

## Basic Information and Communication Technology Competency Development for Teachers and Schools in Preparation for ASEAN Commencement

Supinda Lertlit, Ed.D.

Faculty of Education, Rangsit University

supinda.l@rsu.ac.th

### Abstract

The purposes of this research were to identify basic Information and Communication Technology (ICT) competency areas that school educators require in order to develop their teachers, and to explore basic ICT competency that schools need in their preparation for ASEAN (Association of Southeast Asian Nations) commencement in 2015. A mixed method of quantitative and qualitative research was used in this study. Surveys and focus group interviews were conducted. The first group using a simple sampling method, 143 school educators completed the questionnaires. The second focus group selected by using purposive sampling method, ten school administrators in the central, northern, and southern provinces of Thailand were interviewed. The data collected from the survey-questionnaires and semi-structured interviews were analyzed and interpreted by using rating scales and content analyses. The descriptive analysis described mean, standard deviation, and simple frequency distribution values. The findings from school educators reveal four ICT competency areas for teachers at high to highest level of requirement, and the ICT competency that the focus group in four areas are related to the first group. The findings on basic ICT competency in preparation for ASEAN commencement in 2015, the focus group informatively express positive opinions and useful suggestions in five main points. The results of this study suggested further studies to explore in broader dimensions of ICT competency standards for teachers. The research outcomes have implications for schools that wish to embark on human resource development planning.

**Keywords:** *Information and Communication Technology, ICT competency, school educators, school administrators, teachers' professional development*

### 1. Introduction

Educational Technology has been integrating Information and Communication Technology (ICT) within all subject areas whilst real world technology evolves continuously. Most basic education schools in the world were encouraged long ago to adopt ICT in teaching and learning (UNESCO, 2002). In order to cultivate high-quality teaching, support for ongoing professional development in schools is essential. Teaching quality has been defined as instruction that enables a wide range of students to learn. Additionally, teaching quality is in part a function of teacher quality (Darling-Hammond, Wei, Andree, Richardson, and Orphanos, 2009; Darling-Hammond, 2012; Gallimore, Ermeling, Saunders, and Goldenberg, 2009; Hanushek, 2011; Yoon, Duncan, Lee, Scarloss, and Shapley, 2007). According to National Assessment of Educational Progress (NAEP) survey data, they also confirmed an unfortunate reality that teachers were typically not using ICT in the most effective ways (Wenglinsky, 2006), and could not keep pace with the rapid changes of technology (Greene & Crespi, 2012).

### 2. Background of the Study

The education sectors have strongly emphasized that basic ICT literacy is important to teacher development (Wildová, 2010) and high quality teachers are the most important asset of schools, but no appropriate policies ensure that schools have good quality of teachers on hand (Hanushek, 2011; The Wallace Foundation, 2012). A particularly noteworthy finding is the empirical link between schools and improved student achievement (Webster-Wright, 2009). Therefore, school administrators who are key persons will be able to gear their schools toward modern digital teaching and improved

learning environments, and they require appropriate ICT preparation in order to support and strengthen their teachers (Namfa, 2012), especially for ASEAN preparation by 2015.

Within ASEAN, the Networked Readiness Index 2013 in Global Information Technology Report 2013 (WEF, 2013a) indicates that Thailand ranks 74th out of 144 countries and trails by more than 70 and 40 places behind Singapore and Malaysia, respectively. Thailand exhibits a number of weaknesses across the board. Looking back at the history of the reports, Thailand ranked 34th in 2006, 77th in 2012 and 74th in 2013; its ICT competitiveness has clearly deteriorated. In addition, the Global Competitiveness Report 2012-2013 (WEF, 2013b) ranks Thai education bottom out of eight ASEAN countries surveyed. Among the ten ASEAN countries, Singapore, Malaysia and Brunei Darussalam take the top three spots, respectively, while Cambodia comes in sixth and Vietnam seventh, followed by Thailand. Myanmar and Laos were excluded in the survey. The report also states that money is not the most important factor in guaranteeing a good education, and that high-income teachers often do not possess adequate teaching capabilities. However, the ASEAN ICT Master plan of 2015 has been targeted within 10 years of cooperation and yielded to the changes in the ICT landscape and the influential shift toward new areas such as ICT applications for e-education (ASEAN, 2011). In Thailand, for instance, One Tablet per Child project (Walker & Pruekchaikul, 2012) in 2012 strongly urges schools to integrate technology which has been granted to more than 800,000 first-grade students, so it is the right time for the concept of ICT competency for teachers' to be adopted by school administrators in the twenty-first century and preparedness for ASEAN commencement.

