



## Development of a Ubiquitous Instructional System for Upper Secondary Students in Upper Northern Thailand

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### ABSTRACT

The purposes of this study were 1) to develop a ubiquitous instructional system for upper secondary students in Upper Northern Thailand and 2) to evaluate a ubiquitous instructional system for upper students in Upper Northern Thailand. This research was a systematic development in a ubiquitous instructional system by analysis, synthesis, designing model and testing instructional system which divide the implementation into 9 steps. They were (1) defining the learning ideology (2) studying the basic education schools and community (3) developing a ubiquitous learning curriculum on basic education level (4) managing the infrastructure (5) developing the ubiquitous instructional packages on basic educational level (6) preparing a ubiquitous instruction via the ubiquitous instructional packages (7) delivering a ubiquitous learning (8) evaluating a systematic and learning environment and (9) assuring the quality of a ubiquitous instructional system. A model of ubiquitous instructional system was called BEDUL model. The findings of this research were 1) The overall data analysis in present status was at the "middle" level and trend of a ubiquitous instructional system on 9 steps was at the "high" level, and the total indicators were significant at the 0.01 level 2) The five ubiquitous instructional packages were efficiency based on 80/80 criterion 3) The post-test learning achievement of ubiquitous learning packages was significantly higher than the pre-test learning achievement at the 0.01 level 4) The result of self-assessment from using the ubiquitous instructional packages was at the "high" level, and 5) The samples ideas and opinions about a ubiquitous learning could be concluded that a ubiquitous instructional system was a new paradigm and innovative for learning society to enhance the efficiency and effectiveness of schooling in upper secondary education level and another.

**Keywords:** Ubiquitous learning, System and systems approach, Instructional system

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## Introduction

Ubiquitous is a Latin word which means "everywhere or seems to be everywhere" or ubiquity is the quality of existing in a lot of places at the same time (Sinclair et al., 1993). Nowadays, ubiquitous technology is the new learning environment for communicated process, it's the new way for using the information technology (IT) on learning and education in a whole area. Weiser (1991) a researcher at Xerox PARC, U.S.A., defined the ubiquitous computing as the human capability and competency to access computing technology which using computer networks in anywhere and anytime, while Jones and Jo, the professors of Griffith University, Australia, said that a ubiquitous learning environment is a situation of setting of pervasive (or omnipresent) education (or learning). Education is happening all around the student but the student may not even be conscious of the learning process. Source data is presented in the embedded object and students do not have to do anything in order to learn. They just have to be there (Jones and Jo, 2012).

Ubiquitous, the new learning paradigm and new role on high efficiency to improve learning and instruction in anytime and anywhere by integrating with using technologies, such as software, hardware, programs and services (Watson and Plymale, 2012). Charles Wedmeyers, is a Professor of The University of Wisconsin-Madison, U.S.A., who is considered the beginner of conceptualizing the ubiquitous education on distance learning in anywhere, anytime. (Saba, 2012)

In Thailand, the ubiquitous education is the definition of technical term on "***Pakawantapab Education***". "Pakawantapab" in Thai means broadcasting or ubiquitous (= Existing Everywhere)

to the audiences who can see or hear in anytime. Ubiquitous or Pakawantology (pa-ka-wan-to-lo-gy), the science of planning, preparing, transmitting, environmental managing and evaluating of knowledge, experience and learning skills to appear in everywhere (Brahmawong, 2012). In Thailand Educational Act 1999, the ubiquitous learning was the new paradigm and very important of processes for implementation. The obvious pedagogies and the ways to practice were in the section 24(5) and (6) in the Education Act which stated that the schools and educational offices must implement and support the teachers and educators to apply the organization's atmosphere and environment such as instructional media and facilitators for learners to improve and develop the learning or instruction on anywhere and anytime (Office of the National Education Council, 1999).

