academicJournals

Vol. 10(22), pp. 2839-2845, 23 November, 2015
DOI: 10.5897/ERR2015.2521
Article Number: C9C795756348
ISSN 1990-3839

http://www.academicjournals.org/ERR

Educational Research and Reviews

Full Length Research Paper

Best management practice for understanding learning in sustainable water resource management (WRM) for secondary science teachers in Thailand

Chunwadee Chunrasaksakun

Education Program in Curriculum and Instruction Program, Faculty of Education, Khon Kaen University, Khon Kaen 40002, Thailand.

Received 08 October, 2015; Accepted 13 November, 2015

The aim of this study is to investigate the effects of training teachers to enhance their students' achievements in water resource and disaster course and to compare the effects of using the curriculum framework between training teachers or using curriculum framework in the secondary schools in Khon Kaen Province of Thailand. It was found that the 28-science teachers were able to manage their learning units and lesson plans on WRD. Statistically significance was differentiated between participating teachers and non participating teachers at .01 confidence levels (ρ < .01). Significant differences in students' achievements between the controlled and experimental groups were found.

Key words: practice, learning, water resource, management, science teacher.

INTRODUCTION

Teaching practice is the most important part of teacher training administrations for teachers who are going to prepare themselves for teaching. It should be the central focus and students' center for learning that should be followed as the educational Thailand system to reform the education system, pivot professional training (The Ministry of Education, 2002). Teacher training is the practical aspect of teacher trainees and it is an assortment of factual and dramatic characteristics. During the teaching practice, teachers find an opportunity to use the acquired knowledge, to emphasize on water resource management, especially in the areas of their natural flood plain and disaster, and to polish teaching methods, teaching principles and teaching techniques. The most critical environmental problem that Thailand is facing presently is water pollution. Despite the annual southwest monsoon, Thailand is subject to drought, particularly in the northeastern region. As of 2002, Thailand had less available water per person than any other countries in Asia, and nearly one third of its water was "unsuitable for human consumption." Inconsumable water was also a result of increasing untreated domestic sewage, industrial wastewater and solid hazardous wastes (ThailandOutlook.com, 2007).

Water should be considered an exhaustible resource because it is indispensable for human activities, food security and ecosystems, as well as for national economics. Unplanned uses of water can have

E-mail: chunwadee@gmail.com. Tel: +66 8 3151 5858.

considerable negative impacts on humans and the environment. Uses of water include agricultural, industrial, household, and environmental activities. As much as 97% of the Earth's water is salt water with only 3% fresh; and slightly over two thirds is frozen in glaciers and polar ice caps (United States Geological Survey, 2005). The remaining unfrozen fresh water is found mainly as groundwater with only a small fraction present above ground or in the air (GreenFacts Website, 2008).

On top of the environmental problem of water pollution is drought. Humans have coped with natural disasters affecting their well-being and future development. In the Asia-Pacific region, past natural disasters have included the tropical cyclone that swept Haiyan in the Philippines in 2013; the Great East Japan Earthquake in 2011 and its associated crippling tsunami; and the severe floods in Thailand in 2011. In 2011 alone, economic losses from global disasters amounted to US $366 billion with 80% occurring in the Asia-Pacific region (Centre for Research on the Epidemiology of Disasters (CRED), 2012).

After floods that inundated Bangkok in 1995, Thailand's King Bhumibol Adulayadej proposed the building of a large network of canals on the outskirts of the capital that would lead to huge holding areas for water runoff called "monkey cheeks". The project was never followed through, however, by successive governments. Following severe mass floods in Thailand in 2011, on Monday 5th of December and in a rare public appearance, King Bhumibol Adulayadej marked his 84th birthday by calling for an end to political conflicts. He asked his subjects to work together to help the millions of people affected by floods that had devastated the country. The government recruited water experts to serve on a committee that was tasked with devising a new water-management system for the country to try and ensure such a disaster would not be repeated. The Prime Minister claimed that all of Bangkok would be dry by the beginning of 2012, but many factories would not be operational for several months. Economic growth for 2011 was forecast at over 4% but is now expected to be only between 1.2 and 1.5% (Time News, 2014).

It is imperative to manage risks in water resources to alleviate damage, the consequences of natural disasters such as flooding and drought, and to increase agricultural production in order to ensure food security for the country. Understanding the types of risk in each area can help planers select appropriate policies and actions to be applied in order to reduce risks and mitigate damage. Thailand has frequently suffered from flooding during the monsoon season and from droughts in summer, or even from both in particular areas.

