Teacher Development Strategies on Technology Usage in Line with Educational Technology Standards under the Secondary Educational Service Area Office 3, Thailand

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Article History
Received: 4 June 2019 **Revised:** 4 July 2019 **Published:** 30 September 2019

Abstract
This mixed-method research aimed to propose development strategies on technology usage in line with the educational technology standards in schools under the Secondary Educational Service Area Office 3. A sample of 350 was randomly selected from school administrators and heads of learning standard of the schools. The tool used was a questionnaire constructed by the researcher, with validity indexes ranging from 0.60-1.00, and Cronbach's alpha coefficient of 0.82. The data were analyzed in terms of percentage, mean, standard deviation, $PNI_{Modified}$, and content analysis.The proposed development strategies 3 consisted of four major strategies: 1) strategy of need assessment for teacher professional development in using technology, 2) strategy of design for teacher development in technology usage, 3) strategy of teacher professional development using technology, and 4) Strategy for evaluating teacher professional development.
Keywords: Strategy, Teacher Development, Technology, Educational Technology Standards

Statement of the Problems
Importance of information and communication technologies is currently emphasized in countries around the world since it affect Educational development. Where technology has not been readily available or it's in its slow pace, educational output will be low and cannot compete with some other countries which modern technologies are widely used in the 21st century. News and information are delivered or in contacted with the advancement of technology and communication.

Therefore, each country around the world take into consideration to invest in modern technology in order to develop its country based on knowledge and advanced technologies. According to the National Economic and Social Development Plan, Vol. 12 (2017-2021), immunity in different dimensions, and balance, strong and sustainable growth needed to be created as foundation for the development of the country (Office of the Director of the National Economic and Social Development, 2016). Giving priorities to integrate technology as a tool to communicate and build relationships, make the news and information flow among involved parties to mutual understanding that matches correctly. This leads to preparation of human resource development in the areas of academic knowledge, skills, creativity, positive attitude, social responsibility, discipline, ethics, moral, encouragement, and aims of life (Suttilertarun, 2007). This has to be done in accordance with educational technology development to by supporting teachers and educational personnel to acquire knowledge, ability and skills in the use of technology production and innovation development. Research and technological development appropriate to the learning process of teachers and educational personnel, and students should be encouraged to safeguard educational technology usage for self-directed as well as continuous and lifelong knowledge seeking (Ministry of Education, 2010).

From the study of technology usage on teaching process, most teachers use electronic media computer technology, multimedia via Wi-Fi network, including active learning techniques, exchange of knowledge through professional learning community (PLC) by means of information and communication technology (ICT) from which administrators, teachers, learners and communities can communicate by online network devices and printing media. However, technologies have been developed so rapidly that cause impacts on the curriculum standards. Although there have been educational reforms according in line with the government policies (Suyaprom and Manmee, 2018), there still be understanding limitation, learning resources access problems, rejection of all forms of technology usage. Consequently, production and design of media that are suitable for learner development cannot be of effective (Yamkasikorn, Jiraro and Phothong, 2016). Therefore, educational reform to encourage the teachers to motivate self-development and boost potential use of technology ranging from learning basic technology, designing, applying, and distributing, to creating expertise on using technology for education is a must (UNESCO, 2010). As of the educational technology standards as prescribed by the Association for Educational Communications and Technology (AECT, 2000), Canada uses technology to sciences teaching, educational reform, and human resource development (Council of Canadian Academies, 2012); France uses technology to design online lessons, enabling learners to develop their own learning abilities and self-directed learning, and to support interaction between learners and instructors (Johnson, McHugo, Hall, 2006); Finland uses technology to support learning in accordance with the environment and to improve quality of education in that the teachers development emphasizing on helping children to be thinkers and readers (Porter-Magee, 2012 cited in the Secretariat of the Education Council, 2016). At present, China places the importance of technology on improving the quality of education for being leaders in artificial intelligence by designing textbooks on AI to support robotics and artificial intelligence in the future (Thepaper.cn, 2019). Meanwhile, the United Kingdom uses technology for education and research in the Internet of Things: IOT (Prachachat Business, 2017) to control various devices through the worldwide internet network (Haseeb, Hussain, Slusarczyk and Jermsittiparsert, 2019) resulting in learners learning together, stimulate self-learning and help to solve problems. Therefore, promoting education in the technology world in the present day, there must be development of teachers as a basis for further development of learners.

