TEACHING AND LEARNING ATTITUDES, READINESS, AND AWARENESS OF SCIENCE TEACHERS THROUGH ICTS INTEGRATION IN LAO VOCATION AND TECHNICAL SCHOOLS TOWARDS ASEAN EDUCATION REFORM

Nattakant Utakrit
Faculty of Technical Education
King Mongkut's University of Technology North Bangkok
nattakant.u@fte.kmutnb.ac.th

ABSTRACT

Science and Information and Communication Technology have become two key elements beside English language in regional and ASEAN socio-economic growth and demographic transitions. As countries are being merged, educational reform is important to achieving international benchmarks and striving in the labour market trends. This research undertook a survey of science teachers and their provision of teaching and learning by utilising materials and resources with ICTs. The correlations among experience, readiness, and awareness of science teachers in regard to the use of ICTs were also investigated. Finally, the study described the promptness, opportunities, and challenges of ICT integration into science. The results showed that science teachers had positive views of the ideals of educational reform. However, they have not yet attained knowledge and understanding in ICT integration, and lack effective staff, facilities and budgets to support their desires and necessities. Thus, training and mentoring and the allocation of finance and resources are critical strategies in raising teaching and learning quality so that teachers are enable to educate their students to achieve career pursuits in the competitive community.

Keywords: *Vocational and technical education, ICTs, ASEAN, educational reform*

---

1. Introduction

Information and communication technologies (ICTs) are technological tools and resources which can be used in communicating, creating, disseminating, storing, and managing (Tinio 2002 cited by Teimoornia, Hamidi, Jomeh, Somayeh, & Foroozesh-nia, 2011). Examples of tools and resources are computer hardware and software, internet connections, broadcasting technologies (radio and television) and telephony (Tinio 2002 cited by Teimoornia, et al., 2011). The contribution of ICTs to universal access has a central influence on education in terms of equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration (UNESCO, n.d.-a). ICTs are the integral element for education reform and innovations in an age of electronic education (Zhiting & Hanbing 2001 quoted by Teimoornia, et al., 2011).

Efficacious ICTs integration requires innovation and a change of roles by the teacher. According to the statement of Jonassen, Peck and Wilson (1999, cited by Arokiasamy, 2015, p. 320) "*computer technologies can change the teacher's role from information giver to facilitator, counselor, advisor, guide, coach, co-learner, mentor, resource, and technology managers, and mediator to the students."* Requirements such as teachers' beliefs and experiences, levels of knowledge, values,

attitudes towards ICTs, sensitivities and capabilities, educational applications, expected outcomes and teaching and learning approaches can result in the high efficient use of ICTs (Thomas & Stratton, 2006 and Commonwealth Department of Education, 2002 cited by Scherer, Siddiq, & Teo, 2015). Thus, it is important for teachers to be competent and act productively towards technologies (Kedel, 2005 cited by Singh & Chan, 2014). Teachers need to have a competency framework for effective workforce that contains ICT skills, didactic techniques, and abilities to assist students to collaborate, solve problems and be creative learners through the use of ICTs (UNESCO, n.d.-b). In addition, they need to understand the elements of ICTs in education that comprise of curriculum and assessment, pedagogy, organisation and administration, and teacher professional learning (UNESCO, n.d.-b).

2. Demands in ASEAN aspects

Science, technology and innovation are the central resources which can sustain financial growth, school curriculums, and fortified nature (Association of Southeast Asian Nations, n.d.). In the industrial area, specialised skills in mathematics, science, engineering, cognitive soft skills (e.g. achieving higher levels of teamwork, creativity and innovation), and the relevance of tertiary education need enhancement. Countries such as the Philippines, Malaysia, Thailand, and Singapore are targeting high-skill manufacturing, such as automotive parts and electronics, as well as knowledge-based services which include information technology and financial services (International Labour Organization and Asian Development Bank, 2014). Science and technology action plans have been developed since the establishment of the ASEAN Committee in 1978 (Association of Southeast Asian Nations, n.d.). The focuses of these plans cover food science and technology, biotechnology, meteorology and geophysics, marine science and technology, non-conventional energy research, microelectronics and information technology, space technology and applications, and science and technology infrastructure and resources development (McDougall, 2014). Therefore, the ASEAN leaders have nominated these areas as dominant fields in the economic forum.