The continued increasing exposure and greater losses associated with disasters demands a better understanding of their complex nature and common causes namely hazards, exposure, vulnerability and resulting risks. Many natural disasters that have occurred in Thailand have resulted in loss of life and economic damage. Most have been storm- and flood-related, while man-made disasters have also caused great losses (ADPC News, 2014). As for the Northeastern region of Thailand, the great flood spread throughout 20 provinces, for example, in Khon Kean province in the flood plain area of the Chi and Nam Phong rivers. Water streams overflowed and covered wetland district areas, such as Muang, Ubon Rattana, Chonnabot, Wang Yai, Wang Noi, and Manjakili Districts, resulting in destroyed rice fields and agricultural areas covered with huge acres of water. The people and their families who lived at the back of the Ubon Ratana Dam were forced to move into the hills or to higher ground temporarily and many schools were forced to close.

LITERATURE REVIEW

The last decade, in particular, has seen the development and reform of Thailand's education system with the government changing the Basic Education Core Curriculum of 2008. Schools were asked to revise their curriculum aligning it with the Basic Education Core Curriculum. They were able to create additional courses relevant to their school mission and local area, for example, teaching about the natural resources of their surrounding environments, local water, minerals or forestry sources (The Center of Khon Kaen News, 2011). Local strands are in accordance with the community and local needs. However, some schools have faced problems trying to integrate local curriculum strands into their curriculum and teaching due to teachers' insufficient knowledge for designing curricula and appropriate instruction.

In formal education, a curriculum constitutes the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of educational objectives. This process includes the use of knowledge, skills and attitudes that are interwoven, through the use of digital media and/or texts that address the complexities of learning (Kerr, 2009).

A curriculum also outlines the skills, performances, attitudes, and values students are expected to gain from schooling. It should include the content of courses (the syllabus), the methods employed (strategies) and other aspects such as school organization. Courses should be arranged in a sequence to make student learning easier. A curriculum normally spans several grades and can refer to entire programs provided by a classroom, school, district, state, or country. A classroom is assigned sections of the curriculum as determined by the school (Nairs and Fisher, 2001).

Secondary education in Thailand aims to improve the quality of life of learners and serves as the basis for further education. It aims to: (a) help learners discover

their own abilities, aptitudes and interests; (b) provide a general education as the basis for securing honest occupations or further education; and (c) respond to the needs of the localities and the nation as a whole. Based on these aims, the curriculum designed by the Ministry of Education aims for learners to develop the following characteristics: knowledge and skills in general education subjects as well as the ability to keep up with academic advances; the ability to maintain and enhance personal and community health and hygiene; the ability to analyze community problems and to choose suitable alternatives for solving them, taking into account various limitations; pride in being Thai; ability to live in peace with others and to willingly help others within the limits of one's capability; creativity and ability to devise and improve (Ministry of Education, 2008).

Of importance is the ability to analyze community problems and choose suitable alternatives to solve such problems. The most important problem here is how to change learning and teaching behaviors towards the environmental problem of water pollution, drought and disaster effects. According to curriculum orientation guidelines, teachers should be focusing on: (a) integrating content from daily life; (b) making greater use of activities, rather than textbooks; (c) using different learning materials in a variety of ways; (d) making learners the center of learning activities; and (e) reducing explanations and helping learners. Such foci will take more time to prepare and teach according to designated teaching/learning curriculum orientations. It has been anticipated, however, that such concerns will be solved in the forthcoming process of reforming the curriculum and learning activities (Ampra and Thaithae, 2008).

Educational policy has facilitated decentralization to schools in developing their own curriculum aligned with the Basic Education Core Curriculum of 2008. Of importance is the collaboration of school personnel and experts. The development of methodological curriculum orientation guidelines starts with a needs assessment, curriculum planning, teacher training, tryout and investigating the outcomes.

METHODOLOGY

The process of research and development for this study was conducted in three phrases.