Obviously, many countries have brought technology to education reform originated by the United States Educational Communications and Technology Association (AECT, 2000) which established the technology standards for education as a guideline for teacher development on using technology that affects learners' development to develop learning skills of effective learning achievement. The

researcher was, therefore interested in formulation of strategies and guidelines consistent with the teacher development process covering such areas as assessment of teacher development needs for educational technology usage, of designs for teacher development on educational technology usage, of teacher development on educational technology usage, and of assessment of teacher development on educational technology usage affecting important skills for the 21st century.

Research Objectives

The research objectives were to develop and propose strategies of the teacher development strategies on technology usage in line with the educational technology standards in schools under the Secondary Educational Service Area Office 3.

Literature Review

The researcher reviewed related literature for understanding of concepts and theories essential to the topic which cover such areas as: human resource development processes, educational technology standards, and strategic management process.

Human resource development process

The human resources development process is planned systematic stages of operations in the development of human resources. People get to experience and learn in a certain period of time to improve your ability to work, by means of training for knowledge, person's skills, production capabilities, and ability to work. Education is to increase knowledge, skills, attitudes, as well as to strengthen its ability to adapt oneself to work with others as needed by the organization. Development is the process of adjustment for readiness to woks. It begins with need assessment by analyzing both corporate mission and individuals. Finally, evaluation of the development process is done for feedback data necessary for further improvement of the process and diversification ranges of skills (multi-skilled). For this research, the concept of human resources development process, based on the concept of Werner & Desimone (2006); Fukijkarn (2013) and Tayossyingyong (2013), consisted of: 1) assess human resource development, 2) design practices, human resources development, 3) human resource development projects, and 4) project evaluation and human resource development.

Educational technology standards

Educational technology standards are concepts and theories represent a scope or technological concept specification that equip professional teachers with knowledge, skills, abilities, and work practices in order that they are able to design teaching system and teaching media that correspond to the content, the learning objectives, and students' characteristics. To produce widely accepted teaching media from available resources, rules, regulations, and social norms must be observed. Evaluation of the media is also required for modification that suits the learners. Synthesizing from those of the Association for Educational Communications and Technology: AECT (2000); Molenda and Januszewski (2008), and Williams Australia (2000), the educational technology standard contains: 1) design, 2) development, 3) utilization, 4) management, and 5) evaluation.

Strategic management process

Strategic management, the process of organizational achievement analyses, consists of three processes: 1) the processes of analyses, 2) of decisions, and 3) of actions (Dess, Lumpkin, and Taylor, 2005). Analyses of internal environment and external environment are for creation of a management strategies and the final evaluation of strategy implementation. This corresponds to the idea of strategic management of Coulter (2008); Kaplan and Norton (2005); Pearce and Robinson (2009); Thompson and Stickland (2003); and Wheelen and Hunger (2012). Four parts of these analyses are as follows. 1) Environmental scanning which is an analysis of external factors includes societal environment, and specific task environment, to find out positive environment dubbed as opportunities (O) and negative environment, or threats (T). Analyses of internal factors include organizational structure, organizational culture, and resources, to find out promising internal factors or strengths (S) and

negative internal factors or weakness (W). It is then summed up in terms of strengths and weaknesses, opportunities, and threats, or SWOT Analyses. 2) Strategy formulation determines mission and objectives which are the results that have to be completed. 3) Strategy implementation is a part where strategies and policies are converted to programs, budgets, and workflows. 4) Control and evaluation is the process of monitoring the implementation of the strategies to ensure sound practices.

