



Profile and predictors of high school teachers' attitude and self-efficacy in utilizing ICT: an investigation from Indonesia

Muhammad Ikhlas¹  · Elmer D. Dela Rosa¹

Received: 26 January 2022 / Accepted: 17 March 2023 / Published online: 3 April 2023
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Abstract

This study investigated the relationship among several predictors that could influence high school teachers' attitudes and self-efficacy in utilizing ICT, such as length of computer use, computer competencies, computer access, computer training, and frequency of using computer programs. Quantitative study through descriptive and correlational design has been used to answer the hypothesis of this study. A total of 345 active high school teachers participated in this study. The correlational person product moment shows that all of the computer-related variables have a positive relationship with attitude and self-efficacy, although the relationships vary from low ($p < 0.05$) to high ($p < 0.01$). Hierarchical analysis showed that the predictors of attitude included computer competencies, computer access, training in computer, and level of using computer's program/apps variables; meanwhile, computer competencies, training in computer, and level of using computer's program/apps become good predictors of self-efficacy. This finding suggests that teachers should frequently access the computer and its app, have competency in using the computer, and have training or professional development in computer for improving teachers' attitudes and self-efficacy in utilizing and implementing ICT for the learning process.

Keywords Attitude toward ICT · Self-efficacy in using ICT · Training in computer technology · Computer technology access · Frequency using computer technology

✉ Muhammad Ikhlas
muhammadikhlas@clsu.edu.ph
Elmer D. Dela Rosa
delarosaed@clsu.edu.ph

¹ College of Education, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines

Introduction

The influence of the rapid development of information, and communications technology (ICT) in education could not be avoided. The global demand requires the world of education to always and constantly adjust ICT developments to efforts in improving the quality of education, especially in the learning process (Ghavifekr and Rosdy 2015; McKnight et al. 2016). ICT has brought a lot of potential for educational change. Teaching has become easier and more meaningful for students with the incorporation of ICT (Chai et al. 2011; Ottenbreit-Leftwich et al. 2012). A lot of studies have found that the integration of ICT in education could enhance education quality worldwide (Rodríguez et al. 2012; Khan 2015; Shen and Ho 2020). With the advancement of technologies, schooling could be done anywhere and anytime virtually (Rubens et al. 2014); teachers could differentiate learning instructions and create student-centered learning (Means 2010), and promote active learning which eventually improves students' creativity, critical thinking, and collaboration as opposed to transmitting facts and skills to students (Gadanidis and Geiger 2010; Blasco-Arcas et al. 2013).

The importance of using ICT as a support for learning activities is a concern for the Indonesian government. Indonesian education has recognized the importance of ICT education since 1976. During that year, a team for ICT education or *Teknologi Komunikasi untuk Pendidikan dan Kebudayaan (TKPK)* was formed (Pustekkom 2015). Since 1978, *Pusat Teknologi Informasi dan Komunikasi Pendidikan dan Kebudayaan (Pustekkom)* or Center of Information and Communication Technology (ICT) for Education and Culture has been managing ICT in education for schools and universities in Indonesia. Nowadays, *Pustekkom* provides several ICT features that are utilized as learning media as well as the center of learning media development itself. Integrating ICT in education in Indonesia is very useful. This has been proven by some previous study, such as students who have positive innovative attitudes in learning to use ICT have good learning outcomes (Hussain 2018), and ICT could be an effective supplementary material (Al-Munawwarah 2015).

ICT was first implemented in the Indonesian curriculum in 2004, known as the 2004 Curriculum or *Kurikulum Berbasis Kompetensi (KBK)* or Competency Based Curriculum (Indonesian Department of National Education 2003). The application of ICT continues to the 2006 Curriculum or *Kurikulum Tingkat Satuan Pendidikan (KTSP)* or Education Unit Level Curriculum. Every high school, whether junior or senior high school, applies special ICT lessons (National Education Standards Agency 2006). However, in the recent curriculum 2013 or K-13 curriculum, ICT subjects were abolished. The elimination of ICT subjects does not mean eliminating ICT, but the Indonesian government through the ministry of education wants every subject to utilize and integrate ICT into learning so that teachers can optimize ICT resources inside and outside the classroom. The regulation of the Indonesian Ministry of Education and Culture (2015) explains the function of integration of ICT in learning is to develop learning resources and learning media, learning preparation, learning processes, learning assessment,

and reporting of learning outcomes. This means that ICT integration can be applied to the whole learning process to improve its quality. Because of that, teachers in Indonesia are required to integrate ICT into learning, both as learning media, teaching materials, and so on. In addition, teachers are also required to be able to manage their lessons using ICT, such as online student reports, computer-based National Exams, or Computer Based Tests, among many others.

With the demands of the twenty-first century coupled with a number of Indonesian government regulations that require teachers to adapt and use ICT in learning, these teachers must implement it. Apparently, the problem is that the teachers in Indonesia are not from the same generation as there are new (junior) teachers and there are also old (senior) teachers. It may be safe to assume that young teachers do not find difficulty in adapting to the implementation of ICT in education, especially for those who take ICT-specific courses during their pre-service training (Lambert and Gong 2010). Problems arise among senior teachers, whose undergraduate studies have not included ICT in education, making it very strenuous to apply something new. This generation's difference will certainly be very influential in terms of utilizing ICT in learning.

Several studies have shown that the knowledge and ability of teachers to utilize ICT in education are still comparatively low. For example, research from Admiraal, et al., (2017) found that veteran teachers (50 years and older) had less self-efficacy and attitudes toward the application of ICT in education. Also, a study by Msila (2015) found a lack of teacher readiness in integrating ICT into education, especially among older teachers. In Indonesia, there are several studies related to the lack of knowledge and ability of teachers to utilize ICT in education. Muhaimin, et al., (2019) found that the knowledge and ability of science teachers in implementing ICT in education were low. Suyanto (2017) found the ability of teachers in applying ICT in education was categorized as moderate.

Teachers are actually required to master the knowledge and apply ICT in education, but in reality, the teachers have difficulty with this (Son et al. 2011). Some previous studies explained ease or not of someone in doing or learning something is caused by several factors including the attitude and self-efficacy of the person (Wood and Bandura 1989; Leach et al. 2001; Prior et al. 2016). Based on this previous study, it is important to investigate the extent to which teachers' attitudes and self-efficacy in utilizing ICT for learning processes.