Phase I: Contextual study

This study was administered in multi-stages. Two hundred and seventeen (217) school administrators and teachers in the Khon Kaen Educational Service Area Office 4 were randomly selected. In addition, 21 specialists were purposively selected in the data collection: 12 professional scientists specializing in WRD (4 professors in WRD, 2 researchers in WRD and 6 local experts in WRD) were selected as well as 9 professional educators specializing in curriculum and instruction (4 supervisors, 3 school administrators and 2 secondary teachers with responsibility for the school curriculum for at least 5 years. The instruments used to collect data were:

1. A questionnaire comprising 48 items with a 5-point rating scale. The questions enquired the participants' current status, problems, needs, and possibility of developing a WRD curriculum framework. The Index of Congruence (IOC) was used for validation with an average mean of 0.87. For reliability, the questionnaire had 0.93, by using Cranach's α- Coefficient.
2. An unstructured interview about learning objectives and learning areas was conducted as a focus group discussion with the 21 specialists. Content analysis and inductive reasoning were used to analyze the data in order to identify the scope of the curriculum framework. The data were summarized into conceptual categories relating to the learning objectives and learning areas in the curriculum framework.

Phase II: Tryout and revision of the curriculum framework and teachers' training manual

Five secondary school teachers in the areas of science and social studies were selected from the sample in phase I. The criteria included the willingness of teachers to be involved in this research project and a full attendance record in the teacher training program. These five teachers were assigned to teach students at the 9th grade level under the Khon Kaen Educational Service Area Office 4.

A one group pretest-posttest design was applied in order to determine the quality of teacher training manual and compare the ability of the 5 teachers before and after their training. The instruments used were: (1) the teacher training program and manual; (2) an achievement test designed by the researchers and (3) an evaluation form consisting of 20 items with a 5-point rating scale to evaluate the quality of learning units and lesson plans on WRD (4) a Likert five-point scale to rate teachers' satisfaction in respect of the teacher training program.

Phase III: To investigate the efficiency of teacher training curriculum

The efficiency of teacher training curriculum was to administer with the sample size of 56 science teachers, 2 separated groups of the 28-controlling teachers and the 28-experimental teachers groups with a multi-stage sampling technique. A non-equivalent control group, pretest-posttest design was applied to 6 classes of 147 students at the 9th grade level from large, medium, and small sized schools under the Khon Kaen Educational Service Area Office 4. The experimental group and control group consisted of 68 and 79 students respectively. The instruments used were: (1) an achievement test (with a reliability of 0.75 by KR21, level of difficulty of 0.20-0.77, and discrimination power above 0.2) focusing on learning areas relevant to WRD designed by the researchers for the pre- and post-test (2) project-based assessment for assessing students' projects relevant to WRD, consisting of 13 items and measured on a four-point scale of *very good*, *good*, *fair* and *needs improvement*.

Research instruments

1. The unstructured selection interview instrument used for teachers interviews
2. The conservational guide book instrument for reporting data records**.**

Table 1. Means and Standard Deviations for Pre and Post Training Achievements of Science Teachers of the WRD.

Group	Pre-test Scores			Post-test Scores		
	n	*M*	*SD*	*n*	*M*	*SD*
Experiment	28	27.92	4.29	28	40.21	3.39
Control	28	27.53	3.32	28	29.92	2.58

Note. The maximum score is 50.

Table 2. Comparisons of post-test scores after the training of science teachers between experimental and control groups.

Group	Post-test scores			*MD*	*t*	*p*
	n	M	SD			
Experimental	28	40.21	3.39	10.29	-12.769	.00
Control	28	29.92	2.58			

$p < 0.01$.

3. Training teacher curriculum document for practicing teachers to learning units
4. Practicing documents for training teachers
5. Pre and post training teacher tests
6. Training teacher satisfaction questionnaire instrument for teachers' perceptions on their satisfied training teacher awareness and understanding on WRD.
7. Quality assessment document instrument was assessed to learning units of curriculum trainee.
8. The pre and post evaluations of students' achievements were assessed.

Table 3. One-way analysis of variance of learning outcomes of the experimental group in large schools, medium and small.

Sources	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	25.86	12.93		
Within groups	65	849.13	13.06	.99	.37
Total	67	875.00			

RESULTS

Teachers' and administrators' perceptions of the current conditions of schools policy about teaching and learning in WRD and teachers' opinions on the teaching and learning problems of WRD were found to be at the medium level. In addition, teachers' opinions on the teaching and learning requirements for WRD were at the high level. Thus, to summarize, the curriculum framework in WRD needed a high level and had the possibility of developing the school curriculum at the medium level.

