native digital students (Ramirez, 2021). Different economic location of the Eastern Part of Thailand causes digital divide in the region (Kongpradit, 2021) where also universities located in these different locations.

Objectives

1. To investigate Eastern preservice teachers' knowledge in digital cultural context of digital native students.
2. To investigate Eastern preservice teachers' knowledge on new learning and teaching technological tools.
3. To investigate Eastern preservice teachers' teaching behaviors using teaching based on internet-based learning for digital native students.
4. To compare Eastern preservice teachers' knowledge in digital cultural context of digital native students with Eastern preservice teachers' knowledge on new technological tools of learning and teaching, and Eastern preservice teachers' teaching behaviors using teaching based on internet-based learning for digital native students.
5. To study the relationship of technological knowledge, technological competence and teaching behavior by using digital technology as the pre-service teachers' perception.

Conceptual framework

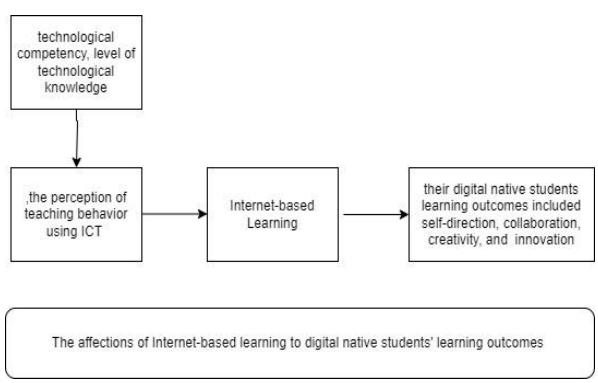

Figure 1 Conceptual framework

Research methodology

Internet-based Learning

To provide informational environment by developing learning resources and to provide the uses of learning resources to students both inside and outside classroom, the provided environments lead students to live in the information society and the educational processes will be changed to make the highest beneficial to nation and global society. It is necessary to enhance preservice teachers' the culture of speaking, communication, expressive behaviors by training and educating them in the ways of methods and skillful on co-working with learning resources to learn via the internet system. On the other side, the learning resources are electronic tools and information sources for education, science, data and information, and reference sources that can produce and publish by digital methods and fulfill the highest quality to instructional media (Aidarbekova, Abildina, Odintsova, Mukhametzhanova, & Toibazarova, 2021). OER: Open Educational Resources helped students to make the engagement, and promote their learning and their learning abilities. The resources that are the suitability and effectiveness of the web-based learning assistant procedure (Mosquera Feijóo, Suárez, Chiyón, & Alberti, 2021) which are the readiness of in-service teachers toward blended learning (Saboowala & Manghirmalani Mishra, 2021).

Digital native student

Technological development causes innovation for development of life quality particularly, in education where learner can be achieved fast and shortly necessary skills. Individual generation's technological skills are differences. Besides it's specified by age, it's also specified by education, income level, cultural characteristics, parents' education level or technology attitude (Çoklar & Tatli, 2021).

The digital natives expose to the factors in which of fast and ubiquitous communication environments. They are, therefore, a different specie which brain's development into neuroplasticity. The digital natives' neuroplasticity is an adjustable and special feature to high environmental changes (Prensky, 2001a; 2001b). This characteristic includes: adjustable to situation, fast change of interest, being able to process parallel information with the expertise of new technologies and fluently use latest new technologies. In addition, they also have high social concern, positive attitude on caring and prosocial, and their content and emotional structure followed by their own work process.

Four characteristics of digital native student (Ekiaka Nzai, Feng, & Reyna, 2014) consist of (1) Shapers of the new digital culture, they reduce traditional procedures and seek new procedures such as watching cartoon via applications instead of via TV programs, (2) Digital creativity, they learn to co-create work with their friends instead of learning from guardian, teacher, school and actual practice, (3) Platform influencer for distribution of digital media, they receive data and information from various channels for the same direction of digital content, and (4) New consumptions of media and game, they are all of designer, creator, and producer based on digital culture. They do not passive consume all of media, music, and game.

Digital native students are comparable to Nets, Pre-service teachers on four fields as shown in the below table.