However, the ubiquitous learning, a new paradigm of learning system has been constrained to the challenge of the practice on how to start the learning procedures. Suwan-nuttachote (2012) implied that the first step of learning implementation and decision on using instructional technology focus on the systematic of learning design. The understanding in learning systems design and methodology was the most important and most benefit to improve the best instruction to enhance the learning achievement. So, we can conclude that the system approach is the best strategic of planning to develop the new instructional system or to improve the instructional system. The strategies of the system approach is based on the philosophical definition, vision, mission, goals, components, functions, relations, steps or procedures, supporting factors, evaluation and control to enhance the

implementation. The emphasis of system approach was on “the steps” which the key word in the approach for instruction (Brahmawong, 2010). It can be concluded them that the important on profit of educational system is the instrument factor for planning and developing the country development to improve and solve the problems in education (Tavigulasub, 2010). The new systems approach, we can define that the strategies for developing a ubiquitous instruction are increase the learning efficiency and to be more effective in the globalization era.

Moreover, the important issue about a modeling design in ubiquitous instructional system was concluded on research methodology in program/project. Kim, Caytiles and Kim (2012) concluded that, a ubiquitous model was a design learning paradigm by using ubiquitous computing in the anywhere and transmitting to learners competency on learning based on the best way and best time appropriateness. So ubiquitous learning which integrated the learning model of electronics Learning (e-Learning) and mobile Learning (m-Learning) in the environment of mobility and flexibility in a ubiquitous instruction. Jones and Jo (2012) said that the advantages of m-Learning when compared to e-Learning include : flexibility, cost, size, ease of use and timely application. The Devices used include PDAs, mobile phones, portable computers and tablets PCs.

We can summarize that, the design and development for the systematic model of a ubiquitous instruction is the most advantageous and important. It is a hot issue and challenge to improve learning construction and educators or researchers must be concerned about this new learning paradigm or the

model in a ubiquitous education. Zhang and Maesako (2009) implied in the implementing of study that the problems and barriers on a new technique were the negative results for implementing. It's necessary to improve and produce the innovation to develop the instruction into high performance in the instructional program.

In conclusion, the advantages of a ubiquitous learning systems in learning society context of the globalization, as the researcher, I am interested in studying a ubiquitous instructional system design for the learners in basic education level by developing a ubiquitous instructional system for upper secondary students. The reason was because the students in this level have the high maturity and readiness for themselves. The instructional model was considered a dynamic driving, especially the potential of the modeling for the learners of the 21<sup>st</sup> century based on learning skills of using information technology and the instructional media. Darling and Hammond (2007 cited in Wongkit-rungruang and Jittarerg, 2012) explained that the students in the 21<sup>st</sup> century have deep insight in the presence pedagogies on learning design, evaluation, and self-awareness. Students have capabilities on checking and solving the problems by using learning resources , especially the implementing on the digital or electronics media , which are very important and useful for learning in anytime and anywhere. These qualitative instruments can supplement and support the students in lifelong education, too (Office of Basic Education Commission, 2012).

For the study, the researcher had designed a ubiquitous instructional system based on the principles and theories of the systems approach related with learning situation anywhere and anytime

from digital media and technologies. The learning approaches integrate a ubiquitous instructional system modeling by using the synchronous, asynchronous and hybrid learning techniques. This innovative study will be the benefit for learning or instruction in upper secondary students as well as other level. The new paradigm of a learning system model is an appropriate designing for education in the globalizing of learning society in the 21<sup>st</sup> century.

### **Objectives**

- 1) To develop a ubiquitous instructional system for the upper secondary students in Upper Northern Thailand
- 2) To evaluate a ubiquitous instructional system for the upper secondary students in Upper Northern Thailand

### **Research Methodology**

This research was designed on a research and development (R&D) technique. The scope of the study were as follows :

#### ***1. Population and Samples***

***1.1 Population.*** The population for this study were separated into 2 groups, the first group were the 31,993 students in Mathayom Suksa 6 level, 927 teachers and 191 school administrators in the schools which located in Upper Northern Thailand. The second group were the 10 experts or specialist in the educational technology and the curriculum/instruction area.