The two times focus group with 12 professional scientists specializing in WRD and 9 professional educators specializing in curriculum and instruction found that the learning areas of WRD should consist of seven themes including water, water resources, water resources management, disaster management, proactive approach for managing WRD, local wisdom on resources management and a definition of WRD terms.

A contextual study found that teachers most preferred a five days' workshop. For knowledge and skills, teachers wanted to know more about how to design learning units and assessments on WRD, as well as information about community learning resources on WRD.

After a-five-day-workshop training, it was found that the voluntary 28 teachers were able to write learning units and lesson plans on WRD. Five teachers produced material of a high standard (mean=3.54) and 23 teachers did so of a good level (mean=3.35). In addition, all of them achieved post-test scores at 70.0%, which was the passing grade (Table 1). There were significant differences between teachers who attended and the ones who did not attended a training program on WRD in aspect of knowledge about how to design a learning unit on WRD (Table 2).

When comparing students' achievements of their learning and non learning to their local curriculum framework, using the learning unit of water source and natural disaster content of the two groups between the experimental learning and normal or controlling learning groups in the 3-school sizes, large, medium, and small, it was found that the students in the experimental group had a much higher learning achievement than the students in the control group, with a statistically significant difference at level .01. However, there was no significant difference among students in the control group in relation to their school sizes (Table 3).

DISCUSSION

The study indicated that from the training on efficiency for using this local curriculum framework on management of water source and disaster for the basic education commission of teachers, trainees were able to learn and make the learning units efficiency. They were able to complete their assignments at their training processes of this curriculum by the dissemination of thinking, the importance and necessity of learning management framework for teachers and school administers, and to direct emphasis on the same thinking to acquiescence. It confirmed the study of Chaiyapan (2005) and Sittisomboon (2003) who reported that the volunteer and network trainers' efficiencies were highly satisfied.

The study was to compare between the 2-student groups, the experimental learning group and the normal learning group, who sat in the different school sizes; large, medium, and small schools for assessing students' achievements. Statistically significant difference was

found between groups of their learning achievement. The achievement of the experimental group was higher than that of the normal group at level .01. Students' solving problem projects were presented and academic on WRD exhibition of students were satisfied by the communities and local folk wisdoms. Some of the exhibitions were: Drought in Our Home Project, Drought at Ubon Rattana Dam Project, Modernized Children on Nam Phong River Conservation Project, and etc. These students' projects were confirmed with the studies of Silanoi et al. (2005), students' mind consciously to environmental conservation (World Bank, 2003), students' achievement of their learning with the post-assessment was greater than pre-assessment (Australian Qualifications Framework, 2011), and training teachers before their using the curriculum was more understanding learning activities than normal teaching of teachers (Fullan and Stiegelbauer, 1991; Nuttrawong, 2010; Utthanan, 2009).

Conclusion

In 2011, Thailand coped with massive flooding. This was caused by a tropical storm named NOCK-TEN and followed by seasonal monsoon rains. Such weather usually falls from August to October. Nearly 3 million acres of farmland were under water and 65 provinces were affected. Approximately 680 people were killed with a US 6 billion estimated costs. The results of the catastrophe indicated that it was very important that teachers and administrators be aware of the need for a curriculum framework in WRD.

The Educational Act of Thailand in 1999 mandated that teachers should conduct classroom research for promoting their career path. For this reason, many teachers wanted curriculum innovation for their classroom research in order to consider possibilities to develop WRD for school curriculum at the medium level. Moreover, a curriculum framework in WRD would ensure school curricula contained updated information and would be of relevance to existing needs in the community. A curriculum framework in WRD would help teachers to easily integrate the content of WRD in every subject within the Basic Core Curriculum. Teachers would, as a result, be able to teach students and develop their knowledge and awareness.

In order to develop a curriculum framework on WRD for the basic education, Walker's Naturalistic Model was adopted. The Model includes three basic phrases termed platform, deliberation, and design. Walker's three-step model has since been used at various levels of curriculum development with pre- service teachers (Bonser and Grundy, 1988); with in-service teachers (Holt, 1990; Ross, 1993); and large-scale programs (Ben-Peretz, 1990; Dev and Walker, 1990 cited in Marsh and Willis, 2007). A platform is used for describing any consensus of concepts, knowledge or learning experiences on WRD. Deliberation is used to identify which concepts or knowledge; and learning experiences are needed or are essential on WRD.