Research Methods

This research was of a mixed method research. The population of 3,006 was administrators, teachers, and head of subject areas at secondary schools under the Secondary Educational Service Area Office 3. A sample size of 350 was determined by using tables of Krejcie and Morgan (1970), 95% confidence.

The research was carried out in three steps as follows.

Step 1, defining the concept of strategies on technology usage in line with the educational technology standards in schools under the Secondary Educational Service Area Office 3 based on the concept of Werner & Desimone (2006); Fukijkarn (2013) and Tayossyingyong (2013). It contained: 1) assessing human resource development needs, 2) designing human resources development projects, 3) implementing the designed human resource development projects, and 4), evaluating the implemented human resource development projects. The results were then synthesized with the concept, scope, technology, standards-based technology as specified by the Association for Educational Communications and Technology AECT) based on the concept of AECT (2000); Williams (2000); and Januszewski and Molenda (2008). Five aspects of the syntheses were: 1) design, 2) development, 3) utilization, 4) management, and 5) evaluation. The concepts of teacher development on technology usage for this study were: 1) assessing teacher needs for the development, 2) designing of teacher development, 3) implementing the designed development, and 4) evaluating the implemented development projects. The concepts of development strategies, followed those of Dess, Lumpkin and Taylor (2005); Kaplan and Norton (2001); Coulter (2005); Pearce and Robinson (2009) and Wheelen and Hunger (2012) involves three areas: 1) monitoring the environment, external and internal environment, 2) strategy, and 3) assessment strategy to set a framework for research, as shown on Figure 1.

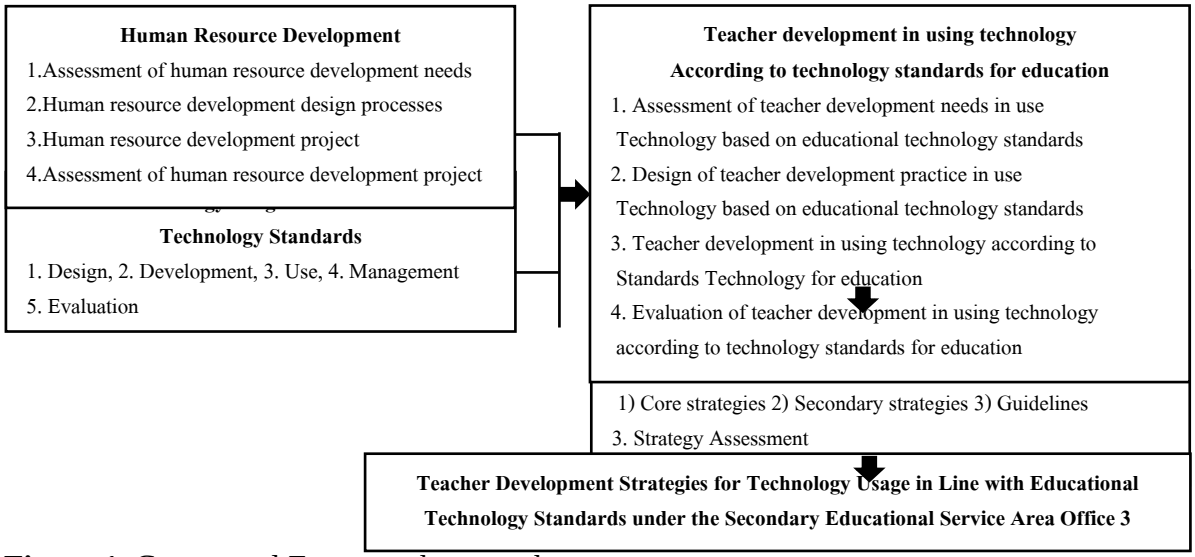

Figure 1. Conceptual Framework research

Step 2, studying existing condition, desirable condition, and teacher needs for technology usage in line with the educational technology standards in schools under the Secondary Educational

Service Area Office 3 by analyzing questionnaire responses by the sample. External condition consist of political and legal aspects, economic aspect, social aspects, and technological aspect, while internal condition consists of the structure, policies on service, personnel, finance-budget, material, equipment, and management.