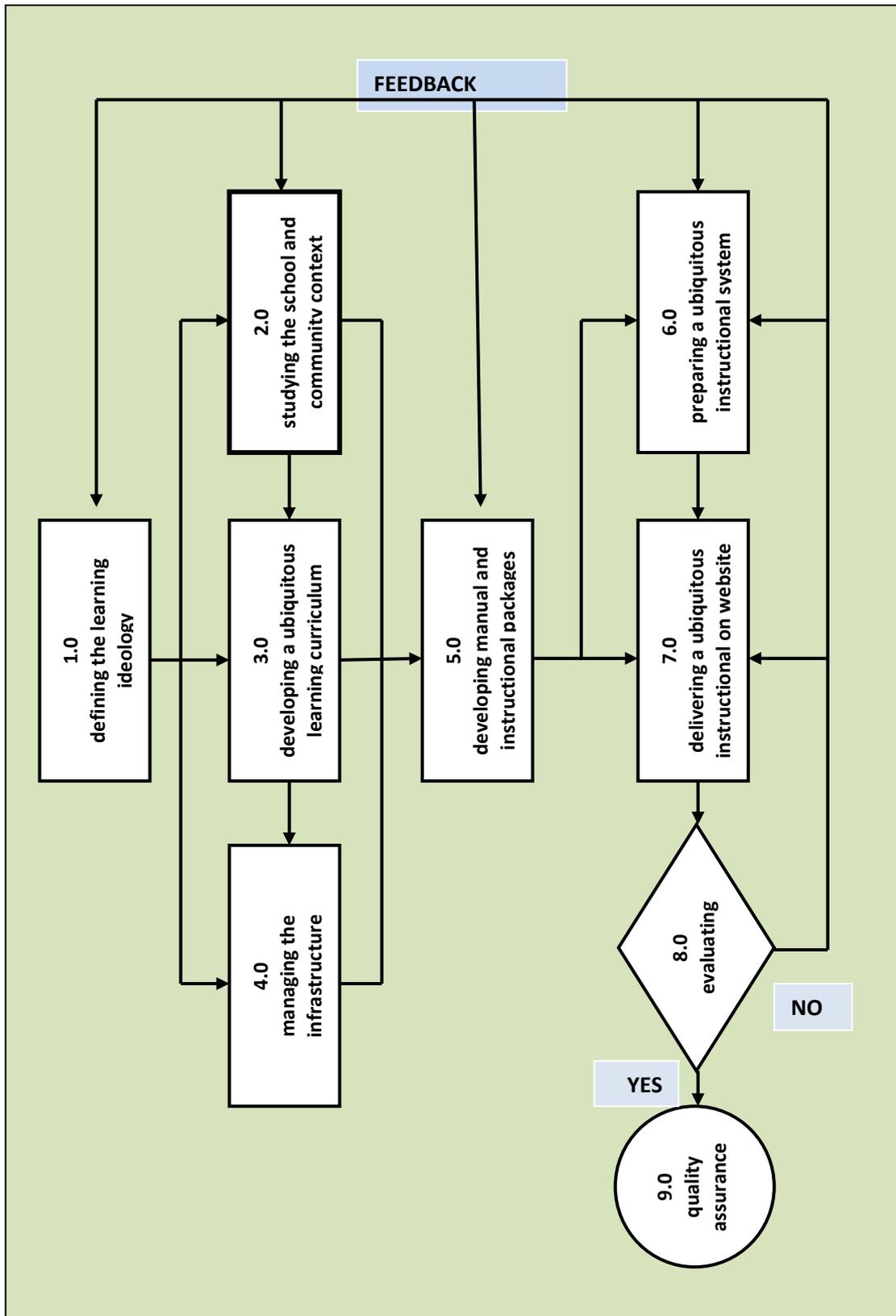
***1.2 Sample.*** The samples were defined into 2 group for studying in 2 phases. The first phase was developing a ubiquitous instructional system. The sample for this phase were the 379

students in Mathayom Suksa 6 level, 274 teachers and 127 school administrators gained by randomly selected. The ratio of the sample were gained by Crejecie and Morgan's table and using proportional stratified random sampling technique and 9 experts or specialists were gained by using purposive sampling technique. The second phase was the quality evaluation of a ubiquitous instructional system which consisted of 30 students, 3 teachers and 3 school administrators by using purposive sampling technique.