A number of research projects have shown that teaching quality is the strongest school-related factor that can improve student learning and achievement (Darling-Hammond, 2012; Hollins, 2011; Vega, 2013). The school administrators, teachers and ICT policy makers are the major influences of teachers' ICT development. Lack of basic literacy in information and communication technology and computer skills can limit a teacher's ability to enhance the quality of classroom learning. Hence, it is important for teachers to understand how ICT can improve the standards of basic education in Thailand and to see how ICT can be used as a tool for more effective instruction. The education sectors have reiterated that basic ICT literacy is important to teacher development (Alharbi & Drew, 2014; Rambousek, Štípek, & Wildová, 2012; Trucano, 2005) and according to Almalki and Williams (2012), Azer (2005) and Yeap (2010), the major focus in education is strengthening the quality and effectiveness of the teacher workforce by raising teacher quality around the world. In addition, Stewart (2010) confirms that a high-quality teacher workforce is not the simple result of some traditional cultural respect for teachers only; it requires deliberate policy support as well.

Since the school administrators and teachers are significant school-related factors of the ultimate goal of student achievement, and ICT competency for teachers is needed as a tool for teaching and professional development (Lertlit, 2012; Waitayangkoon, 2008). Lack of basic ICT competency can limit a teacher's ability to enhance the quality of classroom learning. This research, therefore, rationally focuses on ICT competency areas for teachers that school administrators need and prepare for ASEAN commencement in 2015.

### **3. Objectives**

The objectives of this research were to identify basic ICT competency areas that are required in order to develop the teachers, and to investigate ICT competency for teachers that schools need in preparation for 2015.

### **4. Research Questions**

The findings of this study were expected to answer two research questions as follows:

4.1 What basic ICT competency areas did school educators require in developing their teachers?

4.2 What basic ICT competency for teachers did the schools need in their preparation for 2015?

### **5. Methods and Instruments**

The mixed-method research designs: a quantitative and qualitative inquiry was employed in order to gain the in-depth understanding and corroboration. The researcher aimed to validate the results obtained from a large sample of school professionals by using quantitative research and generalize findings from school administrators via a qualitative research method. The mixed method of quantitative and qualitative research including two different groups of samples in the collection procedure was explained as follows:

5.1 Quantitative research: The school educators were the first group of participants who completed the opinion survey questionnaires

In this first group of the opinion survey, the 200 seminar participants who attended the 2012 annual academic conference held by the Faculty of Education at Rangsit University were the population consisting of school educators and administrators, teachers, instructors, and education-related personnel from varied provinces such as Bangkok, Pathum Thani, Nonthaburi, and Prachinburi. These selected respondents by a simple random sampling method were asked questions relating basic ICT competency required for teachers' professional development. With a 71.50% response rate, a total of 143 valid questionnaires were collected. Based on Krejcie and Morgan's (1970) table for determining sample size toward a given population of 200, a sample size of 127 would be needed to represent adequate samples of the population. The survey included five closed-ended Likert (1932) rating scaled questions asking for their requirement levels according to Vogt (1999) (rating questions of 1 - 5 levels; the rankings were evaluated as 1 = lowest, 2 = low, 3 = average, 4 = high and 5 = highest), and also included open-ended questions asking for additional comments. The content validity of the survey questionnaires was measured by using Index of Item-Objective Congruence (IOC)(Rovinelli & Hambleton, 1977) and scored 1.0. The reliability of the instrument was determined by Cronbach's alpha coefficient (Cronbach, 1951). Data from survey-questionnaires were analyzed and tabulated showing mean (M) and standard deviation (SD) values. The average mean (M) scores range interpretation was indicated as follows:

Average Mean (M) Scores Range	Requirement Level
4.51 - 5.00	Highest
3.51 - 4.50	High
2.51 - 3.50	Average
1.51 - 2.50	Low
1.00 - 1.50	Lowest

5.2 Qualitative research: The focus group, the second group of participants, was interviewed using a research instrument of semi-structured interviews.