The informants were the school administrators and heads of subject areas.

The tool used in the research was a questionnaire surveying existing conditions and desirable condition.

Data were analyzed by percentage, mean ($\bar{X}$), standard deviation (SD) and the $PNI_{Modified}$.

Step 3, developing teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3 as follows.

1. Analyzing strengths, weaknesses, opportunities, and threats from analyses of existing and desirable conditions, external and internal environment for teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3.
2. Developing the teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3 with TOWS Matrix and content analyses.
3. Evaluating the teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3 by organizing the focus group discussion emphasizing suitability and feasibility of the strategies.

The informants for the focus group discussion were eight qualified experts in the fields of educational administration, personnel development, strategy, and educational technology.

Research tools were assessment forms of suitability and feasibility of the drafted teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3.

Data analyses using mean, percentage, and content analysis.

Data collection

The researcher collected two types of data from the samples between July 15, 2018 and September 30, 2018. The quantitative data used a questionnaire containing demographic data, existing and desirable conditions of external environment and internal environment of the teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3, and free comments on the strategies. The questionnaire had minimum content validity values of 0.60 and reliability of 0.82. The qualitative research data were from the focus group discussion of eight experts.

Research Results and Discussion

The results of the proposed teacher development strategies on technology usage in line with educational technology standards under the Secondary Educational Service Area Office 3 consisted of four strategic issue, and 16 strategies as follows.

Table 1.

Strategy	Suitability		Possibility	
	$\bar{X}$	results	$\bar{X}$	results
Strategic issue 1: Assessing the needs for teacher development in the use of technology.	**4.49**	**much**	**4.14**	**much**
Strategy 1: Analyzing teacher development policies in using technology to be consistent with the national policy plan.	4.14	much	3.57	much
Strategy 2: Studying the needs for teacher development in using technology.	4.57	very much	4.28	much
Strategy 3: Analyzing needs and plan for the development of teachers in using technology.	4.28	much	4.00	much
Strategy 4: Assessing the need for teacher development in using technology.	5.00	very much	4.71	very much
Strategic issue 2: Designing teacher development in using technology.	**4.90**	**very much**	**4.42**	**much**
Strategy 1: Focusing on participation in the design of techniques for teacher development methods in accordance with the content, objectives and characteristics of developer.	4.86	very much	4.71	very much
Strategy 2: Improving the form of teacher development activities to be diverse.	5.00	very much	4.42	much
Strategy 3: Developing innovative media designs that are acceptable and not wrong to social law regulations.	4.86	very much	4.14	much
Strategic issue 3: Developing teachers to use technology	**4.97**	**very much**	**4.68**	**very much**
Strategy 1: Supporting the development of teachers in educational institutions.	4.85	very much	4.14	much
Strategy 2: Promoting production and develop teachers to be proficient in using technology to organize teaching and learning processes.	5.00	very much	4.57	very much
Strategy 3: Campaigning to use resources and develop innovative media using technology.	5.00	very much	4.57	very much
Strategy 4: Creating a network and strengthen the teamwork culture.	5.00	very much	4.85	very much
Strategy 5: Strengthening the cultivation of moral values and ethics have discretion in using technology.	5.00	very much	4.85	very much
Strategy 6: Motivating teachers to develop themselves.	5.00	very much	4.85	very much
Strategic issue 4: Evaluating teacher development in using technology.	**5.00**	**very much**	**4.79**	**very much**
Strategy 1 : Creating appropriate evaluation criteria for teacher development.	5.00	very much	4.85	very much
Strategy 2: Adjusting the format of teacher development activities.	5.00	very much	4.57	very much
Strategy 3: Analyzing problems Teacher development activities.	5.00	very much	4.85	very much

From the research, summary and discussion of the findings were as follows.