#### ***2. Scope of contents and implementation***

This research was a systematic development in a ubiquitous instructional system. The methodology of the research design based on 4 components by system analysis, system synthesis, designing instructional system model and testing instructional system. The scope of contents in the systematic model depended on 9 steps. They were 1) Defining the learning ideology 2) Studying schools and community context 3) Developing a ubiquitous learning curriculum 4) Managing the infrastructure and networks 5) Developing the manual and instructional packages 6) Preparing a ubiquitous instruction via the instructional packages 7) Delivering a ubiquitous learning 8) Evaluating a systematic and learning environment and 9) Assuring the quality of a ubiquitous instructional system.

The proposed model of a ubiquitous instructional system in this research was called "**BEDUL Model**" (Basic Educational Ubiquitous Learning Model) see figure 1.



**Figure 1** A ubiquitous instructional system model : BEDUL Model (Basic Education Ubiquitous Learning)

(Surasak Paje, 2015)

### 3. Research Instruments

The instruments of the research were used in 2 phases. The first phase was developing instructional system and the research instruments were the questionnaires about the present status and trend of the ubiquitous learning, the criticism issues for a model recognition, verifying the 5 units of the ubiquitous instructional packages efficient based on 80/80 standard criterion, learning achievement test, satisfaction form and interview form. The second phase was testing a ubiquitous instructional system by using the research instruments which were recognized on the quality approved. The instruments were the manual and instructional packages, the achievement test, the satisfaction form and interview form.

### 4. Data Collection

This research and development was the applied principles and theories of research methodology of STOU (Sukhothai Thammathirat Open University) on 7 steps as follows :

*Step1:* studying contents and knowledge about the ubiquitous learning

*Step 2:* studying the present status, the problems and need assessment on a ubiquitous learning for define and design of a learning model

*Step3:* developing a conceptualizing model of a ubiquitous learning systems

*Step 4:* surveying and questioning by the experts recognition

*Step5:* constructing a proposed model

*Step 6:* testing and improving a model

*Step 7:* improving and developing to a comprehensive model

The data collection for this study was divided into 2 phases as follows :

**4.1 The First Phase.** Designing and developing a ubiquitous instructional system comprised of 1) studying and collecting contents of ubiquitous education from the educational resources, such as books, textbooks, research documents and etc. 2) studying the present status and trend of a ubiquitous learning environment in schooling by using the questionnaires. 3) developing a conceptual framework of a ubiquitous learning by analyzing and synthesizing the questionnaires method. 4) evaluating and criticizing from the experts. 5) improving and developing the model and 6) analyzing, constructing and developing the research instruments.

**4.2 The Second Phase.** The systematic efficiency trial as follows 1) learning experimental model in 3 integrating techniques such as synchronous, asynchronous and hybrid methods. The instruments for this step were the ubiquitous instructional packages, learning achievement test on pre-test and post-test, satisfaction and interview form. 2) evaluating a ubiquitous instructional system by using the learning achievement test. 3) surveying and interviewing samples of the satisfaction on using a model and 4) summarizing and concluding, improving and innovative diffusion .

### 5. Statistic and Data Analysis

The statistic and data analysis were divided into 2 groups as follows :

**5.1 Descriptive and conclusive statistics.** They were percentage (%), arithmetic mean ( $\bar{X}$ ), standard deviation (S.D.), and t-test

**5.2 Efficiency and testing statistics.** They were the statistics for testing research

instruments, such as items difficulty (  $P$  ), items discrimination (  $r$  ), items reliability (  $r_{tt}$  ) and efficiency criteria of learning packages ( $E_1/E_2$ ) 80/80 standard criterion.

### Results or Conclusion

The research finding were as follows :

1) The total data analysis in present status was at the "middle" level and trend of a ubiquitous instructional system on 9 steps was at the "high" level , and total indicator was significant at 0.01 level.

2) The five ubiquitous instructional packages were efficiency based on 80/80 efficiency criterion.