Teachers' attitude toward using ICT in education

Attitude theory emerged with the Theory of Reasoned Action (TRA) which was first introduced by Fishbein and Ajzen (Al-Suqri and Al-Kharusi 2015). Attitude has been defined as the amount of affection (feeling) a person feels to accept or reject an object or behavior and is measured by a procedure that places individuals on a two-pole evaluative scale, for example, good or bad; agree or reject, and others (Ajzen and Fishbein 1977; Ajzen 2011). Attitude is also defined as an evaluation of beliefs or positive or negative feelings from someone if they have to do the behavior that will be determined. The Theory of Reasoned Action (TRA) developed by Ajzen

and Fishbein (1977) explains the relationship between belief, attitude, intention, and behavior.

The attitude itself applies in various disciplines, be it in economics (Gázquez-Abad et al. 2017); technology (Kim et al. 2009); health (Shekar et al. 2011); and even education (Kleebua and Siriparp 2016; Marcinkowski and Reid 2019). It is because attitude is one aspect of psychology that affects a person (Olson and Kendrick 2008), and it applies to a teacher as well. Various previous studies also show how the exploration of teachers' attitudes on some aspects, for example, teachers' attitudes in a new phenomenon or policy, such as teachers' attitudes toward inclusion practices and special needs students (Ross-Hill 2009; Hornstra et al. 2010), inclusive education (Savolainen et al. 2012; Yada and Savolainen 2017), implementation of instructional innovation (Tabata and Johnsrud 2008; Nie et al. 2013), distance education (Tabata and Johnsrud 2008); professional development (Aalderen-Smeets and Walma van der Molen 2015) and others.

Drent and Meelissen (2008) provided evidence to suggest that the attitudes of teachers are directly related to ICT use innovatively in the classroom. This study explored obstructing and stimulating factors that influence teachers' willingness to use ICT in an innovative way. This study was a longitudinal study that utilized data through the ICT-monitor on the implementation of ICT in the Netherlands in primary, secondary, vocational, and teacher education. This study also involved 210 primary teachers to support the research data. The finding of this study revealed that one of the factors that influenced teachers to use ICT innovatively during the learning process was teachers' ICT attitude. It implies that teachers tend to use ICT innovatively for learning activities if they have a good attitude toward ICT. Afterward, there is another study by Ahmed et al., (2020) explored teachers' attitudes toward Using ICTs in the EFL context. This study involved 81 EFL teachers, where the finding of the study explains that teachers possessed positive attitudes toward using ICTs in teaching as they believe that ICT has benefited and is effective for learning, facilitate learning and teaching, motivate students, save time and effort, and develop students' language skills. Gaining an appreciation of the teachers' attitudes towards ICT use may provide useful insights into technology integration and acceptance and usage of technology in teaching and learning (Teo 2008). Furthermore, there was a study by Selwyn (1997) that raises the theme of teacher attitudes toward using ICT in the learning process. This study takes four variables that are considered to be components making up attitudes towards computer use, such as affective, perceived usefulness, perceived control, and behavioral intention components.

Teachers' self-efficacy toward using ICT in education

Self-efficacy is a theory developed by Albert Bandura and began to be known in the 1980s. Self-efficacy has been defined as the individuals' judgments of their abilities to complete specified tasks or to execute certain and conditioned courses of behaviors (Bandura 2010). Self-efficacy is related to self-confidence to have the ability to take the expected action. Self-efficacy is a self-assessment, of whether one can do good or bad actions, right or wrong, and can or cannot do as required. Self-efficacy

is a construct proposed by Bandura based on social cognitive theory. In his theory, Bandura states that human activity is a reciprocal relationship between individuals, the environment, and behavior (triadic reciprocal causation). Furthermore, according to Bandura (Feist and Feist 2008), self-efficacy can be developed through four things, such as mastery experience, vicarious experience, verbal persuasion, and physiological and affective state.

Self-efficacy in its application could be applied to measure the efficacy of a person in utilizing something in his field or expert in (Bandura 2012), for example, the efficacy of doctors in dealing with prescribing (Ryan et al. 2013); auditors in terms of auditing (Su, et al. 2016); and so on. Likewise, in the aspect of education, self-efficacy could be applied to both teachers (Klassen and Tze 2014) and students (Joët et al. 2011). For the teachers, self-efficacy could be applied in teaching the subjects, such as self-efficacy in teaching science for science teachers (Velthuis et al. 2014) and for elementary teachers (Al Sultan 2020), teaching math for the math teachers (Chang 2015; Takunyaci 2021), and teaching primary students for the elementary teachers (Menon and Sadler 2016), and so on. Not limited to that, self-efficacy could also be applied to teachers in terms of the efficacy of a teacher utilizing existing learning resources or media (Annetta et al. 2013); instructional design (Kohen et al. 2022); student management (Martin, et al. 2012; Shoulders and Krei 2015); and classroom management (Abu-Tineh et al. 2011; Shoulders and Krei 2015; Potter 2021). In the current technological era, it could be related to the efficacy of teachers in the use of ICT in learning.

Teachers' self-efficacy in using ICT in education refers to a teacher's belief in knowing and utilizing ICT in Education. This confidence could be measured by giving a questionnaire in the self-assessment form of self-efficacy in education (Guo et al. 2011; Brigido et al. 2013). Related with teachers' self-efficacy in using technology several studies have been conducted, such as self-efficacy with integration of web 2.0 (Pan and Franklin 2011; intended uses or integration of technology (Teo 2009; Lee and Lee 2014); and pedagogical uses of technology (Curts et al. 2008). Meanwhile, current study is more inclined to the study conducted by Wang et al. (2004), wherein, Wang as the first researcher developed a questionnaire that focuses on measuring teachers' self-efficacy in using ICT. In their study, they analyzed 280 pre-service teachers' self-efficacy in technology integration focusing on two aspects, such as vicarious experiences and goal setting. They found vicarious experiences have a strong impact on the success of teachers in technology integration regardless of whether they have a goal setting or not. This current study has a tendency toward the study conducted by Wang et al. (2004), where we used the questionnaire that has been developed by them.