Strategic issues 1: Assessing the needs for teacher development strategies on technology usage had overall suitability at the much level ($\bar{X}$=4.49) and possibility at a much level ($\bar{X}$=4.14), from which the strategy of assessing the needs for teacher development strategies on technology usage was ranked at the top with suitability at the very much level ($\bar{X}$=5.00) and possibility also at the very much ($\bar{X}$=4.71). These findings maybe because assessment of teacher development needs is the first step in the development that teachers must be assessed for their level of knowledge, skills and attitude which is a process that allows the activity designer to use the analyzed data for target activities development for solving problems and meeting the needs of teachers. This corresponded to Smith & Ragan (2005) that the needs assessment is a survey of past teaching problems is a process to know problems and gather information; it intends to: 1) plan to solve problems relating to the content that will allow the trainees to receive and the required skills, and 2) make the design teaching and learning to be appropriate for the target group. So, need of assessment is a process that allows designers to use information to set learning goals, helps solve problems of teaching and learning to meet the learning needs of learners as well.

Strategic issue 2: Designing the teacher development in using technology had overall suitability at the very much level ($\bar{X}$=4.90) and possibility at the much level ($\bar{X}$=4.42), from which the strategy of strategy to improve the form of teacher development activities to be diversified was ranked at the top with suitability at the very much level ($\bar{X}$=5.00) and possibility at the much level ($\bar{X}$=4.42). This is probably the case because design of teacher development activities affected the behavior change to be learned in a better direction. If the development model does not allow teachers to learn, the designer must analyze the suitability of the activity model. It is used to improve the activity style to be consistent with the needs of teachers that result in teachers learning. As Carpenter and Edgar Dale (2003) said learning style innovation development using learning management technique, knowledge in the subjects taught, and teaching strategies make the learners think, analyze, synthesize, create new things and interaction between the instructor and the learner that promotes the potential development of the learner. It is also a sustainable solution.

Strategic issue 3: Developing the teachers to use technology had overall suitability at the very much level ($\bar{X}$=4.97) and possibility also at the very much level ($\bar{X}$=4.68). Five of six strategies had suitability at the highest possible rating ($\bar{X}$=5.00). They were 1) the strategy of promoting production and develop teachers to be proficient in using technology to organize teaching and learning processes, with possibility at the very much level ($\bar{X}$=4.57); 2) strategy of campaign to use resources and develop innovative media using technology, with possibility at a very much level ($\bar{X}$=4.57) 3) strategy of create a network and strengthen the teamwork culture, with possibility at a very much level ($\bar{X}$=4.85), 4) strategy of strengthen the cultivation of moral values and ethics have discretion in using technology, with possibility at a very much level ($\bar{X}$=4.85), and 5) strategy of motivated teachers to develop themselves, with possibility at a very much level ($\bar{X}$=4.85). It may be that the education agency saw the importance of promoting production and develop teachers to use technology to organize teaching processes. Due to the changing world today that learning all the time is possible, education institutions must therefore be adapted to be a learning organization. The quality of the learners depends on the quality of the teacher. (McKinsey, 2007). Therefore, the production and development of teachers must be promoted to have knowledge and expertise on technology usage for the research, development of their teaching to quality to improve the quality of learners. In addition, teaching materials play an important role in helping communication between instructors and the learners so that teaching could be in accordance with the teaching objectives and encourage teachers to be enthusiastic in preparing new techniques, create interesting teaching materials. Therefore, teachers should have the knowledge and technology skills in teaching and learning and ability to produce and use electronic media (Chindanurak, 2017). Moreover, networking and team working cause shared learning and teaching techniques. As a result, the teachers could perform self-development and also increase efficiency and effectiveness of the administration, as well as building personnel commitment, both inside and outside the