Characteristic comparison of Pre-service teacher to Digital native student

Field	Pre-service teacher (Tapscott, 2009 cited in Ekiaka Nzai et al. 2014)	Digital native student (Ekiaka Nzai et al, 2014)
Culture	Emotional and intellectual openness Inclusion Preoccupation with maturity	Shapers of the new digital culture
Creation	Investigations Fierce independence Authentication and trust Innovation	Digital creativity
Publishing competence	Free expression and strong views Immediacy	Platform influencer for distribution of digital media
Media consumption and Behavior	Sensitivity to corporate interest	New consumptions of media and game

The table shows that the characteristics of digital native students cross a threshold of basic characteristics of nets, pre-service teacher where digital culture of those groups are different.

Educating nets, pre-service teacher students

The preparation of the pre-service teachers must provide the digital environment to them since they were young and must manage new educational system in school concerning to the teacher (Shin & Shim, 2021) and must also develop contrarily student's readings (Kekeeva, Darzhinova, & Abdiraimova, 2020). Teacher and educator must utilize both social media technology and emerging technology including augmented reality and virtual reality, the Internet of Things, augmented

reality, artificial intelligence, blockchain, cloud technology, mobile internet, machine learning, deep learning, etc. because nowadays instructional media still can't catch up with technology (An, 2021). The pre-service teacher accepted that the integration of technology and communication for learning activities requires high potentials for (1) improving the quality of instructional processes, (2) enhancing teaching skills, and (3) helping the engagement of student to the instructional processes. Therefore, ICTs are the effective tools to create learning and teaching process atmosphere of teacher and student to move toward the same direction that reinforce the learning interest and experience which are joyful to a student (Zahra, Amel, & Mohamed, 2020).

Teacher in the future must be a person who has competence on teaching by using digital technology (Shevchenko et al., 2021). To promote the opportunities of the 21st Century skills development to a student, teacher must learn and practice those skills, competencies and learning methods in order to improve those skills and competencies of their student (Häkkinen et al., 2020) and particularly, must have skill on content co-creation that develop from the concept in the taught subject (Kapucu & Avci, 2020). In addition, teacher must integrate technology into systems and cultures of practice in school (Seufert, Guggemos, & Sailer, 2021), that is the teacher should have skills to use ICT (Valtonen et al., 2021).

The state-of-the-art program for preparing the pre-service teacher included three dimensions: (1) general digital competence development-the competence that are accordance with context of educational system, (2) competence that integrate technology into learning and teaching activities – focusing on context of the integration of teacher preparation in the future that be able to evaluation of digital tools use in educational processes, and (3) professional digital competency – the competence on working in context of educational system in school such as instructional processes that be able to manage digital learning environment and be manageable professional digital activities. Therefore, the pre-service teachers must be educated in line of the competence on evaluation tool design, ability on interpretation the problem of learning outcomes, disposal of the student's behavior disruption, and self-control on disposal of teaching emotion (Manasia, Ianos, & Chicioreanu, 2020). The pre-service teachers' enhancement of digital competence which they can integrate digital technology into response their students' learning outcomes (Liza & Andriyanti, 2020). Therefore, the pre-service teachers must be prepared from the readiness of learning tools based on computer and multimedia, learning processes that classroom mixed by distance learning, cloud technology, virtual and augmented reality tools, educational processes gamification, robots, three-dimension technology, and MOOC.

Data Collection and Data analysis

Online questionnaire in form of Google Form was created its link and QR code and distributed to 836 respondents in 6 universities via liaison. The duration time of data collection was between 5/11/2021 to 10/1/2022.

The collected data were analyzed by methods as follows:

1. The three experts certified the content validity of the questionnaire and it was tried out and was found the content validity at 0.67-1.00.

2. Cronbach's alpha Reliability Coefficient was used to evaluate reliability of the questionnaire. It consisted of (1) the first section named Knowledge on Digital culture Context and Knowledge on new tools and pedagogical approach, its alpha was at .967, (2) the second section named Digital technology competence, its alpha was at .958, and (3) the third section named Teaching behavior using the digital technology, its alpha was at .991.

3. Descriptive statistics was used to analyze the demographic information of the samples and findings are presented as frequencies, percentages, means, and standard deviations (SDs).

4. t-test was used to compare the pre-service teachers' teaching behavior using the digital technology which were different gender.