3. Education reform to enhance skill mobility from the classroom to ASEAN labour market

The purpose of the ASEAN Economic Community (AEC) is to develop a single market and a production based on a free flow of skilled labour which covers the mobility of both students and staff (Sugiyarto & Agunias, 2014). However, there are challenges of work relocation among the countries due to the lack of met qualifications, experience, and knowledge (Sugiyarto & Agunias, 2014). Since the focus on the development of problem-solving skills and a capacity for creativity are crucial, the reform process in encouraging students to learn autonomy and role changes of teachers into information disseminators is critical. The continuous growth in the ASEAN economies results in shortages of skilled workforces, particularly those who graduate from Technical and Vocational Education and Training (TVET) institutions. (The ASEAN Secretariat, 2013). In a number of ASEAN member states, vocational training is regarded as being less attractive to pursue, despite the benefits that would accrue if more students would undertake high-skill vocational training. The necessities for designing vocational training programmes to meet labour market needs is recognised (The ASEAN Secretariat, 2013).

4. Technical and vocational education and training in Laos PDR

Focusing on the Laos People's Democratic Republic (PDR), one of the nine indicative targets is to standardise the education quality and professional and pedagogical skills of vocational teachers in

diverse fields nationwide. This target also includes enhancing school leaders and staff to tackle the technologies and world changes (Strategic Research and Educational Analysis Center, 2009). Basically, a vocational education from the beginning of the high school level allows students to choose their education options based on their aptitudes and plans that match their future study and/or career pursuits. Vocational education institutions offer different programs depending on the target industry (Strategic Research and Educational Analysis Center, 2009). Regarding the registered Technical and Vocational Education and Training (TVET) curriculum frameworks, most students enroll in low-skill training programmes, especially in business, and this consequently leads to a shortage of highly-skilled technicians (The ASEAN Secretariat, 2013). In order to match the science community's requirements, beside the education policies and framework establishments (The ASEAN Secretariat, 2013), the use of computer-based technologies should become a predictable element (Velle, McFarlane, & Brawn, 2003). At present, science study inevitably proceeds with accessible online databases, email communications between institutions, electronic and digital applications for data collection, analysis, manipulation, publishing, and report producing (Velle, et al., 2003).

5. Methodology

5.1 Sample and data collection method

This paper aims to find and assess the associations among attitudes, readiness, and awareness of ICT integration into science subjects of teachers in vocational schools in Laos PDR. The outcomes are aimed at describing participants' opinions towards perceptions, challenges and their suggestions in engaging with an ASEAN educational system. The purposive sampling size of 42 participants (23 males and 19 females) were science teachers, who taught a range of basic science to specialised fields such as chemistry, biology, physics, geology, metallurgy, and astronomy in 7 vocational schools located across the Laos PDR. Teacher qualifications ranged from a minimum degree of diploma to a maximum of master level degrees, most of the participants having completed a bachelor degree. Their experience of science teaching ranged from less than a year to a majority with more than 10 years' experience.

5.2 Instrumentation

The research design in this study was mixed method. Data were collected via a web questionnaire instrument and semi-structured interviews. In order to test the internal consistency of the Likert-type questionnaire items (Boone & Boone, 2012), the Conbrach's alpha (α) technique was used to determine the co-efficient variables (Arokiasamy, 2015) as shown in the standardised formula below:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$ (UC Regents, 2016)

where N is equal to the number of items, c-bar is the average inter-item covariance among the items and v-bar equals the average variance. The following Table 1 indicates the measurement of the study variables using the Likert-scale questions.

Table 1: Instrumentation of the study variables

Variables	Number of items	Types of scale	α
positive attitudes in engaging ICTs to support teaching and learning in science subject	7	5-point Likert scale	0.869
online learning experience	11	5-point Likert scale	0.906
readiness in integrating ICTs in science subject in-class	9	5-point Likert scale	0.883

6. Finding & Discussion

6.1 Reliability analysis

The Cronbach's alpha coefficient value for all variables in the study revealed a range of coefficient value from 0.869, 0.906, and 0.883 accordingly. The dependent variables of online learning experience had a highest reliability coefficient compared to the other two variables. Overall, the three dependent variables show that the items within each group had high coefficients of reliabilities.