In this research, two rounds of focus groups were used. The consensus of deliberation found that the essential learning areas of WRD should consist of seven themes including water, water resources, water resources management, disaster management, a proactive approach for managing WRD, local wisdom on resources management and definition of terms on WRD. We used the seven themes to design a local curriculum framework on WRD. The planned curriculum included: 1) the introduction; 2) definition of terms; 3) goal for developing learners; 4) strands of WRD; 5) learners' assessment; 6) guidelines for schools to integrate WRD into the school curriculum; and 7) suggestions. In this curriculum framework, WRD is relevant to the Basic Education Core Curriculum at Grade levels 1–12, where schools can apply to develop teaching and learning so that students are given experiences of WRD, communities and local wisdoms. This result matches that of the study by Padsin (2008), who reported on the development of a learning unit with the Lam Pao Flood Plain Environment school group.

Evaluation of teacher perceptions and readiness to adopt and carry out the innovation is crucial to the success of the program. Teacher training programs should be an integral part of the curriculum development stage. Fullan and Stiegelbauer (1991) reported that teachers and connected personnel were the foundational factor propelling educational innovation and the curriculum successfully. Teachers should adjust their thinking and teaching to be aligned with the curriculum and always update their knowledge and skills.

Focusing on the training and practicing of teachers in a WRD curriculum framework found that teachers were satisfied with a five days' workshop. The workshops gave them enough knowledge and skills of how to design learning units and assessments on WRD, as well as information about community learning resources on WRD. A model for training was a balance of being external to school and a personal mission to teachers (Goodson, 2000).

This study indicates that the new WRD curriculum framework needs to be composed of substantial knowledge for teachers who are in leadership roles in their teaching. These results revealed that the 28 voluntary science teachers who received training were able to design learning units from the WRD curriculum framework. The model and personal mission of teachers to efficiently design and write learning units was shown to enhance their competence.

Comparisons between the two learner groups (experi-mental learning and control) for assessing learners'

achievements who sat in different school sizes (large, medium, and small) can be made. Of statistical significance were differences found in the learning achievements between the two groups; the experimental group was higher than the control at level .01. Students in the experimental group could create projects focusing on solving problems relevant to WRD. The students' problem solving projects were presented and exhibited to the community. For example, the "Drought in Our Home" Project, "Drought at Ubon Rattana Dam" Project, and "Smart Children on Nam Phong River Conservation" Project. These projects showed that students have knowledge and attitude concerns about WRD and have thinking skills. The results are substantiated with the studies of Silanoi et al. (2005) who reported learners' minds being conscious to environmental conservation. In the last decade, previous research have reported that learner achievements in the post-assessment were greater than pre-assessment; learners' training and using the curriculum had more understanding towards learning activities than to conventional teaching (Australian Qualifications Framework, 2011; Fullan and Stiegelbauer, 1991; Nuttrawong, 2010; Utthanan, 2009; World Bank, 2003).

Based on the findings of this study, a number of suggestions can be offered. Organizations, institutes, the Primary Educational Service Area Office, and the Secondary Educational Service Area Office should specify policies that support and promote the propagation of the local curriculum framework concerned with the management of water resources and disasters into every school's curriculum of the basic education (Grades 1-12). Knowledge, skills and attitudes of WRD have cultivated moral traits for primary and secondary educational learners who are able to emphasize acknowledge and appreciation and include experiencing skills in their daily life. Teachers should be trained and practiced in the curriculum framework in order to promote the investigation, improvement and adaptation of their teaching within the core curriculum system. Educators and professional occupations should investigate a curriculum framework for suitability and possible learners' achievements.

In terms of applications for developing and using a curriculum framework on WRD such as the basic education commission, Primary Educational Service Area Office and Secondary Educational Service Area Office, educational institutes need to be cautious in covering the sub-content of the core curriculum. The needs of schools and the community should be considered. Human resources need to be continually developed in terms of knowledge, skill and experience in teaching and learning management. The administration should support the curriculum prototype; understand the point of the curriculum; learner participation; and revise data assessment. School administrators should aim build a friendly, cooperative school environment, and plan towards sufficient budgets in order to develop their curriculum on WRD within the basic education core curriculum.

It is suggested that further research to demonstrate the need for curriculum frameworks be administered throughout all educational levels and be continually monitored and developed. The suitability of the curriculum framework may change in response to, for example, time and changes in its content. The new curriculum should study its effects and determinants in order to be further adapted and improved with other learning subject groups.

Conflict of Interests

The author has not declared any conflicts of interest.