High school teachers' attitude and self-efficacy of using ICT

In this study, the target is high school teachers. Several studies have shown high school teachers' attitudes toward the use of technology in learning. High school teachers who possess positive attitude in ICT tends to use the ICT in learning process (Salleh and Laxman 2014), as well as in using particular technology such as

digital learning environment (Pynoo et al. 2011); interactive whiteboard (Isman, et al 2012). Jimoyiannis and Komis (2006) explore high school teachers' attitudes toward ICT adoption in education, finding that teachers have a positive attitude towards the use of ICT in learning, especially in three ways: the importance of their training on ICT, the general role that ICT can play in education, and the application of ICT tools in the instruction process.

Mustafina (2016) found that most high school teachers possess a positive attitude toward using ICT due to the benefits provided by technology, such as distance learning and visualization of the content. Apart from that, Mustafina also found that high school teachers who have a positive attitude toward technology tend to influence students' academic motivation. A relatively similar study was conducted by Isman et al. (2012), which focuses on a particular technology that is using interactive whiteboards in learning, has found several reasons for the importance of the use of technology by high school teachers, such as, it can be a role in devolving the students' academic performance, and professional development as well as their need to keep up with technological innovations. In addition, some previous studies show that high school teacher attitudes toward using technology are correlated with several variables, including gender, specialty, and teaching experience (Jimoyiannis and Komis 2006); age, teaching experience, school location, ICT training, and duration of training (Zyad 2016). However, another study by Semerci and Aydin (2018) showed no significant difference in high school teachers' attitudes toward ICT by their gender, age, teaching experience, ICT experience, ICT skills, and ICT training.

Furthermore, related to teachers' self-efficacy in using technology, there are several studies that directly investigate the level of high school teacher self-efficacy in utilizing technology for the learning process (Igwebuike et al. 2014; Kazu, and Kurtoğlu 2022; Simsek, and Yazar 2017). For example, a study by Simsek and Yazar (2017), found that high school teachers have high self-efficacy toward technology. In this study, using the instrument they developed themselves, Educational Technology Standards Self-Efficacy (ETSSE) (Simsek and Yazar 2016), it was found that high school teachers had a high level of agreement on all components of the ETSSE scale, such as educational technology could facilitate and inspire student learning and creativity, design and develop digital age learning experiences and assessments, model digital age work and learning, promote and model digital citizenship and responsibility, and engage in professional growth and leadership.

High school teachers' self-efficacy in using technology in learning was found to be correlated with several variables and could be influenced by these variables. Several variables can influence high school teachers' self-efficacy in using technology such as general self-efficacy, subject area, prior experience in computer and software use (Paraskeva, et al. 2008); gender (Buabeng-Andoh 2015); ICT infrastructure (Kundu, et al. 2020). In addition, Kundu et al., (2020) indicated three factors of ICT infrastructure that could influence teachers' self-efficacy in using ICT, including teachers' training activities, ICT equipment, and school management. Igwebuike et al. (2014) found in their study that focused on high school teachers' self-efficacy in using technology, several things need to be considered when teachers have low self-efficacy, such as the lack of someone else to help, need adequate time, and facility assistance.

Present study

Attitude and self-efficacy can have big influence on the use and utilization of technology by teachers and prospective teachers (Teo 2010; Holden and Rada 2011; Celik and Yesilyurt 2013; Lemon and Garvis 2016). If the teacher maintains a good attitude or perception toward integrating ICT into education, then the teacher finds it easier to apply (Singh and Chan 2014). Likewise, if a teacher is efficacious towards ICT in education, then the teacher tends to easily understand and apply ICT in education (Robertson and Al-Zahrani 2012).

Interestingly, several studies also have been found discussing the relationship between some variables related to computer technology toward teachers' attitudes and self-efficacy in using ICT. Attitude in using computer has been found to have a relationship with several variables including years of computer use and level of computer confidence (Teo 2008); level in use ICT or computer technology (Al-Zaidiyeen et al. 2010); computer attributes, culture, and computer access (Capan 2012); subject domain and has personal computer (Teo 2006); self-efficacy (Lee and Tsai 2010); level of computer competences (Albirini 2006; Capan 2012); teacher training (Li et al. 2019); and computer anxiety (Celik and Yesilyurt 2013).

Furthermore, there are some computer technology related variables which has found to have good impact on self-efficacy in using ICT or computer technology, such as computer experience (Topkaya 2010; Paraskeva et al. 2008; Robertson and Al-Zahrani 2012), frequency of use and possessing a computer (Topkaya 2010); teaching experience in integrating technology (Han et al. 2017; Lailiyah and Cahyono 2017); computer anxiety (Celik and Yesilyurt 2013); self-esteem and computer training (Paraskeva et al. 2008); professional development academy on technology skills / computer skills (Brinkerhoff 2006); computer access and computer qualification (Robertson and Al-Zahrani 2012).

Inspired by these theories and previous studies, the present study was anchored on the concepts presented above. This study was point out the theory of teachers' attitude in using ICT includes, affective, perceived usefulness, perceived control and behavioral intention component; and the theory of self-efficacy in using ICT for learning. Meanwhile, for the predictor variables, the researcher limited and focused only on a few variables, such as length of computer use (Teo 2008), computer competencies (Albirini 2006; Capan 2012), computer access (Capan 2012), computer training (Li et al. 2019), and frequency of using computer programs (Al-Zaidiyeen et al. 2010) identified as independent variables. Table 1 describes the previous study which connected the dependent and independent variables. Therefore, the researchers were motivated to conduct the study about the relationship among those predictor variables toward teachers' attitude and self-efficacy in utilizing ICT. Lastly, Researchers also look at which variables could be predictors of attitude and self-efficacy in using ICT. The framework of this study is shown in Fig. 1.

- H1—Predictor variables such as length of computer use, computer competences, computer access, computer training and frequency of using computer program predict teacher's self-efficacy in using computer.