6.2 Attitudes of science teachers on the use of computer

Of the total participants, only 13% considered themselves as a competent user while 52.4%, which were the majority of teachers, believed that their computer skill was just at an average level. 28.6% of the respondents spent approximately 4-6 hours on a computer per week whereas 26.2% used up to 7-9 hours per week. The survey found that 54.8% had a computer at home but 28.6% did not have Internet access, excluding smart phones. 85.7% of people, therefore, used the computer from school regardless of Internet access, and only 7.1% accessed the Internet from their mobile phone. In terms of improving and practicing computer skill, 33.8% asked their friends or colleagues to assist, 26.8% conducted self-study from online resources, 19.7% attended computer workshops and another 19.7% practiced autonomously from relevant hard copies, such as books, documents, and manuals.

6.3 Readiness of teachers in integrating ICTs in science teaching

Table 2: Lists of non-teaching and teaching computer applications categories

Categories	Application/ Resources	Non-teaching related		Teaching related	
		M	SD	M	SD
Productivities	Microsoft Word	4.73	1.27	4.57	1.31
	Microsoft Excel	4.17	1.38	4.10	1.43

	Microsoft PowerPoint	3.60	1.72	3.50	1.71
	Microsoft Equation	N/A	N/A	4.0	2.83
Graphic and Media	N/A	N/A	N/A	N/A	N/A
Personal Interest	Google	3.76	1.82	3.10	1.93
	YouTube	4.10	1.57	3.39	1.73
	http://lao44.org/	N/A	N/A	2	0.000
Communication	Hotmail	3.39	1.39	3.20	1.59
	Yahoo	2.97	1.55	2.92	1.58
	Facebook	4.44	1.52	3.50	1.59
	Line	3.33	1.62	2.92	1.52
	Skype	2.71	1.59	2.62	1.46
Security Tools	N/A	N/A	N/A	N/A	N/A
File Systems and Disk Managements	N/A	N/A	N/A	N/A	N/A

Participants had been asked to list the computer applications they used in both teaching and non-teaching, related to the frequency of usage. After that, all the applications were be sorted into 6 categories based on the purposes and definitions of Vermaat, Selbok, Freund, Campbell, & Frydenberg (2016) as shown in table 1. Overall, participants used applications for teaching purposes less than for non-teaching purposes. Productivity software like Microsoft Word was the most used in both non-teaching (M=4.73, SD=1.27) and teaching purposes (M=4.57, SD=1.31). In particular, communication applications were used more than any other categories while usage of graphics and media, security tools, and file systems and disk managements were not mentioned. In the communication group, Facebook reached the highest usage in non-teaching (M=4.44, SD=1.52) as well as teaching relevance (M=3.50, SD=1.59). Additionally, Microsoft Equation and a website site http://lao44.org/ (a website which contains academic information, communication and knowledge of Laos in general and national issues) had only been used for the teaching purposes, M=4, SD=2.83, M=2, SD=0.00 respectively. 97.6% showed that there was a policy that encouraged teachers to use ICTs in teaching. The research found that 37% of teachers encouraged their students to implement ICTs in the assignments, while 60.8% used ICTs for teaching preparation in which 31.5% was for teaching contents and 29.3% for documenting the class material. The majority of participants at 46.5% went online and surfed the webs for their teaching preparation, while 34.9% explored from offline material such as books and manuals.

6.2 Associations amongst participant's opinions towards the attitudes of ICTs in science class teaching, online learning experiences, and readiness of ICT integration in science subject.

Table 3: Association amongst participant's opinions towards the integrations of ICTs in-class, online learning, and ICT resources in science subject.

	Positive attitudes in integrating ICTs in science teaching	Learning system via online classroom experience	Readiness in integrating ICT in science subject in-class

Spearman's rho	Positive attitudes in integrating ICTs in science teaching	Correlation Coefficient	1.000	.627**	.430**
		Sig. (2-tailed)	.	.000	.005
		N	42	42	42
	Learning system via online classroom experience	Correlation Coefficient	.627**	1.000	.472**
		Sig. (2-tailed)	.000	.	.002
		N	42	42	42
	Readiness in integrating ICT in science subject in-class	Correlation Coefficient	.430**	.472**	1.000
		Sig. (2-tailed)	.005	.002	.
		N	42	42	42