ACKNOWLEDGMENTS

Sincere thanks are extended to Research Funds, because this research was supported by 2011-2013 Research Funds from the Holistic Watershed Management Cluster, Thailand National Research University, and the Graduate School, Khon Kaen University.

REFERENCES

ADPC News. (2014). Promoting investments for resilient nations and communities. Available at http://www.adpc.net/igo/contents/media/media-news.asp?pid=590&topic=#sthash.8zzw7WMr.dpbs Accessed 23 April, 2014.

Ampra K, Thaithae C (2008). Thailand: Curriculum planning, development and reform. Available at http://www.ibe.unesco.org/curriculum/Asia%20Networkpdf /ndrepth.pdf. Accessed 18 November, 2008.

Australian Qualification Framework (2011). Learning Teaching and Assessment Policy: James Cook University. Available at http://www.jcu.edu.au/policy/allitoz/JCU_076643.html. Accessed 14 June, 2011.

Centre for Research on the Epidemiology of Disasters (CRED) (2012). Annual disaster statistical review 2011: The numbers and trends. Available at http://cred.be/download/download.php?file=sites/default/files/2012.07 .05.ADSR_2011. pdf. Centre for Research on the Epidemiology of Disasters (CRED). Accessed 4 July, 2011.

Chaiyapan M (2005). Training curriculum development of learning unit on investigated learning for primary education teachers. Doctoral Thesis. Graduate School, Khon Kaen University.

Department of Basic Education Commission (2009). Teacher's guide for the development of learning policy guidelines. Ministry of Education Available at http://www.education.gov.za/LinkClick.aspx?fileticket=ZWdincgt264=. Accessed 8 September, 2009.

Fullan M, Stiegelbauer S (1991). The new meaning of educational change. 2nd ed. New York: Teachers College Press. Available at http://www.personal.psu.edu/wxh139/Fullan.htm. Accessed 20 October, 2012.

Goodson IF (2000). Social histories of educational change. Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Kerr JH (2009). Protect pertinent data: Location of dam and drainage areas. Available at http://epec.saw.usace.army.mil/kerrpert.txt. Accessed 6 January, 2009.
Marsh C, Willis G (2007). Curriculum alternative approach: Ongoing Issues. 4th ed. New Jersey, NJ: Pearson Education, Inc.
Ministry of Education. (2008). The core curriculum of the basic education commission 2008, A.D. Bangkok: The Cooperation of Agriculture Congregation of Thailand Ltd Press.
Nairs CH, Fisher DL (2001). Learning environments and student attitudes to science at the senior secondary and tertiary levels. Available at http://www.iier.org.au/iier11/nair.html**.** Accessed 5 January 5, 2011.
Padsin T (2008). Learning unit development on Nam Poa stream deal with community sources on students at grade level 6. Digital Research Information Center (DRIC). Available at http://dric.nrct.go.th/index.php. Accessed 24 July, 2013.
Silanoi L, Phitak N, Netthanomsak T, Sararattana A (2005). Developing local curriculum for making conscious minds on environmental conservation for lower education students in Nam Pong district, Khon Kaen Province. Thai Library Integrate System. Available at http://202.28.199.3/tdc/browse.php?optiontype=title. Accessed 18 October, 2013.
Sittisomboon M (2003). Training curriculum development on classroom research. Doctoral Thesis. Graduate School, Khon Kaen University.
ThailandOutlook.com (2007). About Thailand. Available at http://www.thailandoutlook.com/contents.php?Id=12. Accessed 25 January 2014.
The Center of Khon Kaen's News (2011). People are more than 1.5 thousand families in Khon Kaen have been Jointed cooperation in natural disasters through thick and thin at the Chi and Nam Pong flood plain October 2011. Available at http://www.manager.co.th/Local/ViewNews.aspx?NewsID=9540000129088. Accessed 10 October 2011.
Time News (2014). Thailand: A frail King greets a flood-stricken city. Available at http://content.time.com/time/world/article/0,8599,2101489,00.html. Accessed 25 January 2014.
United States Geological Survey. (2005). Estimated use of water in the United States in 2005. Available at http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf. Accessed 14 July 2005.
Utthanan S (2009). Foundation and curriculum development principles. Bangkok: Publication Center Press.
World Bank. (2003). Sustainable development in a dynamic world: Transforming institutions, growth, and quality of life. World Development Report 2003.