The focus group, the second group of participants, was selected by using a purposive sampling method according to Kerlinger (1986). Ten school administrators with doctoral degrees in education comprised of school directors, school licensees, and school owners in the central, northern, and southern provinces of Thailand. Semi-structured interviews were conducted in this focus group and were used as a measurement to endorse data validity and reliability from the first group. The first part of interview questions was about basic ICT competency required for teachers’ professional development. The second part of open-ended interview questions was about basic ICT that schools need in their preparation for 2015. To assure the validity of the instrument, the content validity was checked by experts and measured by using Rovinelli & Hambleton’s IOC which scored 0.80. The reliability of the instrument was determined by Cronbach’s alpha Coefficient. Data from the first part of focus group interviews were analyzed using the same rating scales analysis as the first group, and data from the second part of interviews were analyzed by using content analysis and simple frequency distribution interpreted in descriptive results.

**6. Results**

The data analyses from the survey of the first group of 143 respondents and the focus group of ten demonstrated that basic ICT competencies were found in four areas. The four basic ICT competency areas included (i) Internet Usage, (ii) Using ICT for Communication, (iii) Basic Software and Hardware Knowledge, and (iv) Teaching Media Production. The data analyses of both groups were tabulated showing statistical values of mean (M), standard deviation (SD), and ranking, including data interpretation (DI) in Table 1 as follows.

**Table 1:** Basic ICT competency areas from the first group of school educators and the focus group

ICT Competency Area	First Group (N=143)				Second Group (N= 10)			
	M	SD	Ranking	DI	M	SD	Ranking	DI
Internet Usage	4.56	0.59	1	Highest	4.60	0.58	1	Highest
ICT for Communication	4.53	0.61	2	Highest	4.35	0.50	3	High
Basic Hardware & Software Knowledge	4.26	0.73	3	High	4.33	0.69	4	High
Teaching Media Production	4.22	0.80	4	High	4.38	0.62	2	High

The results of basic ICT competency areas requirements of two different groups in Table 1 report as follows:

The first group of school educators requires Internet Usage and ICT for Communication areas at the highest mean scores of  $M = 4.56$ ,  $SD = 0.59$ , and  $M = 4.53$ ,  $SD = 0.61$ , respectively, followed by Basic Hardware & Software Knowledge, and Teaching Media Production areas at the high mean scores of  $M = 4.26$ ,  $SD = 0.73$ , and  $M = 4.22$ ,  $SD = 0.80$  respectively. The school educators rank *Internet Usage* at the first position, *ICT for Communication* at the second, *Basic Hardware & Software Knowledge* at the third, followed by *Teaching Media Production* at the fourth. Cronbach's alpha was calculated as the instrument reliability which equals 0.80.

According to the second group or focus group, the results of basic ICT competency areas requirement report that the focus group of school administrators requires Internet Usage area at the highest mean scores ( $M = 4.60$ ,  $SD = 0.58$ ), followed by the high mean scores of Teaching Media Production ( $M = 4.38$ ,  $SD = 0.62$ ), ICT for Communication ( $M = 4.35$ ,  $SD = 0.50$ ), and Basic Hardware & Software Knowledge areas ( $M = 4.33$ ,  $SD = 0.69$ ) respectively. The focus group rank *Internet Usage* at the first position, *Teaching Media Production* at the second, *ICT for Communication* at the third and *Basic Hardware & Software Knowledge* at the fourth. Cronbach's alpha was calculated as the instrument reliability which equals 0.93.

The summary of the first group in comparison with the second group on basic ICT competency areas requirements for teachers shown in Table 1 is as follows.

6.1 Both participant groups require the same basic ICT competency in four areas which are (i) Internet Usage, (ii) ICT for Communication, (iii) Basic Hardware & Software Knowledge, and (iv) Teaching Media Production. The level of requirements of those four areas indicates at the high and highest levels.

6.2 The first ranking position of the basic ICT competency area for teachers required most by two different participant groups has similar mean scores ( $M = 4.56$  and  $M = 4.60$ ) on *Internet Usage* area while both have similar standard deviations (0.59 and 0.58 respectively).

6.3 Ranking in order of the basic ICT competency areas for teachers required by two different participant groups, the ranking positions are in different orders from the second to fourth place as follows:

- The second ranking position of basic ICT competency required by the first group is ICT for Communication; the second group is Teaching Media Production.
- The third ranking position of basic ICT competency required by the first group is Basic Hardware & Software Knowledge; the second group is ICT for Communication.
- The fourth ranking position of basic ICT competency required by the first group is Teaching Media Production ICT for Communication; the second group is Basic Hardware & Software Knowledge.