**. Correlation is significant at the 0.01 level (2-tailed).

The data used in the survey contained the 3 variables of positive attitudes of integrating ICTs to support teaching and learning in science subjects, learning systems via online classroom experience, and readiness in integrating ICTs in science subjects in class. These provide a quantitative measure of a character of personality trait (Boone & Boone, 2012). Suggested data analysis for this type of questions is Spearman's rho for associations amongst the variables that are non-normal distributions as shown in the standardised formula below:

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$ (Field, 2013)

where d_i = difference in paired ranks and n = number of cases. Based on the null hypothesis and alternative hypothesis the assumption can be written in the form below:

$$H0 : \rho_s = 0$$

$$H1 : \rho_s \neq 0$$

where H0 represents that there are no relationships among positive attitudes of integrating ICTs to support teaching and learning in science subject and online learning experience, or readiness in integrating ICT in science subject in-class, while H1 represents that there are relationships among the three mentioned variables.

In Table 2 the association results show that positive attitudes in integrating ICTs in science teaching, and online learning experience, or the readiness in integrating ICT in science subject in class were significantly correlated, r = .63, p < .01 and r = .43, p < .01 respectively. Likewise, online learning experience and the readiness in integrating ICTs in science subject in class were significantly correlated, r = .47, p < .01. It can thus be implied that positive attitudes in integrating ICTs in science teaching and using online learning experienced can have positive results in the readiness for integrating ICT in science subjects in class (Buabeng-Andoh, 2012).

7. Awareness of the ICTs foreseeing the opportunities, impediments and suggestions in developing ICTs in science subjects in vocational schools.

Discussing the opportunity of integrating ICTs in science teaching, 85.7% of participants acknowledged that the government had encouraged people throughout the country to use ICTs in

teaching and gain experience in online learning systems. Additionally, the vocational and technical schools had encouraged teachers to utilise ICTs in teaching in many subjects. Nonetheless, 73.8% had never experienced online learning. Of these percentages 57.1% had ideas about online learning concepts while 26.7% never knew about it. Moreover, responses from online learning experienced users pointed on the positive feedback of accessing web application that it allowed them to choose what course or subject they wanted to know and started learning. One participant mentioned further that

"It is an application and websites that we can register via email. However some apps and websites are free, but some are not."

Regarding the awareness of the formal ASEAN opening ceremony, 83.3% knew that Laos PDR is one of the ASEAN members. The respondents had opinions towards the ASEAN education that it is one of the main strategies that allow member countries to have an equal standard and cooperation, not only in communication but also economy, market labour mobility, culture and particularly in education between schools. Below are some of the statements provided by the participants.

"The ASEAN member countries should cooperate and develop education to have an equal standard in technology because the communication between the countries needs to have the IT equipment to support."

"The cooperation of the ASEAN Economic in education development between the nations in 2015, the member countries need to implement IT for inter-communication. If any country has not applied the computer or IT, the country may lead in disadvantages."

"The developed countries have to be a mentor and provide supports to underdeveloped countries in terms of economy or education."

Besides, in regard to the readiness of teaching and learning development in science to match the ASEAN requirements, most participants believed that they are not ready in the ASEAN battle to improve education as they need more support in information and communication technology facilities, education as well as qualified staff. Some of the opinions from participants are shown below:

"We need more readiness in education in order to engage in as part of the member countries with qualified staff."

"We need the development of teachers to local schools and bring foreign teachers to partake in teaching."

However, there were still barriers in integrating ICTs in science teaching and learning in vocational schools. The findings found that the obstacles come from lacking computer devices 33.3%, school support in facilities 9.5%, computer monitoring by parents and teachers 9.5%, government facilities and finance support 9.5%, and ineffective teachers 14.3%. Parts of the opinions from participants had been included below:

"The computer unit is not enough for students' need. The ability of teachers in using computer for teaching is still poor. The government should provide of computer facility. There should have a project support and need to upheave knowledge in technology to teacher in a higher level."

"The problems are knowledge and skills of teachers, the support of higher administrator in human resource development, the support in having more equipment."

Finally, the suggestions that the participants expressed about the education reform within ASEAN were that they needed support from schools and government in finance and compensation, motivation, ICT facilities, internet usage policy, and opportunity to send the teachers to have overseas qualifications. Some of the feedbacks are illustrated below.