Table 1 Previous studies supporting research hypotheses

Hypothesis		Previous study
H1	Length of computer use Computer competence Computer access Computer training Frequency of using computer program	→ Attitude Teo (2008) Albirini (2006) and Capan (2012) Capan (2012) Li et al. (2019) Al-Zaidiyeen et al. (2010)
H2	Length of computer use Computer competence Computer access Computer training frequency of using computer program	→ Self-Efficacy Paraskeva et al. (2008), Topkaya (2010) and Robertson and Al-Zahrani (2012) Brinkerhoff (2006) Robertson and Al-Zahrani (2012) Brinkerhoff (2006), Paraskeva et al. (2008) Topkaya (2010)
H3	Attitude	↔ Self-Efficacy Celik and Yesilyurt (2013)

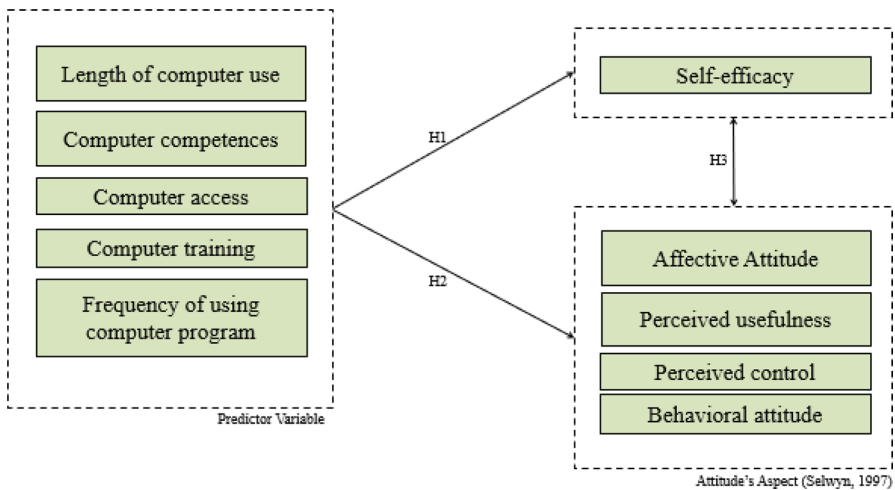


Fig. 1 Framework and hypotheses of the current study

- H2—Predictor variables such as length of computer use, computer competences, computer access, computer training and frequency of using computer program predict teacher’s attitude toward computer.
- H3—There is a positive correlation between teacher’s self-efficacy and teacher’s attitude on utilizing computer for learning process.

Methods

Research design

The descriptive and correlation research designs were employed in the current study. Descriptive research generally concerns with the conditions for relationships that exist, practices that are established, processes that exert no effort, and trends that are developing (Creswell 2003). Descriptive research is often used as a precursor to quantitative research designs, the general overview giving some valuable pointers as to what variables are worth testing quantitatively. Correlation research is concerned with establishing relationships between two or more variables in the same population or between the same variables in two populations (Leedy and Ormrod 2005). In this study, descriptive design was used to describe the socio-demographic teachers, their profile related to computer technology variables, and their attitude and self-efficacy toward computer technology. Meanwhile, correlational design was used to explore the relationship between predictor variables toward teachers' attitudes and self-efficacy toward computer technology.

Participants

Using survey method and simple random sampling technique, a total of 345 in-service teachers participated in this study. In this study, all teachers from public junior and senior high school in Jambi City, from all subject categorized as the population of this study. In this study, the selected schools have good accreditation where these schools have good ICT standards as well. Table 2 presents the relevant profile of the participants. For the subject taught, researchers divide into several sections based on the lessons taught by each respondent and are also classified as relevant and applicable in Indonesia. Furthermore, survey shows that mostly respondents were used computer in interval years between six to ten years (44.35%), have moderate competence (75.10%), have habit two or three time in using computer for a week (28.70%), do not have training and course in using computer during pre/in-service teacher (49.27%), and have habit once a week in access several computer apps that provided (41.16%).

Instruments

In this study, there are three parts of instrumentation that have been administered. Part I contains the questionnaire of attitudes toward computer questionnaire which has developed by Selwyn (1997), and this current study adopted that scale. In this questionnaire, there are 25 items which divided into four dimensions, such as: affective component (six items), perceived usefulness component (five items), perceived control component (six items), behavioral intention component (four items).

Part II includes 16 items regarding teachers' self-efficacy in utilizing computer used a Computer Technology Integration Survey (CTIS) scale developed

Table 2 Profile of respondents

Profiles	Frequency ($n = 345$)	Percentage (%)
Sex		
Male	102	29.6
Female	243	70.4
Type of School		
Senior High School	135	39.1
Junior High School	210	60.9
Subject taught		
Natural Science	75	21.74
Mathematics	38	11.00
Social Science	75	21.74
Languages	54	15.65
Art and Sport	37	10.72
Religious	23	6.67
Humanities	50	14.49
Length of Computer use		
1–5 years	44	12.75
6–10 years	153	44.35
11–15 years	102	29.57
16–20 years	36	10.43
More than 20 years	10	2.90
Competency level in using computer		
No competence	9	3.67
Little competence	77	31.43
Moderate competence	184	75.10
High competence	75	30.61
Access level in using computer		
Never used	21	6.09
Once a month	72	20.87
Once a week	59	17.10
2 or 3 times a week	99	28.70
Daily	94	27.25
Have training / course in ICT (computer)		
Do not have at all	170	49.27
Have training during in-service	54	15.65
Have course during pre-service	86	24.93
Have both training / course during in/pre-service	35	10.15
Level of using computer's program/apps		
Never used	17	4.93
Once a month	74	21.45
Once a week	142	41.16
2 or 3 times a week	97	28.12
Daily	15	4.35

by Wang et al. (2004). The teachers have been to answer the questions which regarding to possibly affecting their self-efficacy in integrating computer into the learning process. The questions of both scale, part I and part II, answered through five interval scale such as, 1—Strongly Disagree, 2—Disagree, 3—Neutral, 4—Agree, 5— Strongly Agree. Table 3 presents the reliability of research instruments related to attitude and self-efficacy based on Cronbach's alpha coefficient.