5. One-way ANOVA method was used to compare 3 groups of educational institution and educational level / Program.

6. The Pearson's Correlation Coefficient method was used to analyze the correlation of variables including (1) Age, (2) Knowledge on Digital culture Context, (3) Knowledge on New tools and pedagogical approach, (4) ∑ of knowledge Digital technology competence, and (5) Teaching behavior

7. The p value of ***P< .001, was used to indicate the level of statistically significant.

Result

Analysis results were presented by tables as follows:

Table 1 Number and percentage of the respondents who are the East pre-service teachers of the Education Faculty discriminating by HEI and educational level

Item	Total of Student (836)	Percentage
The Faculty of Education in the East		
1. University A	159	19.02
2. University B	326	39.00
3. University C	121	14.47
4. University D	182	21.77
5. University E	26	3.11
6. University F	22	2.63
Educational level		
1. Freshmen	180	21.53
2. Sophomore	38	4.55
3. Junior	121	14.47
4. Senior	101	12.08
5. The 5th year class	114	13.64
6. Graduate Diploma in Teaching Profession	282	33.73

The table 1 shows that the samples are the East pre-service teachers at the Education Faculty of University B in the most percentages at 39.00, the next below percentages at 21.77 of University D, and the least percentages at 2.63 of University F. Educational level, the most respondents' percentage are at 33.73 of the Graduate Diploma in Teaching Profession students, the next below percentages of freshmen at 21.53, and the least percentages at 4.55 of sophomore.

Table 2 Comparison of the East pre-service teachers' teaching behavior using digital technology between bachelor degree program students and diploma program students by independent *t*-test

Variable	Program	n	$\bar{x}$	SD	t	df	Sig.
The pre-service teacher students' teaching behavior using digital technology	Bachelor degree program	554	3.81	.76	-2.738**	626.659	.006
	Diploma program	282	3.95	.68			
	Total	836	3.86	0.74			

**$P < 0.01$, *$P < 0.05$

Table 2 shows that the students of bachelor degree program and diploma program had statistically significant difference at .01 where teaching behavior using digital technology of diploma program students are higher than the bachelor degree program students.

Table 3 Comparison of preservice teacher's teaching behavior by using digital technologies those who are different gender using Independent t-test

Variable	Gender	n	$\bar{x}$	SD	t	df	Sig.
Preservice teacher's teaching behavior by using digital technologies	Male	230	3.81	0.76	-1.242	834	0.215
	Female	606	3.88	0.73			
	Total	836	3.86	0.74			

Table 3 shows different gender of preservice teachers who teach by using digital technologies have no significantly difference.

Table 4 Mean comparison of preservice teacher's teaching behavior by using digital technologies as preservice teachers' perception who study in Faculty of Education in different universities and different year class analyzed by One-way ANOVA (n = 836)

Variable	Source of Variance	SS	df	MS	F	Sig
Education Institution / University	Within group	8.678	5	1.736	3.222**	0.007
	Between group	447.132	830	0.539		
	Total	455.810	835			
Year Class/ Program	Within group	15.484	5	3.097	5.837***	0.000
	Between group	440.326	830	0.531		
	Total	455.810	835			

***P<.001

Table 4 shows preservice teachers at Faculty of Education in different universities have teaching behavior using digital technologies as their perception. It found that statistical significant difference was at .01 and found that their different year classes had teaching behavior by using digital technologies was statistical significant difference at .001. Their mean were tested paired comparison by using Scheffe' Method as in Table 8 and 9.

Table 5 The mean comparison of teaching behavior using digital technology as the East pre-service teachers' perception in the Education Faculty of the different HEIs (Higher Education Institutions) and the different educational level using One-way ANOVA method (n = 836)

Variable	Source of Variance	SS	df	MS	F	Sig
HEIs (Higher Education Institutions)	Between group	8.678	5	1.736	3.222**	0.007
	Within group	447.132	830	0.539		
	Total	455.810	835			
Educational level / Program	Between group	15.484	5	3.097	5.837***	0.000
	Within group	440.326	830	0.531		
	Total	455.810	835			

***P<.001

Table 5 shows that the East pre-service teacher students of Education Faculty in different HEIs (Higher Education Institutions) had teaching behavior using digital technology as their perceptions, statistically significant at .01 and found that the students in the different year class had teaching behavior using digital

technology as their perceptions, statistically significant at .001. Then, those mean were taken to test the pared comparison by Scheffe's Method as in Table 6 and 7.