> *"I want my school to enhancing the support science subject teaching and learning."*
>
> *"We need to have resources and utilise them to their highest value."*
>
> *"I would like the higher administrators."*

Such demands for knowledge, qualifications and skills in the wider community indicate that education is widely seen as being a foundation to a more economically-integrated ASEAN region. Many countries are strengthening, integrating and mounting the science and information communication and technology into the foundations of education, as an essential component, in order to achieve international requirements and endeavour to meet the need for the free flow of labour. In addition, they need more support from the government and schools in facilities, predictable policies and education reform frameworks, training, and finance and work compensations.

8. Conclusion and Future Recommendation

Science with the innovative use of information technology is knowledge that TVET students should be acquiring. There is a developing sense of concern about the need to enhance opportunities for training through TVET to reach market requirements. Various measures could help reform education systems and strengthen learning outcomes. Science teachers need more encouragement and support in improving their ICT skills and integrating them into science study. In addition, teachers need to feel secure that their students will be provided with the core employability and cognitive skills to move successfully from the classroom to the workplace, which will help to contribute to individual career plans and overall market competitiveness within the nation and globally.

Acknowledgement

I am grateful for the assistance from many Laotian volunteers who helped me distributing, surveying and collecting data across the country. Many thanks for participants who gave valuable feedback and opinion to make me accomplish in this research. Last but not least, kind-hearted peer readers who gave me valuable feedback in this paper.

References

Arokiasamy, A. R. A. (2015). Correlation between Cultural Perceptions, Leadership Style and ICT Usage by School Principals in Malaysia. *Procedia - Social and Behavioral Sciences*, 176(2015), 319-332. Retrieved December 10, 2015, from ScienceDirect database.

Association of Southeast Asian Nations. (n.d.). *ASEAN Ministerial Meeting on Science and Technology (AMMST)*, Retrieved November 16, 2015, from http://www.asean.org/asean-economic-community/asean-ministerial-meeting-on-science-and-technology-ammst/

Boone, H. N., & Boone, D. A. (2012). Analyzing Likert Data. *Extension Journal, Inc.,* 50(2). Retrieved October 12, 2015, from Journal of Extension database.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(1), 136-155. Retrieved December 2, 2015, from IJEDICT database.

Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics*: SAGE.

International Labour Organization and Asian Development Bank. (2014). *ASEAN Community 2015: Managing integration for better jobs and shared prosperity*. Bangkok: International Labour Organization and Asian Development Bank.

McDougall, D. (2014). *Historical Dictionary of International Organizations in Asia and the Pacific*. United Kingdom: Rowman & Littlefield.

Scherer, R., Siddiq, F., & Teo, T. (2015). Becoming more specific: Measuring and modeling teachers' perceived usefulness of ICT in the context of teaching and learning. *Computers & Education*, 88(2015), 202-2014. Retrieved September 30, 2015, from ScienceDirect database.

Singh, T. K. R., & Chan, S. (2014). Teacher Readiness on ICT Integration in Teaching-Learning: A Malaysian Case Study. *International Journal of Asian Social Science*, 4(7), 874-885. Retrieved November 1, 2015, from Asian Economic and Social Society website.

Strategic Research and Educational Analysis Center. (2009). *Lao People's Democratic Republic: Technical Assistance and capacity Building in Education Policy Analysis Economic Relevance Study* Retrieved October 1, 2015, from http://moe.gov.la/data/publications/ERS/Economic%20Relevance%20Study%20Report%20Eng.pdf

Sugiyarto, G., & Agunias, D. R. (2014). *A 'Freer' Flow of Skilled Labour within ASEAN: Aspirations, Opportunities and Challenges in 2015 and Beyond*. Bangkok: International Organization for Migration and Migration Policy Institute.

Teimoornia, M., Hamidi, F., Jomeh, S. M. R. I., Somayeh, & Foroozesh-nia. (2011). The implementation of Information and Communication Technology (ICT) in Extracurricular activities of Education system in Iran. *Procedia Computer Science*, 3(2011), 617-622. Retrieved November 30, 2015, from ScienceDirect database.

The ASEAN Secretariat. (2013). *ASEAN State of Education Report 2013*. Jakarta: Association of Southeast Asian Nations (ASEAN).