The results from the focus group's interviews show the basic ICT competency for teachers required in school's preparation for ASEAN commencement in 2015. Especially of the open ended questions for Issue #1, all ten comments from ten school administrators are completely positive; the issues (questions) #1 to #5 and the comments (answers) are

presented in descriptive details including simple frequency distribution (f) values as follows:

*Issue #1: Comments on teacher's ICT competency and school's preparation for ASEAN by 2015*

Comment #1: ICT is very important and necessary (f = 10/10) such as, it gives opportunity to communicate, to search for information, and access to social networks, especially for provincial schools. Teachers are required to have competencies in ICT (f = 9/10), such as, to develop ICT skills continuously, and to keep up with ASEAN community educational information. Some teachers do care while others are gradually realizing importance and necessity of ICT, and they need to be able to practice guidelines on the use of network etiquette rules.

*Issue #2: What strategies, plans or policies does the school have to prepare for ASEAN?*

Comment #2: Staff development policy and strategies are set to support in ICT knowledge and English language training programs provided to teachers and staff (f = 9/10), such as, basic ICT literacy, social networks communication, and Internet usage. In addition, teaching evaluation to meet targets is another strategy they prepared for (f = 1/10).

*Issue #3: What governmental or private agencies does the school need in order to support ICT competency development of teachers, in which areas, and how to prepare before entering the ASEAN community?*

Comment #3: All responsible agencies, both governmental and private, for example, the Office of the Basic Education Commission, Educational Service Area Offices, and nearby universities are needed to support schools in ICT training courses, such as, hardware and software programs, e-Learning, (f = 9/10) and English for ICT (f = 1/10).

*Issue #4: Does your school have potential in ICT or not compared with similar schools in ASEAN member countries? If not, which parts need to be improved?*

Comment #4: Five believe that their schools have enough ICT potential (f = 5/10) because of existing policies, turning policies into practices, having enough budget, and having 90% capable personnel in ICT and sufficient equipment, having ICT staff to handle ICT issues and will enhance every classroom to be an ICT classroom. Three do not have enough ICT potential (f = 3/10) because of lack of ICT equipment, the school itself is not competent, rapid growth of technology, and no funds to upgrade equipment promptly. The final two gave no answer (f = 2/10).

*Issue #5: Do your teachers have basic ICT competency or not compared with similar schools in ASEAN member countries? If not, which parts need to be improved?*

Comment #5: Three believe that their teachers have enough ICT potential (f = 3/10) because most of the teachers are young with adequate ICT, schools support teachers to get trained continuously, and schools have maintenance budgets. Five believe that their teachers do not have enough ICT potential (f = 5/10) because of lack of ICT knowledge,

lack of English proficiency, weak educational system, and unskillful personnel. The final two gave no answer ( $f = 2/10$ ).

## 7. Discussion

In the order ranking of requirements of basic ICT competency for teachers in four areas, the results from both participant groups show the *Internet Usage* ranks first. This finding explains that both groups agree that the Internet usage can bring teachers and schools great benefits such as the Internet provides teachers with minimum cost materials, motivates the students to have confidence to express themselves, brings schools and communities closer together, allows expanded opportunities for mentoring, keeping in contact with societies with no limits of time and place (Luan, Fung, Nawawi & Hong, 2005; Serim & Koch, 1996; Stone & Perumean-Chaney, 2011).

Besides, the results from both groups suggested school stakeholders that the specific ICT areas should be included in the training programs; it is relevant to conceptual framework emphasized by UNESCO (2011) and its ICT Teacher Competency Framework for Teachers created in 2008 and developed in 2011. The framework addressed three different successive stages of a teacher's development. The first is Technology Literacy, enabling students to use ICT in order to learn more efficiently. The second is Knowledge Deepening, enabling students to acquire in-depth knowledge of their school subjects and apply it to complex problems. The third is Knowledge Creation, enabling students to generate new knowledge.

Furthermore, the challenge is how to enable teachers not only to overcome the technology barriers but also to empower them to integrate the appropriate technology into teaching and learning processes, known as appropriate technologies for sustainable development (Kim, 2013; Pearce, 2007). Building the capacity of teachers in the uses of ICT for education (Bokova, 2012; KFIT, 2013; VVOB, 2012; Waitayangkoon, 2008) also requires long-term continuous development, sharing of knowledge among teachers, and collaboration among educators, governmental education offices, public and private institutions, relevant organizations, and support from school administrators.