Table 6 The mean comparison of teaching behavior using digital technology according to the East pre-service teachers' perception in the Education Faculty of the different HEIs (Higher Education Institutions) using Scheffe's method for paired comparisons

Mean	HEIs (Higher Education Institutions)	University A	University B	University C	University D	University E	University F
3.9848	University A	-					
3.8984	University B	.08637	-				
3.8682	University C	.11657	.03021	-			
3.6882	University D	.29661*	.21025	.18004	-		
3.7788	University E	.20595	.11959	.08938	-.09066	-	
3.7715	University F	.21334	.12697	.09676	-.08328	.00738	-

Table 6 shows that the East pre-service teachers' teaching behavior using the digital technology of Education Faculty of University A was higher than the students' teaching behavior of University D, statistically significant at .05. The other pares are not statistically significant.

Table 8 shows that teaching behavior using digital technology had relationship to digital technological knowledge and competence in positive direction, statistically significant at .001. It means that the East pre-service teachers who have high digital technological knowledge and competence, they also have high teaching behavior by using digital technology. The age had the relationship, not statistically significant.

Table 7 The Mean comparison of teaching behavior by using digital technology according to pre-service teachers' perception in different educational level using Scheffe's method for paired comparisons

Mean	Year class	Freshman	Sophomore	Junior	Senior	The 5th year class	Grad. Dip.
3.6292	Freshman	-					
3.9591	Sopho - more	-.32990	-				
3.7668	Junior	-.13759	.19231	-			
3.9560	Senior	-.32683*	.00307	-.18924	-		
3.9613	The 5th year class	-.33209*	-.00219	-.19450	-.00526	-	
3.9517	Grad. Dip.	-.32257*	.00733	-.18498	.00426	.00952	-

*P < .05

Table 7 shows that the Education Faculty's freshmen had teaching behaviors using digital technology behavior were less than the senior, the 5th year class, and Grad. Dip. Students, respectively, statistically significant at .05. The other pares are not statistically significant.

The reflection of the results

The main results of this research, it can be seen that (1) the preparation of digital teacher it is initiated from the higher education program by preparing pre-service teacher can integrate digital technology into the classroom and be adjustable media to learning and

Table 8 The relationship of age, technological knowledge, technological competence and teaching behavior by using digital technology as the East pre-service teachers' perception using the Pearson's Correlation Coefficient method

Variable	Age	Knowledge on Digital culture Context	Knowledge on New tools and pedagogical approach	∑ of knowledge	Digital technology competence	Teaching behavior
Age	1					
Knowledge on Digital culture Context	.032	1				
Knowledge on New tools and pedagogical approach	-.050	.583***	1			
∑ of knowledge	-.010	.895***	.884***	1		
Digital technology competence	-.009	.193***	.179***	.210***	1	
Teaching behavior	.062	.323***	.318***	.360***	.468***	1

*** P< .001

teaching activities (Muliyati, Bakri, Siswoyo, Ambarwulan, Septyaningrum, Budi, & Fitriani, 2020). Whereas pre-service teacher is the person who is clever in the use of ICT tools and accessible to the learning resources, therefore their lecturer must design the activities that enhance the digital competencies of pre-service teacher Tran, Phan, Le, & Nguyen, 2020. Particularly, learning and teaching atmosphere that must be learner-centered according to a work (Zhao, Liu, & Su, 2021) found that flipped classroom can be applied to a course such as educational technology provided to the pre-service teacher. The environment in school must make ready of learning resources and be conducive services to learning (Alarcón, del Pilar Jiménez, & de Vicente-Yagüe, 2020), (2) The competencies of the pre-service teacher can indicate to the working abilities, a work (Capuyan et al., 2021) found that the pre-service teachers who work with innovation they will work efficiently and improve the quality. In order that educational development will increase the development of service quality (Rafiola, Setyosari, Radjah, & Ramli, 2020). Therefore, teacher who has the future vision on ICT's knowledge, attitude, and belief, s/he will be a person who is an innovative usage of ICT in classroom. Teachers who integrate ICT, they will be the person who is changeable teaching practices to be focusing on learner-centered (An & Mindrila, 2020; Conceição, 2021). Even though the training of the pre-service teacher that pays attention to the integration of ICT into classroom, the weakness is the provision of the experiences on the disposal of student's disruptive behavior, customization of learning, and self-regulation of teaching emotions (Manasia, Ianos, & Chicioreanu, 2020), and (3) By the way, technological alteration leading to be "Flipped learning", this modern method tends to be more of a student-centered such as self-regulated learning (Yoon, Hill, & Kim, 2021) and connectivism (Marais, 2011). Because of new technologies are the original of sparkling on learning's initiatives, methods, and patterns in which of student exposes to media, internet, and networks for accessing learning resources outside his/her classroom to co-create knowledge (Sutrisno, Andre, & Susilawati, 2021).