Part III deal with the predictor variables such as: length of computer use, computer competences, computer access, computer training during pre-service and in-service, and level of frequency of using a computer program or application. Some variables have been adopted from Albirini (2006) such as computer competence and computer access meanwhile training in using computer, meanwhile length of computer use and level of frequency of using computer program/application have been added by researcher based on some previous studies (see Table 4). To get length of computer use, the researcher asks a question in the form of how long the respondents have used the computer (in year/s). After that, related with competency, researchers asked the respondents with self-assessment toward themselves how expert them in doing some activity related with computer, such as install new software on a computer, use a printer, and etc. (in four scale such as 1—no competence, 2—little competence, 3—moderate competence, and 4—high competence). Computer access was used to look at how often the teachers use computers, such as at home, or at school, with five option scale, such as 1—never used, 2—once a month, 3—once a week, 4—2 or 3 times a week, and 5—daily. For the training in using computers, researchers asked the teachers whether they have computer course/training during their college program or after they become professional teachers. Lastly, the level of frequency of using computer programs/applications was used to look at how often teachers use computer apps/programs, like word processing (e.g., M.S Word), spreadsheets (e.g., Ms. Excel), and others (obtain through the five scale option, such as 1—never used, 2—once a month, 3—once a week, 4—2 or 3 times a week, and 5—daily).

Table 4 shows the instruments related to the predictor variables distributed to participants.

Data analysis

Descriptive statistics such as frequency, percentages, mean, and standard deviation were used to analyze the data regarding the profile of the respondents, their attitude toward ICT, their self-efficacy in integrating ICT, and the predictor variables. Moreover, the Pearson product-moment correlation was employed to test the relationship between predictor variables toward teachers' attitude and self-efficacy in using ICT. Series of hierarchical regression analyses were performed to determine if the predictor variables predict teachers' attitude and self-efficacy in using ICT, controlling for sex (Sieverding and Koch 2009; Alam and Halder 2017) and high school level (Koh et al. 2010).

Table 3 Research Instruments related to attitude and self-efficacy variable

Variables	Source	Sample item	Total of items	Reliability	
				Original study	Current Study
Attitude	Selwyn (1997)				
Affective attitude		Using a computer does not scare me at all	6	0.94	0.77
Perceived usefulness		Computers help me organize my work better	5	0.94	0.75
Perceived control		If I get problems using the computer, I can usually solve them one way or the other	6	0.95	0.70
Behavioral attitude		I will use computers regularly throughout school	4	0.88	0.73
Self-Efficacy	Wang et al. (2004)	I feel confident that: I have the skills to use the computer for instruction	16	0.96	0.85

Results

In this part the quantitative results which were obtained from predictor variables questionnaire, Attitude Scale, and Self-Efficacy Scale are presented. This part showed the results obtained such as, description of teachers' attitude and self-efficacy toward computer technology; correlation between predictor variables, attitude, and self-efficacy; hierarchical regression analysis of predictor variables toward attitude; and hierarchical regression analysis of predictor variables toward self-efficacy.

Description of teachers' attitude and self-efficacy toward computer technology

Table 5 shows teachers' attitude in using computer technology with overall mean is $\bar{x}=3.67$ ($SD=0.42$), which is categorized as "very good." It is also made clear by the four indicator such as affective, perceived usefulness, perceived control and behavioral intention components that get the "very good" category, followed by 17 items get "very good" category, 3 items get "good" category, and 1 statement gets the "excellent" category. One statement that gets an excellent category is "Computers help me to organize my work better," with mean $\bar{x}=4.21$, $SD=0.87$. From this statement, we can draw the conclusion that most teachers are greatly helped by the existence of computers, where the teachers assume that computers will greatly facilitate their work as teachers.

Furthermore. Statement that get lowest mean is "I don't need someone to tell me the best way to use a computer" ($\bar{x}=3.18$, and $SD=0.98$). From this statement, it can be concluded that most teachers do not like being given input in

Table 4 Research instruments related to predictor variables

Variables	Source	Sample item	Total item
Length of computer use	Added by researchers based on a study by Teo (2008)	On average, how long have been you using the computer? please specify the number of years (.....year/s)	
Computer competences	Albirini (2006)	Install new software on a computer	15
Computer access,	Albirini (2006)	Please identify how often you have computer access in the following context 1. In your home 2. At school (computer lab or library) 3. Other (like internet cafes, etc.)	3
Pre-service and In-service training on computer	Modified by researchers based on a study by Alhassan (2017) study	Instructions: Please put a tick (√) in the appropriate answer 1. Have you taken any computer course/subject during your undergraduate /BS degree <input type="checkbox"/> Yes <input type="checkbox"/> No 2. a) If “yes,” have you attended other training on computer (e.g., workshop, seminar, etc.)? <input type="checkbox"/> Yes <input type="checkbox"/> No b) If “No,” have you attended any training on computer (e.g., workshop, seminar, etc.)? <input type="checkbox"/> Yes <input type="checkbox"/> No 3. from number 2 (a/b), if “yes,” please specify the number of hours and / or days: days / hours	3
Level of frequency of using computer program/application	Added by researcher based on Topkaya (2010) study	Please indicate your level of frequency of using each of the followings programs/application, such as: word processing (e.g.: Ms. Word), etc	10

using computers, whereas if someone is willing to accept input from others of course, it will be very good to be heard, wherewith the input his performance can be get increased (Joeng and Turner 2015). This also applies to the use of computer technology by the teacher, where if they wants to receive and apply input by others who understand the computer, it can improve their quality in using the computer.

Based on Table 6, it found that the overall mean of the teachers’ self-efficacy toward computer technology is $\bar{x}=3.65$ ($SD=0.45$), which is categorized as “very good,” This is also made clear by the sixteen statements that received the “very good” category. Of the sixteen statements, there is item that get the highest mean, item number 2, with the statement, “I feel confident that I have the skills necessary to use the computer for instruction” ($\bar{x}=3.88$, $SD=0.83$). And the item that get the lowest mean, such as item number 5 with the statement “I feel confident that I can use correct computer terminology when directing students’

computer use,” with a mean of $\bar{x}=3.42$ and $SD=0.83$. Nevertheless, it is still categorized as very good. It is known that most respondents felt confident that their abilities and strategies in utilizing computer technology in learning. It is very good for teachers, where utilizing technology especially computers in learning is very important, it can facilitate the work of teachers in delivering the lesson to the students (Wright and Wilson 2005). Teachers who can use computers or other technologies very skillfully will certainly have a good learning process, in this way expected to achieve optimal learning outcomes.

Correlation analysis between predictor variables, attitude, and self-efficacy

Pearson product-moment correlation (Table 7) was used to look at how the relationship between teachers’ computer-related variables such as length of computer use, computer competencies, computer access, training in computers, and level of frequency of using computer program/application; toward teachers’ attitude and self-efficacy in utilizing computers. Furthermore, the Pearson product-moment also showed the result of the relationship between teachers’ attitudes and teachers’ self-efficacy in using computers.