3) The post-test learning achievement of ubiquitous learning packages was significantly higher than the pre-test learning achievement at 0.01 level.

4) The result of self-assessment from using the instructional packages via network was the "high" level and the sample ideas and opinions about a ubiquitous learning could be concluded that a ubiquitous learning system was a new paradigm and innovative for a learning society to enhance the efficiency and effectiveness of schooling in upper secondary education level.

### Discussion

The research and development of a ubiquitous instructional system for upper secondary students in Upper Northern Thailand is the important topic and issue for discussion as follows :

1. The designing and developing of a ubiquitous instructional system were divided into 9 steps. The research conceptual framework was based on theories and practices of the system approach. The results of the research methods on 9 steps in the

ubiquitous learning framework showed that, total indicator of present status in the implementing was on the "middle" level, and the indicator in trend of implementing was on the "high" level. All steps indicators were significantly different in 0.01 level. Thus it can be summarized that the system approach is very important for the instructional system. Tavigulasub (2011) implied that the system approaches is the most important aspect for the implementing, problem solving, communicating, assuring quality, evaluating, controlling and checking. It is a good strategy for innovative construction and forecasting the new paradigm in education.

2. The details of this in-depth study from analyzing of the contents, trying-out the research instruments and personnel ideas and opinion techniques found that, the ubiquitous instructional system in this research would be appropriate for application in learning with the different contexts in the new educational era which would likely depended on using technology-based paradigm by emphasizing on the learner-center approach. A new paradigm helps the learners make their good character on self-managing skills and integrating the curriculum by linking over their experience with the technology (Branson,1990). Nowadays, people who lives with educational technology have the best chance to integrated skills in various learning method such as e-learning, networked learning, online learning, open learning, distributed learning, virtual education, digital media and technology for learning, technology enhanced learners in instruction, especially the conceptualizing in research, references and construction contents (Loveless, 2013). So the ubiquitous learning is an innovative learning by using technologies in difference contexts in modern society.

3. BEDUL Model, a ubiquitous instructional system which was designed and developed which is the advantage for the learners and based on the principles and theories of the system approach is responsive innovation in educational objectives in the new paradigm and the different context on the anywhere and anytime learning situation. The current issue in transformative learning will change the learning paradigm in the 21<sup>st</sup> century, especially the computer networks revolution in the digital age. In the learning society, the ubiquitous instructional system will appear anywhere and anytime. Bitter and Legacy (2009) said that, the functions of high competency in ubiquitous computer era were the communication, data transformation and information linkage anywhere and anytime. This phenomenon is the influence of the ubiquitous computing and technology. So the ubiquitous computing and networks provided high competency and capability on connectivism for human learning and instruction in the present world pedagogy.

## **Recommendation**

### **1. Recommendations for the implementation**

1.1) This studying in the systematic approach of a ubiquitous instructional system was designed and developed in relation to the Basic Education Curriculum Act 2008. The pedagogy emphasized the analysis, synthesis, design, trial and improvement . A ubiquitous model should be applied for the learning and instruction for the learners or subjects in any levels or any context of learning environment.

1.2) A ubiquitous instructional system is an educational innovative pedagogy of the instructional technology in the new age. It is a

responsive and reflexive model related to the educational reform strategies. Brahmawong (2012) said that the ubiquitous education is the new instruction which has role on the Education Act 1999 in section 66 which refer to the learners development in compatibility of the new innovation by using knowledge management for themselves. Three learning methodologies are self-direct learning (SDL), peer-direct learning (PDL) and teacher-direct learning (TDL).

1.3) The BEDUL Model is a new instructional system based on the principles and theories of the system approach. This model and pedagogy can be used and apply for any learning activities in upper secondary students level and other levels in any places and any contexts. Moreover, this model should be use for the tele-training in the syllabus or curriculum of training, too.

## **2. Recommendations for the further research**

The researcher has some recommendations as follows :

2.1) There should be studies on designing a ubiquitous instructional system for learning or educating in another level.

2.2) There should be a study and trial for the learner groups in a different context.