Discussion

Those conclusions can be discussed as the followings:

1. The East pre-service teachers of the diploma program on the teaching profession had teaching behaviors using digital technology higher than the freshman level. According to a work (Ma & Baek, 2020) found that in-service teachers had knowledge on TPACK higher than pre-service teachers. As same as, almost the diploma program students are acting on the in-service teachers. And also, one result of this research shows that they usually use digital technology in teaching and learning activities and their teaching behavior are higher than the bachelor degree program students. However, all of these students still need the provision of Information and Communication of Technology (Gündüz, 2020). In addition, the programs must provide training all of skills such as communication skills, problem solving skills, information literacy skills, etc., to the in-service teacher students (Alahmad, Stamenkovska, & Gyori, 2021).

2. The East pre-service teachers at the University A had teaching behavior using digital technology higher than the East pre-service teachers at the other universities. This issue can be discussed that the total number of respondents are the diploma program students on the teaching profession at the University A, so it effects on the answer of this issue.

3. The East pre-service teachers' teaching behavior using digital technology had positively relationship to digital technological knowledge and competence. Factors of the digital technological knowledge and competence included (1) Knowledge on Digital, (2) Knowledge on New tools and pedagogical approach, (3) ∑ of knowledge, and (4) Digital technology competence mainly effect to the East pre-service teachers' teaching behavior using digital technology. Whereas the age does not confirmatively effect to the East pre-service teachers' teaching behavior using digital technology. These findings are accordance with the work of Çoklar and Tatli (2021) as aforementioned. However, this result is in line with a work (Alenezi, 2020) found that pre-service teachers used digital tools, achievement of their student will be high and their teaching practices will also be efficiency. The pre-service teachers who have technological competence and practices, they will use digital technology in planning, teaching, evaluation, and knowledge creation. They are prepared to integrate technology to the lessons but they are not assured of technological application to various types of teaching (Ramazanova et al., 2021). Therefore, the preparation of the pre-service teachers entering the 21st Century by cultivated them in 3 dimensions included (1) knowledge, (2) competence and skills on pedagogy, communication, educational media creation, etc., and

(3) attitudes (Siregar, 2020; Avsec & Ferk Savec, 2021). Digital competence is the important factor of the whole education system (Tomczyk, 2020).

4. Whatever the East pre-service teachers enthusiastically use digital technology in learning and teaching process, they still take into account the digital divide in the society. The qualitative data revealed that their students and the guardian cannot be owner of the communicative tools, those of people are also inaccessible to the internet as the work of Machmud, Widiyan, and Ramadhani (2021). According to Caneva (2021) said that there are still the digital divide of the potentials and competences of learning resources access included (1) access level, and (2) use level.

Conclusion

This research paper can be summarized that the results of the 836 online respondents are (1) the Diploma Program students on the Teaching Profession had teaching behavior using digital technology higher than the freshman level, (2) the East pre-service teachers at University A had teaching behavior using digital technology higher than the East pre-service teachers at other universities, and (3) the East pre-service teachers' knowledge and competence on digital technology positively related to the teaching behavior using digital technology and the age had the relationship, not statistically significant.

Suggestions

Suggestion of this research

There are three types of teacher preparation as follows:

1. The bachelor degree program, the way that teacher who is expertise in pedagogy and subject.

2. The diploma program, the way that teacher who is comprehension in the subject and according to customization in the didactics.

3. The provision of Internet-based technologies in school system which builds the access throughout the school system particularly to learning resources. The system will promote well the learning and teaching activities in knowledge creation according to satisfaction, flipped classroom, and finally learner-centered.

Suggestion of the next research

To develop this issue, the next research should conduct on (1) investigate the factors that effect on teaching behaviors using digital technology, and (2) research on research and development model of teaching practices using new technology in learning and teaching activities.

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