Though ICT competency is very important and necessary, looking at it from a different side, an outstanding example was presented in this study. Some significant viewpoints from Bumiller (2010), Needle (2010), and Yu (2014) who reviewed and noted that one of the basic software programs used for presentation tasks (or so-called PowerPoint) (Microsoft, 2014) was not favored by some presenters in particular parties, such as research organizations, the military, universities, and training units. They marked serious concerns that the program stifled discussion, critical thinking and thoughtful decision-making, it was considered as a big glass barrier between the speaker and the audience. However, Altman (2014) argued that if such a program was ditched and presenters did charts and slides in text program (or so-called Word) (Microsoft, 2014), the audience would be reading articles boringly. Teachers should be aware of these serious concerns since it was not about how they use ICT as a tool integrated in teaching and learning in a classroom context only but teachers should know how to select the appropriate tools and manage them properly as well.

## 8. Implications

This study gives useful implications to school administrative management that wish to embark on human resources and professional development strategic planning, particularly on teacher professional development programs in basic ICT competencies.

Additionally, the implications of this study should guide, for instance, school administrators or policy makers in teacher education programs to include basic ICT competencies in the school policies.

For future studies, researchers who are in educational technology or relevant fields may be interested in a broader scope and a deeper dimension of standards of ICT competency to help develop teachers' professional development in certain school provincial service areas or specific contexts.

## **9. Conclusion**

Based on the findings, the results of this study answer the research questions of what basic ICT competency areas that the schools need for their teachers in professional development planning, and how the school administrators plan their preparedness in ICT competency for their teachers awaiting the goal of realizing an ASEAN Community by 2015.

The statistical results shown in Table 1 endorsed that the focus group required the same four ICT areas of Internet Usage, ICT for Communication, Basic Hardware and Software Knowledge, and Teaching Media Production the same as the 143 school educators at the high to highest level. Though ranking positions among ICT four areas found were in different places, *Internet Usage* ranked first in both results.

The school administrators were positive and all agreed that ICT was very important and necessary for a teacher's ICT competency and a school's preparation for ASEAN in 2015. They also had plans, strategies, and policies in ICT literacy to support their teachers and schools. More importantly, the school administrators had strong confidence in their competent ICT staff and equipment, and were ready for the ASEAN community but they were not confident in their teachers who lack of ICT and English competency. This led to their special needs of external supports from government and educational institutes to provide ICT and English training courses for their teachers.

## **10. Acknowledgement**

My grateful thanks are extended to the participants who attended the Public Seminar on Educational Innovations in ASEAN Dimension organized by the Faculty of Education, Rangsit University for their feedback on the survey questionnaires. Also this research benefited from the useful comments provided in the interviews by a focus group of ten school administrators in Ayutthaya, Krabi, Nakhon Si Thammarat, Pathum Thani, and Petchaboon provinces.

## **11. The Author**

Supinda Lertlit holds a doctoral degree in education from the Faculty of Education, RSU. At present, she works for Bilingual Education- a program at the Faculty of Education, RSU.

## **12. References**

Alharbi, S. and Drew, S. (2014). Using the Technology Acceptance Model in Understanding Academics' Behavioural Intention to Use Learning Management Systems. *International Journal of Advanced Computer Science and Applications*, 5(1), 143-155.