2.3) There should be studies about in-dept detailing on variable factors that reflect designing and developing in a ubiquitous instructional system in any level.



## References

- Bitter GG, Legacy JM. Using Technology in the Classroom.(7<sup>th</sup> ed.)New York : Allyn and Bacon, Inc.2009.
- Brahmawong C."Systems and the Systematic Management." in Systems Approach in Education. Syllabus Code 27703. Unit 1-8. Graduate School of Education, Sukhothai Thammathirat Open University, Nonthaburi : STOU Press.Thai. 2010.
- Brahmawong C. "Thailand Educational Visioning :Forward to Ubiquitous Education." in The Manual for integrating Tablets for Enhanced Education. Bangkok : Office of Basic Education Commission, Ministry of Education.Thai.2012 a.
- Brahmawong C. "The Fundamental Concept of Research in Educational Technology and Communications. "in Research in Educational Technology and Communications. Syllabus Code 27702.Unit 1-6. Graduate School of Education, Sukhothai Thammathirat Open University, Nonthaburi : STOU Press. Thai 2012 b.
- Branson RK. "Issue in the Design of Schooling : Changing the Paradigm." Educational Technology. 4 (April 1990), 7 - 10.
- Jones V, Jo JH. "Ubiquitous Learning Environment : An Adaptive Teaching System Using Ubiquitous Technology." Accessed September 26, 2012. Available from <http://www.ascilite.org.au/conferences/perth04/procs/pdf>.
- Kim HJ, Caytile RD, Kim TH. "Design of an Effective WSN-Based Interaction u-Learning Model. "Accessed January 19, 2013 .Available from <http://www.julita.usask.ca/mable/webber.pdf>.
- Loveless A, Williamson B. Learning Identities in a Digital Age : Rethinking Creativity Education and Technology. New York :Routledge. 2013.
- Office of Basic Education Commission. A Report of Using Electronics Media in Learning of Supervisors and Teachers Under the Office of Basic Education Commission. Bangkok :Kurusapha Press. Thai .2011
- Office of National Education Council. Thailand Educational Act 1999.Bangkok : Prig- Wan Graphic, Inc. Thai .1999
- Saba F. "A System Approach to the Future of Distance Education in College and universities : Research, Development and Implementation." Continuing Higher Education Review.Vol.76, 2012, 30 - 37.
- Sinclair J, et.al. BBC English Dictionary: A Dictionary for the World. London : Harper and Collins Publishers, Ltd. 1993
- Suwan-nattachote P. "The Important and Models of the Instructional System." Accessed March 20 , 2012. Available from <http://www.inded.rmutsy.ac.th/datapdf/10/2009-10-25>
- Tavigulasub W. "Forward to the Education System Approach." in Systems Approach in Education. Syllabus Code 27703. Unit 1-8. Graduate School of Education, Sukhothai Thammathirat Open University. Nonthaburi : STOU Press. Thai.2010



- Tavigulasub W. "Systems Managing and Designing."  
in Educational Technology and  
Communications. Syllabus Code 20310.  
Unit 1-7. Faculty of Education, Sukhothai  
Thammathirat Open University.  
Nonthaburi : STOU Press. Thai. 2011
- Watson EC, Plymale WO. "The Pedagogy of  
Things : Ubiquitous Learning , Students  
Culture an Constructivist Pedagogical  
Practice." in Kidd, Terry and Chen , Irene.  
( Editors). Ubiquitous Learning : Strategy  
for Pedagogy, Course Design and  
Technology. U.S.A. : Information Age  
Publishing, Inc. 2011
- Weiser M. "The Computer for the 21<sup>st</sup> Century."  
Scientific American. 265(3) (1999), 94 - 04.
- Wongkit-rungruang V, Jittarerg A. Skills of the  
Future : The Education for the 21<sup>st</sup> Century.  
Bangkok : Open World Press. Thai , 2011
- Zhang H, Maesako Y. " A Framework of  
Learner Development Ecosystem for  
Designing a Ubiquitous Educational  
Information Infrastructure." Journal of  
Software. 4(2) (April 2009), 124 - 131.