Pearson correlation (Table 7) shows that all of the predictor variables are positively related to all the components of attitude: length of computer use ($r=0.13-0.34$), computer competence ($r=0.33-0.46$), computer access ($r=0.26-0.45$), training in computer ($r=0.12-0.32$), and level of using computers program ($r=0.31-0.52$). Similarly, the predictor variables are all positively related to self-efficacy ($r=0.13-0.49$). Finally, all the components of attitude are positively related to self-efficacy ($r=0.40-0.58$).

Predictor variables of attitude towards computer

Hierarchical regression analysis in Table 8 shows that about 6.1% of the variances in teachers’ attitude toward computer was explained or accounted for by sex and high school level (Model 1). Male teachers ($t=2.563$) and those teaching in junior high school ($t=-4.07$) tend to have a favorable attitude toward ICT use. Meanwhile, Model 2 accounts for about 46.2% of the variance in teachers’ attitudes toward computer. Controlling for sex and school level, the result shows that teachers with higher levels of computer competencies ($t=2.513$), more frequent computer access ($t=4.735$), more training in computers ($t=3.592$) and use computer applications more often ($t=3.592$) are more likely to have a favorable attitude in using ICT.

Predictor variables of self-efficacy in using ICT

Results show that Model 1 is not significant. Meanwhile, Model 2 accounts for about 35.7% of the variance in teacher’s self-efficacy in using ICT. Computer competencies ($t=4.392$), training in computer ($t=4.298$) and level of using computer program ($t=6.415$) are positive predictors of self-efficacy in ICT use (Table 9).

Table 5 Teachers' attitude in using computer technology

No.	Item	Mean	SD	Description
	Indicator: Affective Component			
1	Whenever I use a computer, I am afraid that I might damage it in some way.*	3.71	0.55	Very good
2	I hesitate to use a computer for fear of making mistakes I can't correct*	3.66	1.09	Very good
3	I don't feel afraid about using a computer	3.56	1.02	Very good
4	Computers make me feel uncomfortable*	3.71	0.93	Very good
5	Using a computer does not scare me at all	3.91	0.90	Very good
6	I hesitate to use a computer in case I look stupid*	3.69	0.92	Very good
	Indicator: Perceived Usefulness			
7	Computers help me to organize my work better	3.71	1.04	Very good
8	Computers make it possible to work more productively	3.91	0.54	Very good
9	Computers can allow me to do more interesting and imaginative work	4.21	0.87	Excellent
10	Most things that a computer can be used for I can do just as well myself*	3.93	0.78	Very good
11	Computers can enhance the presentation of my work to a degree which justifies the extra effort	3.81	0.87	Very good
	Indicator: Perceived Control			
12	I could probably teach myself most of the things I need to know about computers	3.77	1.05	Very good
13	I can make the computer do what I want it to	3.83	1.08	Very good
14	If I get problems using the computer, I can usually solve them one way or the other	3.52	0.48	Very good
15	I am not in complete control when I use a computer*	3.81	0.88	Very good
16	I need an experienced person nearby when I use a computer*	3.61	1.01	Very good
17	I do not need someone to tell me the best way to use a computer	3.29	0.95	Good
	Indicator: Behavioral Intention			
18	I would avoid taking a job if I knew it involved working with computers*	3.69	0.96	Very good
19	I avoid coming into contact with computers in school*	3.56	0.98	Very good
20	I only use computers at school when I am told to*	3.18	0.98	Good
		3.54	0.60	Very good
		3.74	0.95	Very good
		3.63	0.96	Very good
		3.33	1.05	Good

Table 5 Continued

No.	Item	Mean	SD	Description
21	I will use computers regularly throughout school	3.47	0.88	Very good
	Overall Mean	3.67	0.42	Very good

1.00 – 1.80 = Poor

1.81 – 2.60 = Fair

2.61 – 3.40 = Good

3.41 – 4.20 = Very good

4.21 – 5.00 = Excellent

*Reversed coded items

Table 6 Teachers' self-efficacy toward computer technology

No.	Item	Mean	SD	Description
1	I feel confident that I understand computer capabilities well enough to maximize them in my classroom	3.79	0.81	Very Good
2	I feel confident that I have the skills necessary to use the computer for instruction	3.88	0.83	Very Good
3	I feel confident that I can successfully teach relevant subject content with appropriate use of technology	3.66	0.73	Very Good
4	I feel confident in my ability to evaluate software for teaching and learning	3.67	0.75	Very Good
5	I feel confident that I can use correct computer terminology when directing students' computer use	3.42	0.83	Very Good
6	I feel confident I can help students when they have difficulty with the computer	3.55	0.85	Very Good
7	I feel confident I can effectively monitor students' computer use for project development in my classroom	3.46	0.84	Very Good
8	I feel confident that I can motivate my students to participate in technology-based projects	3.62	0.78	Very Good
9	I feel confident I can mentor students in appropriate uses of technology	3.63	0.83	Very Good
10	I feel confident I can consistently use educational technology in effective ways	3.56	0.88	Very Good
11	I feel confident I can provide individual feedback to students during technology use	3.78	0.72	Very Good
12	I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning	3.62	0.80	Very Good
13	I feel confident about selecting appropriate technology for instruction based on curriculum standards	3.77	0.79	Very Good
14	I feel confident about assigning and grading technology-based projects	3.77	0.82	Very Good
15	I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices	3.74	0.89	Very Good
16	I feel confident I can be responsive to students' needs during computer use	3.58	0.77	Very Good
	Overall mean	3.65	0.45	Very Good

1.00 – 1.80 = Poor

1.81 – 2.60 = Fair

2.61 – 3.40 = Good

3.41 – 4.20 = Very good

4.21 – 5.00 = Excellent

Discussion and conclusion

In this study, our focus was to look at factors that could influence high school teachers' attitudes and self-efficacy in using ICT. However, before we discuss in more detail the variables that can affect teachers' attitudes and self-efficacy, we explore quantitatively how teachers' attitudes and self-efficacy themselves were based on the questionnaire used. First, the findings show that teachers, on average, have a highly positive attitude toward the use of ICT in learning. This finding is not much different from several studies which found that teachers have positive attitudes toward the use of ICT (Mwila 2018; Ndibalema 2014; Sánchez et al. 2012; Semerci and Aydin 2018; Tezci 2010). In Indonesia, several studies have tried to explore how teachers have an attitude toward the use of technology in learning. Haryanto (2021), in his study exploring English teachers' attitudes toward using ICT, found that teachers have a positive attitude toward the use of ICT. Following that, a recent study report by Subekti and Kurniawati (2022) investigated English teachers' attitudes toward the use of technology during the COVID-19 outbreak. Their study found that, generally, English teachers have positive attitudes toward the use of technology in English online classes. However, they found that there were ambivalent attitudes among the teachers toward ICT during online classes, where more than half of the participants felt they failed to use technology and did not believe that technology made their classes more effective.