- Almalki, G., Williams, N. (2012). A Strategy to Improve the Usage of ICT in the Kingdom of Saudi Arabia Primary School. (IJACSA ) International Journal of Advanced Computer Science and Applications, 3(10), 46-52.
- Altman, R. (2014). What's the Problem with "Creating a PowerPoint"? Retrieved March 17, 2014 from [https://www.betterpresenting.com/ editorial/creating-a-powerpoint](https://www.betterpresenting.com/editorial/creating-a-powerpoint).
- ASEAN (2011). The 10th ASEAN Telecommunications and Information Technology Ministers Meeting Adopted and Launched the ASEAN ICT Master Plan 2015: We're Stronger When We're Connected. Retrieved October 2, 2013 from <http://aseanict.com>.
- Azer, S.A. (2005). The qualities of a good teacher: how can they be acquired and sustained? Journal of the Royal Society and Medicine. February; 98(2): 67–69.
- Bokova, I. (2012). The Power of ICT in Education Policies: Implications for Educational Practices. Asia Pacific Ministerial Forum on ICT in Education (AMFIE) 2012. Retrieved November 18, 2013 from <http://www.unescobkk.org/ education/ict/ict-in-education-projects/policy>.
- Bumiller, E. (2010). We Have Met the Enemy and He Is PowerPoint. Retrieved March 17, 2014 from <http://www.nytimes.com/2010/ 04/27/world/27powerpoint.html>.
- Cronbach, L.J. (1951). Coefficient Alpha and the Internal Structure of Tests. Psychometrika, 16(3), 297.
- Darling-Hammond, L. (2012). *Creating a Comprehensive System for Evaluating and Supporting Effective Teaching*. Stanford, CA: Stanford Center for Opportunity Policy in Education. Retrieved September 15, 2013 from <http://edpolicy. stanford.edu>.
- Darling-Hammond, L., Wei, R.C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional Learning in the Learning Profession: A Status Report on Teacher Development in the United States and Abroad. Stanford, CA. Retrieved September 25, 2013 from <http://edpolicy.stanford.edu>.
- Gallimore, R., Ermeling, B.A., Saunders, W.M., & Goldenberg, C. (2009). Moving the learning of teaching closer to practice: Teacher Education Implications of School-based Inquiry Teams. Elementary School Journal, 109(5), 537-553.
- Greene, H. & Crespi, C. (2012). The Value of Student Created Videos in the College Classroom – An Exploratory Study in Marketing and Accounting. International Journal of Arts & Sciences. 5(1). 273-283.
- Hanushek, E.A. (2011). The Economic Value of Higher Teacher Quality. *Economics of Education Review*. 30, 466-479.
- Hollins, E.R. (2011). Teacher Preparation for Quality Teaching. Journal of Teacher Education, 62(4), 395-407.
- Kerlinger, F.N. (1986). Foundations of Behavioral Research. Holt, Rinehart and Winston, 1986. Psychology. pp. 667.
- KFIT. (2013). Facilitating Effective ICT-Pedagogy Integration Project. Korean Funds-in-Trust: Final Report, January 2010 to March 2013. UNESCO Bangkok.

Kim, G. J. (2013). Case Studies on Integrating ICT into Teacher Education Curriculum in Asia. UNESCO Bangkok. Retrieved October 15, 2013 from <http://www.unescobkk.org/resources/e-library/publications/article>.

Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610.

Lertlit, S. (2012). Information Technology Literacy of Bilingual Education Program Students of Faculty of Education at Rangsit University. Annual Education Conference 2012: Public Seminar on Educational Innovations in ASEAN Dimension. Faculty of Education, Rangsit University. 38-52. RSU Press.

Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 22(140). 1-55. Retrieved July 15, 2009 from <http://www.citeulike.org/user/robertlischke/article/2731047>.

Luan, W. S., Fung, N. S., Nawawi, M., & Hong, T. S. (2005). Experienced and inexperienced Internet users among preservice teachers: Their use and attitudes toward the Internet. *Educational Technology & Society*, 8 (1), 90-103.

Microsoft. (2014). Microsoft Office Products; Office Applications. Retrieved March 10, 2014 from <http://office.microsoft.com/en-us/products/microsoft-office-365-for-home-or-for-business-office-online-FX101825692.aspx?CTT=97>.

Namfa, B. (2012). Asia-Pacific Ministerial Forum on ICT in Education (AMFIE) 2012: Teacher Preparation for Teaching in Digital Age. Retrieved March 10, 2013 from <http://www.unescobkk.org/education/ict/ict-in-education-projects/policy>.

Needle, D. (2010). U.S. Military Battles Crafty Foe – PowerPoint. Retrieved November 28, 2013 from <http://www.nytimes.com/2010/04/27/world/27powerpoint.html>.

Pearce, J.M. (2007). Teaching Science by Encouraging Innovation in Appropriate Technologies for Sustainable Development. Proceedings of the 11th Annual National Collegiate Inventors and Innovators Alliance Conference. 159-167, 2007.

Rambousek, V., Štípek, J., Wildová, R. (2012). Research of ICT Literacy Education in the Czech Republic. *Procedia - Social and Behavioral Sciences*, 69(24), 1945–1951.