organization, towards goal achievement. As Boonyakit (2004) said, learning process is important in that it causes a bond of trust, and it is vital to improve operational processes through decision making and problem solving. If people have good attitude and enthusiasm, the organization is successful. In addition to developing the knowledge, skills, and education should focus on knowledge and morality balance of, being of a professional teacher with morality, ethics, and professional conduct. This could be done by means of teacher training workshops aiming at the achievement of the performance, service, and good cooperation (Yuttasard Pianthaisong, 2016). Importantly, good morale, motivation, and positive attitude towards their work encourage teachers to develop their own and help the organizations achieve the goal. As Phramaha Wiwatt Parichano Puakniyom (2008) has said. the morale is a good cause to motivate cooperation and initiatives. They build loyalty as a better understanding and harmony which encourages practitioners dedication, intelligence and talent to the organization, confident in their enterprise operations to achieve their organizational goals more effectively.

Strategic issue 4: Evaluating teacher development in using technology had overall suitability at the very much level ($\bar{X}$=5.00) possibility also at a very much level ($\bar{X}$=4.79), from which all three strategies had suitability at the highest possible rating ($\bar{X}$=5.00). They were: 1) the strategy of creating appropriate evaluation criteria for teacher development, with possibility also at a very much level ($\bar{X}$=4.85); 2) the strategy of adjusting the format of teacher development activities with possibility also at a very much level ($\bar{X}$=4.57); and 3) the strategy of analyzing problems for teacher development activities, with possibility also at a very much level ($\bar{X}$=4.85). This maybe because of the creation of evaluation criteria is a crucial step to the results, reflection of deficiencies and deserves a revision of the development process. This is consistent with the findings of Natchaya Rattanasatapronpong (2015) whose research entitled "The study of The Strategic Development of English Learning Quality Enhancement of Students in Primary Schools under Kamphaeng Phet Primary Educational Service Area Offices 1. and 2. She found that evaluation criteria were aligned with the strategic objectives of the format and content development activities causing changes in behavior, physical, intellectual, emotional, and social. Quality moral, ethics, and discipline raise awareness of societal benefits (Ministry of Education, 2003). Problem analyses, for searching causes of the problem, could be done through observations, interviews, and questionnaire responses. When causes of the problem have already been found, problem solving could be started by defining the expected results, indicators of success, and a clear goal as to meet the needs of teachers. As Bahadur and Gelade (2006 cited in Bahadur, Gelade and Basadur, 2014) said, process commonly used in the solution is to create new forms of alternative approaches to address the issue of the possibility. Solving problems in practice, factors leading to its use in planning solutions to achieve success should be considered. The final step is creating multiple alternatives to apply in practice which will lead to acceptance of implementation.

Suggestions

Suggestions from this research entitle "Teacher Development Strategies on Technology Usage in line with the Technology Standards for Education under the Office of Secondary Educational Service Area 3" are as follows:

Suggestions from research results

1. The study indicated that teacher development process on the aspect of assessing teacher development needs was found to be at the very much level, especially in the areas that the school determines the evaluation criteria consistent with the needs. Therefore, educational institutions should provide opportunities for teachers and educational personnel to participate in planning, setting objectives, selecting target group, creating a teacher development in education technology usage project. The project could be formulated by conducting survey and assessment of knowledge, and

teacher technology skills in teaching and learning. The survey results should be part of organizing activities in accordance with the needs of the participants.

2. The study found that teacher development process in the aspect of need for implementation of teacher development activities was rated at the very much level, especially in the field of teaching design and learning to use modern technology equipment. Therefore, educational institutions should promote research on textbook development design for teachers to gain knowledge and skills on modern technology usage in teaching and learning students. Educational personnel should study modern technology teaching materials in order to keep pace with technological changes as well as encouraging teachers to produce their own innovative media. Qualified experts should be invited to teach and train teachers on designing and creating innovative teaching materials from local resources so that learning appropriate to learner characteristics be promoted.

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