Second, the findings also revealed that high school teachers have a high level of self-efficacy toward the use of ICT. This finding is consistent with previous research on teachers' self-efficacy toward technology (Durak 2021; Giles and Kent 2016; Šabić et al. 2022; Simsek and Yazar 2017; Yalcin et al. 2011). However, only a study by Simsek and Yazar (2017) directly describes high school teachers' self-efficacy toward technology, while the others focus less on high school teachers. Furthermore, there were few studies related to teachers' self-efficacy toward the utilization of ICT in Indonesia. Yet, none of those studies have directly looked at the self-efficacy of high school teachers toward the use of ICT. For example, Lailiyah and Cahyono (2017) found that teachers' self-efficacy toward technology was in the "good" remark category, and the results of the study showed that the level of teachers' self-efficacy was slightly lower than our study. However, their study focused more on English Foreign Language (EFL) teachers. After that, another study by Ekawati et al. (2021), which focused on teachers' self-efficacy towards web-based professional development practices, found that the majority of the participants had a high level of self-efficacy. However, the participants of their study were teachers that taught a specific subject and included all levels of teachers, such as elementary, junior high, and senior high school teachers.

Furthermore, regarding the investigation of the relationship among the predictor variables such as length of computer use, computer competences, computer access, computer training, and frequency of using computer program, with teachers' attitude and self-efficacy in utilizing ICT. Based on the findings, length of computer use had a positive relationship to all components of attitude, and self-efficacy. This indicates

that teachers who experience using computer longer have higher attitude and self-efficacy in using ICT for learning process, similar to the findings of Teo (2006) on attitude and Teo (2008) on self-efficacy. Better attitude and self-efficacy could be due to the habits that the person has developed so that the use of the computer becomes very familiar and they reached peak level in utilizing computer technology resources (Eret and Ok 2014).

Computer competencies also have a positive relationship with the four components of attitude and self-efficacy. This indicates that respondents who have a high level of competence in the use of computers have favorable attitudes and high self-efficacy towards computer technology, similar to the findings of Albirini (2006) and Shih (2006). Furthermore, computer access is positively related to attitude and self-efficacy. Teachers who frequently access computers have favorable attitudes and self-efficacy toward utilizing computer technology and ICT in the learning process. This finding supports the study of Brinkerhoff (2006), indicating that the more often teachers access the computer be it at home, at school or any other place, their attitudes and self-efficacy towards the computer technology is higher. Frequent access to computers and other IT technology makes teachers accustomed to operating the technology and applications that exist in that technology. By frequently accessing computer technology (Graham et al. 2009; Dange 2010), teachers will have a high level of confidence and optimism in using any technology, which can also have an impact on the attitude and self-efficacy of the teacher in utilizing ICT and computer technology for learning processes. In addition, Victor et al. (2020) explained that computer competency needs to be obtained along with changes in technology and time. And there is improvement in technology over time that require teachers to accept and adopt.

The Finding also shows that teachers’ training/courses in computers during pre-service and in-service programs are positively correlated with attitude and self-efficacy. Teachers who had computer training either in undergraduate programs or

Table 7 Pearson correlation between predictor variables, attitude and self-efficacy

Variables	(6)	(7)	(8)	(9)	(10)
Predictor variables					
(1) Length of computer use	0.34**	0.17**	0.13*	0.23**	0.13*
(2) Computer competence	0.38**	0.37*	0.46**	0.33**	0.44**
(3) Computer access	0.26**	0.26**	0.33**	0.45**	0.19**
(4) Training in computer	0.32**	0.32**	0.28**	0.12*	0.37**
(5) Level of using computer’s program/apps	0.41**	0.31**	0.52**	0.51**	0.49**
Attitude components					
(6) Affective					0.51**
(7) Perceived usefulness					0.40**
(8) Perceived control					0.53**
(9) Behavioral intention					0.58**
(10) Self-efficacy					

Table 8 Regression coefficients of the predictor variables on attitude in using ICT

Model	Predictor variable	B	Std. error	<i>t</i>	P
1	(Constant)	3.768	0.090	42.044	0.000
	Sex	0.125	0.049	2.563	0.011
	High school level	- 0.185	0.045	- 4.070	0.000***
2	(Constant)	2.590	0.115	22.542	0.000
	Sex	- 0.004	0.038	- 0.111	0.912
	High school level	- 0.240	0.040	- 6.044	0.000
	Length of computer use	0.004	0.004	0.917	0.360
	Computer competences	0.117	0.047	2.513	0.012*
	Computer access	0.138	0.029	4.735	0.000***
	Training in computer	0.064	0.018	3.592	0.000***
	Level of using computer's program/apps	0.177	0.032	5.527	0.000***

Model 1 = $R^2 = 0.061$, $F_{(2,342)} = 11.042$, $p < 0.001$

Model 2 = $R^2 = 0.462$, R^2 Change = 0.401, $F_{(7,337)} = 41.268$, $p < 0.001$

***Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$

Sex = 0 – Female, 1 – male; High school level = 0 – JHS, 1 – SHS

in-service programs tend to have a good attitude and self-efficacy toward utilizing computer technology in the learning process. A previous study by Albirini (2006), also revealed that participants in his study who have professional training in computer or ICT tend to have good confidence or self-efficacy in using computers or other technology. Lack of training or exercise affects a person's confidence and self-efficacy in doing or using a computer, whereas someone who has a lack of training tends to have less confidence and self-efficacy in using computers (Hiçde et al. 2014).