Rovinelli, R. & Hambleton, R.K. (1977). On the Use of Content Specialists in the Assessment of Criterion-Reference Test Item Validity. *Dutch Journal of Education Research*, 2, 49-60.

Serim, F. & Koch, M. (1996). Why Teachers Use the Internet. O'Reilly & Associates. pp. 292. Retrieved July 15, 2014 from <http://www.eric.ed.gov/?id=ED396700>.

Stewart, V. (2010). Raising Teacher Quality around the World. *The Effective Educator* December 2010/January 2011. 68(4):16-20.

Stone, M.T. & Perumean-Chaney, S. (2011). The Benefits of Online Teaching for Traditional Classroom Pedagogy: A Case Study for Improving Face-to-Face Instruction. *MERLOT Journal of Online Learning and Teaching*. 7(3).

- The Wallace Foundation. (2012). *The School Principals: Guiding Schools to Better Teaching and Learning*. Retrieved September 25, 2013 from <http://www.wallacefoundation.org>
- Trucano, M. (2005). *Knowledge Maps: ICTs in Education*. Washington, DC: *infoDev*/World Bank.
- UNESCO. (2002). *Information and Communication Technology in Education: A Curriculum for Schools and Programme of Teacher Development*. UNESCO Paris. Retrieved July 15, 2013 from <http://unesdoc.unesco.org/images/0012/001295/129538e.pdf>
- UNESCO. (2011). *ICT Competency Framework for Teachers*. Retrieved July 2, 2013 from <http://www.unesco.org/new/en/unesco/themes/icts/teacher-education/unesco-ict-competency-framework-for-teachers>.
- Vega, V. (2013). *Teacher Development and Leadership Research Review*. Retrieved September 15, 2013 from <http://www.edutopia.org/teacher-development-research>
- Vogt, W. P. (1999). *Dictionary of statistics and methodology*. Sage: Thousand Oaks, California.
- VVOB. (2012). *ICT in education in Vietnam*. The Flemish Association for Development Cooperation and Technical Assistance. Retrieved August 8, 2013 from <http://www.vvob.be/vietnam/?q=en/key-players-meeting-ict-education-vietnam>.
- Waitayangkoon, P. (2008). *ICT Professional Development of Teachers in Thailand: The Lead-Teacher Model*. *ICT in Teacher Education: Case Studies from the Asia-Pacific Region*. UNESCO Thailand. 110-115. Retrieved October 15, 2013 from <http://www.unescobkk.org>.
- Walker, K. & Pruekchaikul, K. (2012). *The 8Th Committee Meeting: One Tablet per Child Project*. Ministry of Education. Retrieved January 28, 2013 from <http://www.en.moe.go.th>.
- Webster-Wright, A. (2009). *Reframing Professional Development through Understanding*. *Review of Educational Research* June 2009. 79(2). 702-739.
- Wenglinsky, H. (2006). *Technology and Achievement: The Bottom Line*. *Educational Leadership* December 2005/January 2006: Learning in the Digital Age. 63(4), 29-32.
- Wildová, R. (2010). *Development of Professional Education in Primary School through the Changes in Methodology of Different Curriculum Areas*. *Conference of the International Journal of Arts and Sciences*, 2(4): 104-110 (2010).
- World Economic Forum (WEF). (2013a). *Global Competitiveness Report 2012- 2013*. Retrieved September 5, 2013 from <http://reports.weforum.org/global-competitiveness-report-2012-2013>.
- World Economic Forum (WEF). (2013b). *Global Information Technology Report 2013*. Retrieved September 5, 2013 from <http://reports.weforum.org/global-information-technology-report-2013>.

Yeap, B. H. (2010). Improving Mathematical Thinking through Assessment. *Journal of Science and Mathematics Education in Southeast Asia SEAMEO-RECSAM*, 33(2), 187-197.

Yoon, K. S., Duncan, T., Lee, S. W-Y., Scarloss, B., and Shapley, K. (2007). Reviewing the Evidence on How Teacher Professional Development Affects Student Achievement. *Issues & Answers Report, REL 2007(033)*. U.S. Department of Education. Retrieved October 11, 2013 from <http://ies.ed.gov/ncee>.

Yu, A. (2014). Physicists, Generals and CEOs Agree: Ditch the PowerPoint. Retrieved March 17, 2014 from <http://www.npr.org/blogs/alltechconsidered/211399851/science>.