Lastly, the findings show that the level of frequency of using computer programs or applications is positively related to attitude and self-efficacy, which indicated that the respondents who often use applications or programs on a computer were more likely to report higher scores in attitude and self-efficacy toward computer technology. Teo (2006) with his study has found that teachers who often use computer applications tend to get a high score in attitude and self-efficacy toward the computer. This finding is closely related to a person's habits, preferences, and frequency in repeating something, including using computers and applications therein. Someone who is accustomed to or has good habits in using something tends to have good self-efficacy towards something that is used (Wang et al. 2013), which in this finding related to the use of computers and computer applications by teachers.

Predictor variables of teachers' attitude in using computer technology

Computer competences, computer access, training/course in computer during pre-service and in-service and level of frequency of using computer program/application

Table 9 Regression coefficients of the predictor variables on teacher's self-efficacy in using ICT

Model	Predictor variable	B	Std. error	<i>t</i>	<i>p</i>
1	(Constant)	3.756	0.098	38.502	0.000
	Sex	0.030	0.053	0.572	0.567
	High school level	- 0.101	0.049	- 2.038	0.042*
2	(Constant)	2.461	0.133	18.458	0.000
	Sex	- 0.079	0.044	- 1.782	0.076
	High school level	- 0.046	0.046	- 1.007	0.315
	Length of computer use	- 0.007	0.005	- 1.431	0.153
	Computer competences	0.237	0.054	4.392	0.000***
	Computer access	- 0.054	0.034	- 1.590	0.113
	Training in computer	0.088	0.021	4.298	0.000***
	Level of using computer program/apps	0.238	0.037	6.415	0.000***

Model 1 = $R^2 = 0.013$, $F_{(2,342)} = 2.184$, $p > 0.05$

Model 2 = $R^2 = 0.357$, R^2 Change = 0.344, $F_{(7,337)} = 26.680$, $p < 0.001$

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$

Sex = 0 – Female, 1 – Male; High school level = 0 – JHS, 1 – SHS

are positive predictors of teacher's attitude in using computer technology, which indicates, the teacher who has good computer competences, often access computer, has computer training/course and often utilize various applications or programs on the computer tend to exhibit higher attitude toward utilizing computer technology in the learning process.

Computer access and level of frequency of using computer programs/applications could be influenced by habits, where if someone is accustomed to doing something, in this case, respondents who have good competence towards computer use, tend to have good attitudes towards computer utilization, especially in learning (Mackare and Jansone 2018). Albirini (2006). Meanwhile, the current study corroborates the study by Torkzadeh and Van Dyke (2002) that respondents who had training in computers tended to have good attitudes toward computer or ICT utilization.

Predictor variables of teachers' self-efficacy in using computer technology

Findings showed that computer competencies, training in computers, and level of using computer programs or applications, are positive predictors of teachers' self-efficacy in using computers. It indicates that teachers who have high computer competencies, had taken undergraduate programs for related ICT and ICT training during in-service teachers, and often use applications/programs on computers tend to be more efficacious in using computers for the learning process. These findings are the same as those obtained by research conducted by Shih (2006) which found that computer competence is a good predictor of self-efficacy in using the computer. In terms of training, someone who has taken a computer-related course is accustomed to and

can use a computer compared to someone who has no computer or ICT-related subjects during his bachelor's degree. This also applies to someone who has attended a training program in using computers or ICT, which person is accustomed to using computers or ICT (Karagiorgi and Charalambous 2006), which can result in the person having good self-efficacy in computer use. Finally, respondents who frequently use various applications or programs on the computer tend to get a higher score in self-efficacy in using the computer. If someone is accustomed to doing something, then he would perceive that doing it is easy and successful (Brinkerhoff 2006).

Limitations and recommendation

In summary, the results of this study could be useful for the related department, policymaker, principal, or even the teachers themselves, in knowing and refining from computer-related variables including length of computer use, computer competencies, computer access, computer training, and frequency of using computer programs, as well as teachers' attitude and self-efficacy in utilizing ICT for the learning process. However, to get maximum results and in-depth analysis, further research is needed. This study is only limited to self-report measures of attitude and self-efficacy. Further studies could examine actual knowledge and skills in ICT application/integration. As perceptions are prone to measurement biases, a competency-based assessment could be adopted to measure if positive attitude and high levels of self-efficacy can influence skills, which are more observable and valid evidence of ICT application. The study is limited to one city, such as Jambi City, the capital city of Jambi Province, which means it is limited only to an urban area. Further study can include in-service teachers in suburban and rural areas, as well as further study, may have more comprehensive that include many cities or districts.

Conclusion

This study focused on determining from some variables such as length of computer use, computer competencies, computer access, computer training, and frequency of using computer programs, as predictors or not of teachers' attitude and self-efficacy in utilizing ICT for their learning process. The finding shows the predictor variables had a significant and positive relationship with all four components of teachers' attitudes as well as teachers' self-efficacy. Related to predictors of teachers' attitudes in using ICT, computer competencies, computer access, training in computers, and level of using computer programs has found as good predictors of teachers' attitudes, meanwhile, for teachers' self-efficacy only computer competencies, training in computer, and level of using computer program/apps which found as good predictors. The findings that have been obtained in this study has a good impact on knowing how the teachers' attitude and self-efficacy in utilizing ICT and it might be useful input for the relevant department, policymaker, school principal, teachers

themselves, and other. This input could be used to improve the implementation of ICT in the learning process by the teachers with relevant strategies, such as add more training or professional development in using ICT, improve the ICT facilities at school, and ICT must be continued and further applied by teachers in the learning process in schools.

Acknowledgements Our thanks go to the Department of Education and Culture, both of Jambi City and Jambi Province, for their support and permission in this study, and to all teachers who have participated in this study.

Authors contribution In this study, the first author was involved in several roles, such as conceptualization, methodology, validation, formal analysis, investigation, resources, and data curation. Meanwhile, the second author has roles in conceptualization, methodology, visualization, and supervision. All authors approved the final manuscript.

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability The authors provide access to data for any who are interested in this study. Kindly contact the corresponding author for data transparency and availability.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The authors declare that this study has followed applicable research ethics. This study obtained approval from relevant stakeholders, such as the Department of Education, Jambi City, and Jambi Province. Furthermore, all participants have been given informed consent and agreed to take part in this study.

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